June 5, 1951 C. T. DENTON 2,556,071

WATERPROOF MEMBRANE FOR FLOOR COVERINGS

Filed July 11, 1946 2 Sheets-Sheet 1

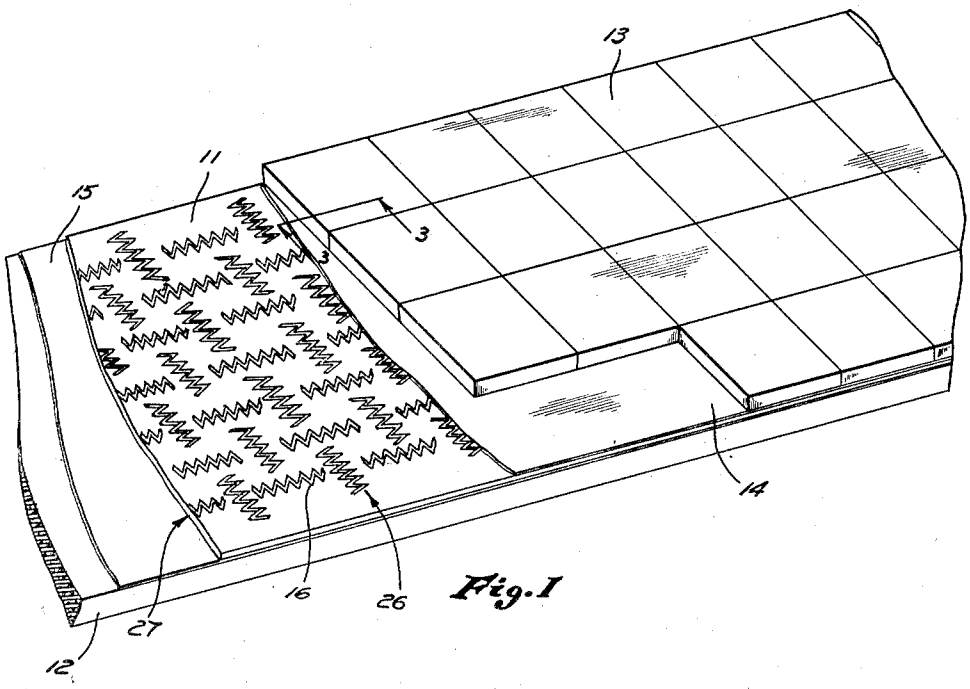


Fig. 1

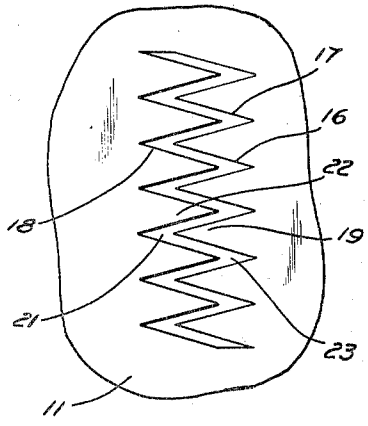


Fig. 2

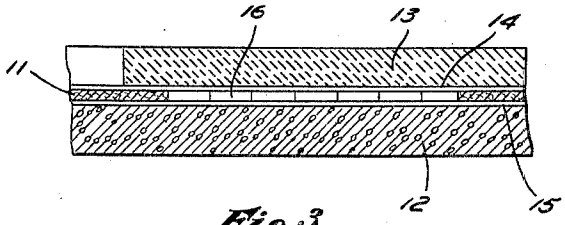


Fig. 3

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WATERPROOF MEMBRANE FOR FLOOR COVERINGS

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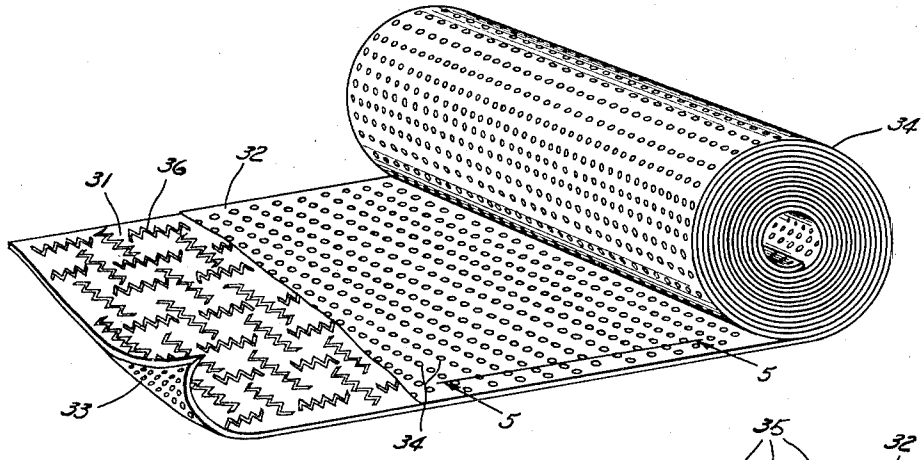


Fig. 4

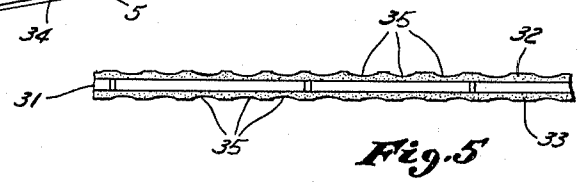


Fig. 5

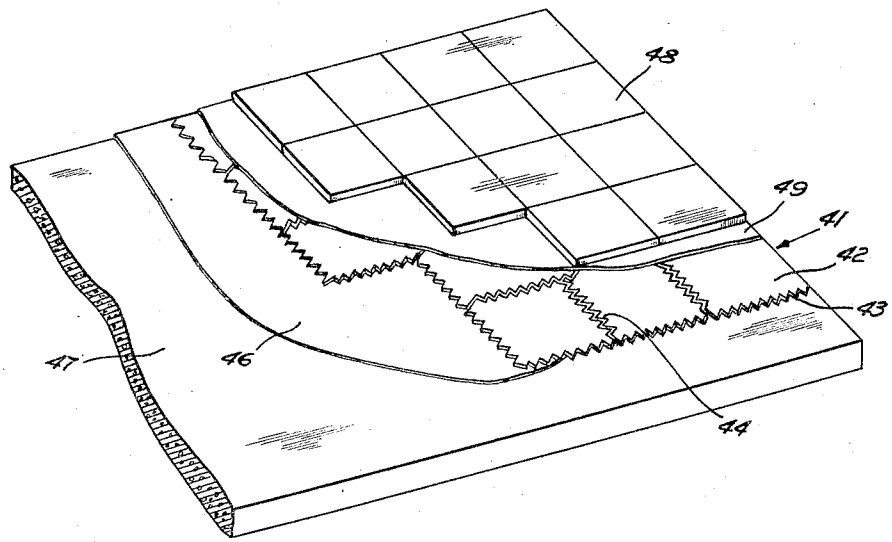


Fig. 6

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UNITED STATES PATENT OFFICE

2,556,071

WATERPROOF MEMBRANE FOR FLOOR COVERINGS

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4 Claims. (Cl. 117—4)

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This invention relates to laminated fabric and analogous manufactures and more particularly to floor coverings such as linoleum, rubber and asphalt tile, cork in sheet and tile form, and the like.

An object of my invention is the provision of a protective sheet, or membrane, adapted to occupy a position between the floor covering and the floor surface for the purpose of protecting the floor covering against moisture and chill otherwise apt to penetrate the material of which the floor is composed and thus reach the floor covering. Commercial practice involving the use of linoleum, linoleum tile, and similar floor coverings has taught that installation upon concrete floors, especially in basements, garages, and the like where the concrete slab rests directly upon the earth, must receive special treatment because of the presence of moisture within the slab itself and also apt to penetrate through the slab from the earth. Although attempts have been made to protect the floor covering against such moisture by the use of a membrane of protective material between the floor surface and the floor covering, they have not been universally successful because of the deleterious effects of the moisture upon the membrane itself. Limitations of manufacturing costs and details of installation such as requirements for establishing a good bond between the floor surface and the floor covering, require that a protective membrane of this nature be composed of porous material sufficiently absorbent to receive and retain a protective impregnation of suitable material insoluble in water, such as asphalt. Material so treated is found to be water-resistant in that it does serve, with a high degree of efficiency, in preventing the penetration of moisture through the membrane, but it cannot be classified accurately as "waterproofing" in that even though the porous carrying sheet is saturated with asphalt to the maximum degree possible, it has been found impossible, at least when produced upon a commercial basis, to fill all of the pores of the backing sheet and thus remove all of its absorbent characteristics. Consequently, when membrane of this nature is laid on such a surface as a concrete slab and then linoleum, linoleum tile, or similar floor covering laid thereupon, serious difficulty is frequently encountered because of the tendency of the membrane to absorb moisture from the slab to the extent that it is caused to swell, such swelling in the plane of the membrane itself becoming manifest in a spreading movement which, due to the spreading being unequal throughout the entire area of the floor, causes buckling. This spreading action of the membrane is even more disadvantageous when it is used as an underlying protective agent for floor covering in the nature of tile because it tends to cause separation of the tile from each other, thus developing cracks through which moisture can penetrate from above to the further detriment of the tile, the bonding agent by which they are secured to the membrane, and the membrane itself.

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It is an object of the present invention, therefore, to provide a protective membrane for use in connection with linoleum floor coverings and the like wherein provision is made for the expansion of the membrane which inevitably follows its being affected by moisture, in such a manner as to avoid damage to the floor covering laid upon the membrane whether that floor covering be in the form of a continuous sheet or assembled tiles.

A further object is to provide a protective membrane of the general character described which, instead of developing the tendency to buckle and thereby loosen the floor covering if and when the membrane becomes affected by moisture, develops a "knitting" action which actually draws the tile more securely downward toward the floor surface.

A further object is to provide a protective membrane of the general character described which, in one of its modifications, provides means, in addition to the bonding material itself, for anchoring the floor covering to the floor surface and also developing a cushion adding materially to the resilient nature of the floor covering itself after installation is complete.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred forms of my invention which are illustrated in the drawings accompanying and forming part of the specification. It is to be understood that I do not limit myself to the showing made by the said drawings and description, as I may adopt variations of the preferred forms within the scope of my invention as set forth in the claims.

Referring to the drawings:

Figure 1 is a perspective view showing a section of floor with floor covering in the form of asphalt tile laid thereupon, with protective membrane incorporating the principles of the present invention in co-operative association with the tile. The figure illustrates the successive layers broken

away progressively, the better to reveal their relative position with respect to each other.

Figure 2 is an enlarged plan view showing one of the expansion-compensating slots by which the membrane of the present invention is characterized.

Figure 3 is an enlarged detail view in vertical section taken upon the line 3—3 of Figure 1, with the direction of view as indicated.

Figure 4 is a perspective view showing a slightly modified form of protective membrane incorporating the principles of the present invention.

Figure 5 is an enlarged detail view in vertical section taken upon the line 5—5 of Figure 4, with the direction of view as indicated.

Figure 6 is a perspective view showing a still further modified form of protective membrane incorporating the principles of the present invention.

In that form of my invention which is illustrated in Figures 1 to 3, inclusive, my improved protective membrane is indicated at 11 as being installed on the upper surface of a slab 12 of concrete so as to afford protection to the floor covering 13 which in this instance is illustrated as being in the nature of laminated fabric tile of conventional design. It should be understood, however, that the membrane 11 is applicable with equal advantage as a protective agent for other types of floor covering, such as linoleum provided in continuous sheet form. In accordance with usual practice, the floor covering 13 is bonded to the upper surface of the membrane 11 by a suitable bonding agent 14, and the membrane 11 is bonded to the floor surface by bonding agent 15. This bonding agent may be of any suitable material such as mastic linoleum cement, linoleum paste, or the like, it being understood that the particular type of bonding agent selected depends upon the nature of the installation and the type of surface to which the floor covering 13 is apt to be subjected. For example, when installing a floor covering of this or similar nature upon a concrete slab such as that indicated at 12, which is apt to contain a substantial amount of moisture, it is customary to employ water-resistant mastic as the bonding agent, i. e., material which is penetrable by moisture but the structure of which is not affected by moisture. In most instances, this has proven to be the most satisfactory type of bonding agent because it is capable of maintaining adhesion even in the presence of material quantities of moisture, and yet it does not completely seal off the upper surface of the concrete slab 12, thus permitting at least a limited degree of ventilation for the concrete, which feature minimizes the tendency for the slab to "sweat" as the result of its temperature changes and the accompanying condensation of moisture which cannot be avoided if all communication between the concrete and the atmosphere is completely eliminated.

The membrane 11 is preferably formed of a sheet of suitable felt saturated with waterproofing material such as asphalt. A well known type of such material available commercially is believed preferable because it is possessed of superior thermally insulative and knitting qualities which offers important protection for the overlying floor covering from the chill of a concrete floor which otherwise has the tendency to make linoleum, and particularly rubber and asphalt tile, unduly brittle. It has been customary to provide such material in continuous sheet form and also in approximately 36" square sheets.

However, as has already been pointed out, this product, while being water resistant, still retains enough of the original absorbency of the material of which it is formed to permit it to absorb enough moisture to cause it to expand, the extent of such expansion frequently being so great that the 36" sheets of such material will develop buckling, actually forcing the membrane upwards off the floor surface, and thus forcing the overlying floor covering, such as asphalt tile, to buckle and break.

My invention, therefore, contemplates the provision of means for compensating for such expansion in the plane of the membrane itself by providing a relatively large number of expansion-compensating slots 16 throughout substantially the entire area of the membrane 11. Each of these slots 16 is of zigzag form, being defined by two opposed serrated edges 17 and 18 respectively, arranged with the serrations 19 of one edge 17 extending into the spaces 21 between the serrations 22 of the opposite edge 18, and with the serrations 22 of the edge 18 extending into the spaces 23 between serrations 19 of the edge 17. Because of this arrangement, motion of the two edges 17 and 18 toward each other through a considerably greater distance than the actual width of the slots 16 can occur before the edges actually come together.

The slots 16 are arranged preferably in straight rows 26 extending transversely across the strip of membrane 11 intersected by other straight rows 27 extending perpendicularly with respect to the rows 26 and consequently longitudinally of the strip of membrane 11. One of the slots 16 of a longitudinally extending row 27 is introduced between each two adjacent slots 16 of a transversely extending row 26 and vice versa; and the slots 16 are preferably arranged in the membrane 11 so close together that the slots 16 of each two adjacent parallel rows are in overlapping relationship, as is clearly shown in Figure 1.

Thus it may be seen that I have provided a protective membrane 11 which is capable of expanding to a substantial degree in the plane of the membrane itself without causing enlargement of the actual dimensions of the sheet of membrane and without causing buckling, inasmuch as the expansion is taken up by a narrowing of the slots 16. These slots 16 are formed in the sheet of membrane 11 at such closely spaced intervals that only a relatively small amount of the material of the sheet exists between adjacent slots and the material of which the sheet is composed is possessed of suitable inherent resiliency to "give" sufficiently to avoid buckling of the sheet between slots when such expansion occurs. Moreover, owing to the overlapping characteristic of the points or serrations 19 and 22 of the opposed edges of each slot ample support is provided for the floor covering 13 thereabove, thereby avoiding any sagging or other indication upon the upper surface of the floor covering 13 of the presence of the slots 16 therebelow. Another advantage of especial importance in connection with the overlapping nature of the serrations 19 and 22 of the opposed edges 17 and 18 of each of the slots 16 is that when expansion of the membrane 11 occurs, movement of the points or serrations 19 and 22 more deeply into the spaces 21 and 23 respectively develops a "knitting" action which actually increases the tension of the layer 14 of adhesive, thus drawing the floor covering 13 above each slot 16 more firmly downwards toward the surface of the floor 12.

In the modification illustrated in Figure 1, the membrane 11 is in the form identified in the trade as "dryback," i. e., it does not come provided with either of the layers of bonding agent 14 or 15 attached thereto; hence, in using this form of membrane, it is necessary to spread the bonding agent 15 upon the floor surface before the membrane 11 is applied and after the membrane 11 is in position the upper layer 14 of bonding agent is applied to the upper surface of the membrane 11 preparatory to laying the tile 13, or whatever type of floor covering is to be employed. In Figures 4 and 5, however, a modified form of membrane 31 is illustrated which is similar to the membrane 11 previously described except that it is supplied with both upper and lower surfaces already provided with the bonding agent 32 and 33 respectively. Inasmuch as membrane 31 of this nature is to be made available to the trade either in the form of a long continuous sheet rolled as indicated at 34, or in stacked flat sheets, it is essential that the layers 32 and 33 of adhesive be dry when offered for sale. Consequently, the bonding agent employed in this modification should be of a type that solidifies to a dry, non-tacky nature and can have its tacky quality renewed as by applying a suitable solvent to its outer surface just prior to the time at which the membrane is to be installed. Several types of adhesives possessed of these characteristics are available and can have their tackiness renewed merely by spreading with gasoline, alcohol, or the like, depending upon the nature of the individual bonding agent.

Owing to the fact that the layers 32 and 33 of bonding agent are dry and relatively hard when the process of manufacture of membrane 31 is completed, it is convenient to form the outer surface of each of the layers 32 and 33 with a large number of relatively closely spaced depressions 35 which have been found advantageous in that they entrap a certain amount of air between the membrane 31 and the surfaces to which the bonding agents 32 and 33 secure it. Hence, they add very materially to the resilient nature of the floor covering laid upon the upper surface of the membrane 31, making even relatively hard finished linoleum have the "feel" of rubber floor covering, tending to deaden sound and to cushion impact. However, even though some air is entrapped in each of the depressions 35, that air will be at a lower pressure than that of the ambient atmosphere because a certain amount of the air in each depression 35 will be squeezed out of the depression when the linoleum, or whatever type of floor covering is employed, is rolled in accordance with conventional practice. When laying floor covering and, as the bonding material associated with the membrane 31 dries, the loss of moisture contained within the entrapped air will be accompanied by a lowering of its vapor pressure with the result that the actual pressure of the entrapped air in each pocket will, after the bonding agent has hardened, be materially less than that of the ambient atmosphere. Consequently, the depressions 35 operate after the fashion of vacuum cups tending to increase the bond between the membrane 31 and the floor surfaces upon which it is laid and between the membrane 31 and the overlying floor covering. These added advantages of greater resiliency and greater tenacity are achieved without sacrifice of the ability of the membrane to expand in its own plane without buckling and to develop the knitting action tending to draw tile laid thereupon more closely together, resulting from the presence of the closed spaced zigzag slots 36 corresponding to the slots 16 of the previously described modification.

Figure 6 shows a still further modified form of protective membrane 41 in the form of small rectangular, preferably square, sheets 42 which, instead of being provided with closed slots throughout the entire area of each square 42 are defined by sinuous lateral edges 43. The squares 42 are of relatively small size, with the result that even though the slots 44 between pairs of adjacent squares 42 are the only slots provided in this form of membrane 41, the slots 44 are so closely adjacent each other throughout the entire area of the assembled membrane 41 that substantially the same degree of expansion of the membrane 41 can occur without buckling, as in the case of either of the first two described modifications. The edges 43 of each square 42 are of serrated form and the squares 42 should be laid upon the bonding agent 46 by which they are to be secured to the floor surface 47, with the serrations of each square 42 extending into the spaces between the serrations of the adjacent squares, but spaced from the adjacent squares far enough to leave zigzag slots 44 of say one sixteenth or three thirty-seconds of an inch in width. Preferably, the dimensions of each square 42, although relatively small, are slightly greater than the dimensions of the conventional tile 48, thus avoiding the possibility of inadvertently laying the tile 48 throughout the entire area of the floor surface 47 with their edges coinciding with the edges of the underlying squares 42 of this form of protective membrane 41, even though the layer 49 of adhesive whereby the tile 48 are bonded to the upper surface of the membrane 41 may be applied in such a thick layer as to obscure the form and size of the squares 42 to which the layer of adhesive has been applied.

I claim:

1. As a new article of manufacture, a protective membrane adapted to occupy a position between a floor surface and overlying floor covering, comprising a sheet of fibrous material impregnated with water repellent material and characterized by a series of slots spaced apart from each other in said sheet, said impregnated sheet being of a yielding nature and the edges of said slots being spaced apart whereby expansion of said material in the plane of said sheet is compensated for by narrowing of said slots, both edges of each of said slots being serrated with the serrations of one edge extending into the spaces between serrations of the opposite edge whereby sagging of said floor covering into said slots is minimized and narrowing of said slots is accompanied by a knitting action drawing said floor covering more tightly toward said floor surface.

2. As a new article of manufacture, a protective membrane adapted to occupy a position between a floor surface and overlying floor covering, comprising a sheet of fibrous material impregnated with water repellent material and characterized by a series of slots spaced apart from each other in said sheet, said impregnated sheet being of a yielding nature and the edges of said slots being spaced apart whereby expansion of said material in the plane of said sheet is compensated for by narrowing of said slots, and a coating of hardened bonding material carried by at least one surface of said sheet, said bonding material being characterized by the quality of

being made adhesive by the application of a solvent thereto, both edges of each of said slots being serrated with the serrations of one edge extending into the spaces between serrations of the opposite edge whereby sagging of said floor covering into said slots is minimized and narrowing of said slots is accompanied by a knitting action drawing said floor covering more tightly toward said floor surface.

3. As a new article of manufacture, a protective membrane adapted to occupy a position between a floor surface and overlying floor covering, comprising a sheet of fibrous material impregnated with water repellent material and characterized by a series of slots spaced apart from each other in said sheet, said impregnated sheet being of a yielding nature and the edges of said slots being spaced apart whereby expansion of said material in the plane of said sheet is compensated for by narrowing of said slots, and a coating of hardened bonding material carried by at least one surface of said sheet, said bonding material being characterized by the quality of being made adhesive by the application of a solvent thereto, the surface of said coating of bonding material having depressions therein adapted to trap air therein between said membrane and said floor covering, both edges of each of said slots being serrated with the serrations of one edge extending into the spaces between serrations of the opposite edge whereby sagging of said floor covering into said slots in minimized and narrowing of said slots is accompanied by a knitting action drawing said floor covering more tightly toward said floor surface.

4. As a new article of manufacture, a protective membrane adapted to occupy a position between a floor surface and overlying floor covering, comprising a continuous sheet of fibrous material impregnated with water repellent material and characterized by a series of slots closed at their ends and spaced apart from each other in said sheet, said impregnated sheet being of a yielding nature and the edges of said slots being spaced apart whereby expansion of said material in the plane of said sheet is compensated for by narrowing of said slots, both edges of each of said slots being serrated with the serrations of one edge extending into the spaces between serrations of the opposite edge whereby sagging of said floor covering into said slots is minimized and narrowing of said slots is accompanied by a knitting action drawing said floor covering more tightly toward said floor surface.

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