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UNDERLAY FOR FLOOR COVERINGS

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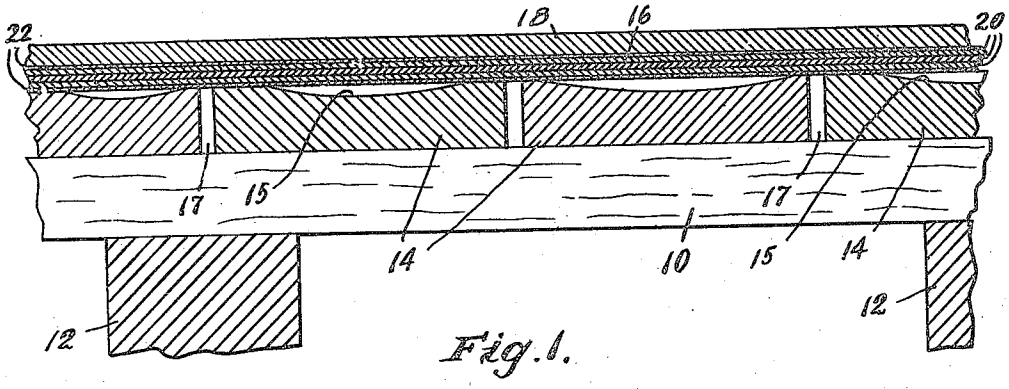



Fig. 1.

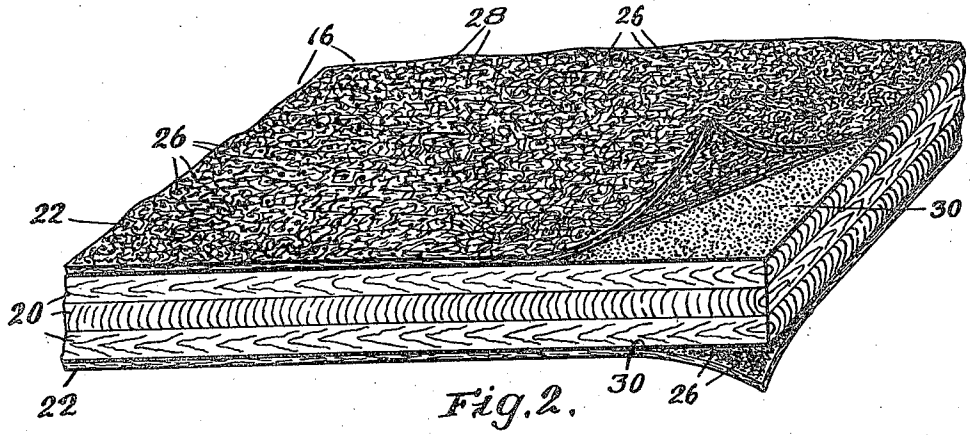



Fig. 2.

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## UNDERLAY FOR FLOOR COVERINGS

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7 Claims. (Cl. 154—45.9)

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This invention relates to an improved composite board which has particular utility as an underlay for linoleums and the like resilient or compressible floor coverings although it is suitable also for various other structural purposes as, for instance, packing crates, walls and the like.

Any use of a stiff underlay for floor coverings of the nature of linoleum usually presupposes a sub-floor having irregularities of surface, joints, etc., which would be impressed in the linoleum or other floor covering and thereby be made visible at the surface of the covering if the latter with or without a felt backing were laid directly on the sub-floor. Thus, any effective underlay must have stiffness and resiliency capable of permanently bridging depressions and cracks in the sub-floor, and provision also must be made to prevent warping of the underlay and to permit relative lateral shifting of the underlay and the floor covering to take care of differential expansions and contractions which otherwise would break the bond between the linoleum and the underlay.

I am aware that it has been proposed heretofore to use plywood as an underlay for floor coverings; and also laminated fibre board structures. Actual experience has shown, however, that the prior plywood underlays have been open to attack by moisture with consequent warping and frequent breaking of the cement bond between the linoleum and the underlay and also of the bond between the plies of the underlay. This produces bulging or cracking of the floor covering which, aside from its unsightly appearance, causes uneven wear at the affected regions. The prior laminated fibre board structures have not been satisfactory because they are compressible and gradually become molded to the contour of the sub-floor, and irregularities and cracks in the sub-floor very soon become visible at the surface of the floor covering.

The plywood underlay heretofore proposed has been a plywood board of the order of half an inch or thereabouts in thickness and comprised of five or more plies, presumably in an attempt to minimize the action of moisture thereon. A thick underlay is objectionable as it raises the surface of the covering to such an extent, frequently, as to interfere with the proper operation of doors and is otherwise objectionable. Hence, an object of the present invention is the provision of a thin plywood underlay that is rigid to resist deformation under the weight of a person and resilient to spring back to its original flat condition when relieved of an unusual pressure and

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having surfaces protecting the plywood core from detrimental attack by moisture.

It is a further object of the present invention to provide an underlay which has stiffness and resiliency capable of permanently bridging depressions and cracks in a sub-floor and which is protected against warping by moisture impervious barrier sheets which constitute also a means permitting differential expansion and contraction without danger of breaking the cement bond between the floor covering and the underlay.

Another object is to combine these mentioned qualities of stiffness and resiliency in an underlay whose over-all thickness dimension is commercially acceptable.

A further object of the invention is the provision of a plywood underlay as above described having a protective surface thereof which functions as the usual lining felt to which the floor covering is adhesively affixed, thereby eliminating the necessity for a special lining felt.

A feature of the invention resides in utilizing a moisture impervious substance which continues indefinitely rather tacky, and a water insoluble substance which sets to relative hardness and provides a strong and permanent bond in the midst of the underlay as well as constituting with the tacky substance a definite barrier against passage of moisture.

It is, moreover, an object of the invention to generally improve composite board structures and particularly such structures used as underlays for floor coverings.

The mentioned objects and results may be attained by employing a stiff sheet of wood as a core for the underlay, which preferably will be plywood, and applying to each face of the wood core a paper sheet impregnated with a moisture impervious substance that, for at least one paper sheet has the further characteristic that it continues indefinitely rather tacky.

Between each sheet barrier and the wood core a thin film of water insoluble adhesive constitutes a bond between the wood core and the barrier sheet and, in conjunction with the barrier sheets, effectively insulates the wood core against moisture. Preferably the water insoluble film is one having strong affinity for both the wood and the impregnated paper fibres but which does not greatly penetrate beyond the surface of the impregnated paper. Thus, when the water insoluble film sets to hardness the fibres in the midst of the paper sheet continue capable of slip relative to each other, thereby to permit differential expansion and contraction as between the floor

covering and the underlay without danger of breaking the bond between these two.

The paper barrier sheets preferably are relatively thin. They may be, for example, of felted fibre variety, as paper felt, felted under considerable pressure so that the barrier sheets on two faces of the wood core do not detrimentally add to the over-all thickness of the underlay. Yet the impregnated felted fibre structure of each sheet and the water insoluble bonding film effectively resist the passage of moisture and permit relative lateral shifting of mid-fibres for the purpose above explained.

In the accompanying drawing,

Fig. 1 is a vertical sectional view through a floor having my improved underlay thereon and having a linoleum floor covering laid upon the underlay; and

Fig. 2 is a perspective view of a fragment of a corner portion of a sheet of the improved underlay on an enlarged scale, with corner portions of the barrier sheets pulled away from the core.

Referring to the drawing, Fig. 1 shows a rough under flooring **10** on the usual joists **12**, and a top flooring **14** on the under floor. As illustrated, worn depressions **15** and cracks **17** between the floor boards are exaggerated somewhat to emphasize the bridging characteristics of the improved underlay **16** which is shown laid over the irregular surface of the top floor **14**. A floor covering **18** is laid upon the underlay.

Referring to Fig. 2, the underlay comprises a stiff and resilient wood core **20** preferably composed of three plies of wood veneer which in a practical embodiment of the invention each may have thickness approximating 1/20 of an inch. They may be thicker or thinner as desired and are combined with crossed grains. The number of plies may be varied to suit specific purposes. The veneers preferably although not necessarily are from deciduous woods, as beech, birch, for instance, which have close grain and are strong and permit the use of a thinner core than one made from weaker wood of a more open grain. The barrier sheets **22** on opposite faces of the plywood preferably are felted paper sheets impregnated rather generously with a suitable water impervious substance such, for example, as asphalt. The asphalt or other substance preferably will be of a consistency and type which can readily penetrate the felted paper sheet as a liquid and which will continue indefinitely to have a rather tacky character and feel. In the drawing, Fig. 2, the water impervious substance is indicated at **26** by the irregular dots dispersed among the promiscuous lines **28** which represent the felted fibre of the paper.

According to the invention, said barrier sheets of paper **22** are strongly bonded to the plywood core by a water insoluble film of glue, indicated in Fig. 2 by the stippling **30**. This glue **30** may be of any suitable kind but I have found that urea resin glue has a satisfactorily strong affinity for both the wood and the impregnated paper and that it does not greatly penetrate either the surface of the wood or go deeply into the structure of the paper under the combining pressure and the heat required for setting the resin. In the case of the paper barrier sheets I consider this important in that it leaves the matted fibres in the midst of the paper sheet restrained against lateral relative movement only by the asphalt which is not set to hardness and thus the paper can to a needed extent shear laterally at this mid region as differential expansion imposes lateral stresses at the regions of attachment. This permissible shearing of the paper barrier relieves the cement bond between the floor covering and the underlay of the stresses which otherwise might break the bond. Any suitable paper may be employed for the barrier sheets **22**, but I have found a paper felt to have desirable characteristics of strength and ability to absorb substantial amounts of the asphalt or other moisture impervious agent. The paper sheets **22** may be relatively thin, for example, 16 thousandths of an inch in thickness, thus adding only slightly to the overall thickness of the underlay. Yet these sheets, treated as above, effectively combine with the urea resin glue to insulate the wood core against absorption of moisture from the water soluble cement, usually of lignin variety, employed for attaching the floor covering to the underlay, and from atmosphere. Also sheets of this mentioned thinness can effectively perform the function of providing flexibility between the linoleum and the underlay which accommodates differential expansion and contraction as between the floor covering and the underlay.



The term "sub-floor" is employed herein in the broad sense of meaning any rough and irregular floor or other support upon which the composite board structure may be spread.

In use, my improved underlay will be arranged as illustrated in Fig. 1, and may if desired be cemented to the sub-floor, although preferably it will be attached by nails or drive screws not shown. The underlay is applied to the floor preferably with the parallel grains of more than one ply crossing the cracks of the floor. The underlay as is seen in Fig. 1 bridges any depressions and cracks in the sub-floor but due to its characteristic resiliency it may be temporarily depressed into such a depression but it will spring back as soon as the depressing force is removed. The barrier sheet **22** on the underside of the underlay combined with the water insoluble film of glue **30** between it and the wood core effectively insulates the core against moisture which may come up through the floor cracks or otherwise find its way between the floor and the underlay. The upper impregnated barrier sheet **22** coacting with its associated film of water insoluble glue **30** similarly effectively insulates the core at the upper side against moisture from the linoleum cement and from atmosphere.

The underlay ordinarily will be supplied commercially in rectangular sections of size to be conveniently transported and handled, such as 4 foot square sections or larger or smaller.

The plies of the core preferably are bonded one to another by a water insoluble adhesive or glue as, for instance, a urea resin, which exists as a water impenetrable film between each pair of plies.

While the barrier sheets are above described as identical, this need not be the case as the under barrier sheet need not be a paper felt but can be harder, as a kraft or other harder sheet and can be rendered water impermeable by a harder asphalt having a higher melting point, as its main function is to prevent the wood core from being subject to moisture that may be present in the air in contact with the lower surface of the underlay, as when the underlay overlies a cellar, for instance.

The underlay is made by combining the various wood veneer plies and the asphalt-impregnated facing sheets with liquid bonding films of the thermo-setting resin in a flat plate press under

suitable pressure, as two hundred pounds per square inch and, where the wood plies are balanced, as by having an odd multiple of plies, at a temperature sufficient to set the resin adhesive or to convert it to its infusible form. The temperature may be two hundred fifty degrees Fahrenheit, or thereabout, maintained long enough to effect the conversion. At this temperature the asphalt in the facing paper sheets is liquid which prevents the liquid resin from penetrating the paper sheets to any deleterious extent.

When the plies are unbalanced, that is, there is an even multiple of plies, it may sometimes be preferable to place the composite board, after pressing, in a hot room at say around one hundred twenty degrees Fahrenheit for a sufficient time as six to twelve hours to set the adhesive, a suitable catalyst being used with the adhesive to obtain setting or polymerization of the resin within this temperature and time to produce a flat composite board.

I claim:

1. An underlay for resilient floor coverings comprising a thin wood core composed of three plies of thin wood veneer combined with a water insoluble glue and with crossed grains forming a composite board balanced to resist warping in any direction and rigid to resist deformation due to normal pressures thereupon and resilient to spring back upon removal of abnormal pressures thereupon, a lining felt bonded to a face of said core by a wtaer impermeable adhesive and said felt being permeated with a water insoluble substance sufficiently plastic to permit displacement of the fibres of the felt parallel to the face thereof, and a water impermeable paper sheet affixed to the opposite face of said core.

2. A composite board having a stiff and resilient core of wood combined on each side of the core with a barrier sheet of paper impregnated with asphalt, and a water insoluble film of a thermosetting resin adhesive having affinity for both the wood and the asphalt-impregnated paper and strongly adhering to both the wood and the surface fibres of the barrier sheet.



3. A composite board comprising a core sheet of a plurality of plies of wood veneer combined on each side of the core with a barrier sheet of thin felted paper impregnated with asphalt and a water insoluble thermosetting resin film having affinity for both the wood and the asphalt-impregnated paper and strongly adhering to both the wood surface and the surface fibres of the barrier sheet.

4. A composite board comprising a core sheet of a plurality of plies of wood veneer combined on each side of the core with a barrier sheet of relatively thin felted paper impregnated with asphalt and a film of urea resin glue strongly adhering to both the wood surface and the surface fibres of the barrier sheet.

5. A composite board comprising a sheet element of wood combined with a facing barrier sheet of felted paper thinner than the wood sheet and impregnated with asphalt, and a film of urea resin glue strongly adhering to both the wood surface and the surface fibres of the barrier sheet.

6. A composite board comprising a sheet element of wood faced on at least one side with a sheet of fibrous material thinner than the wood sheet and permeated by a moisture impervious substance having the characteristics of asphalt including the character that it continues tacky at the exposed surface of the facing sheet.

7. An underlay for floor coverings comprising a wood core, a felted fibrous facing sheet on the core, a thermosetting adhesive bonding the wood core and facing sheet together, and a moisture impervious substance impregnated within the facing sheet, said adhesive having a setting temperature of the order of two hundred and fifty degrees Fahrenheit, and said moisture impervious substance having the character that it is in liquid state at the said setting temperature of the adhesive.

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