Aug. 29, 1933. M. GRAY 1,925,068

FLOOR

Original Filed Aug. 28, 1931

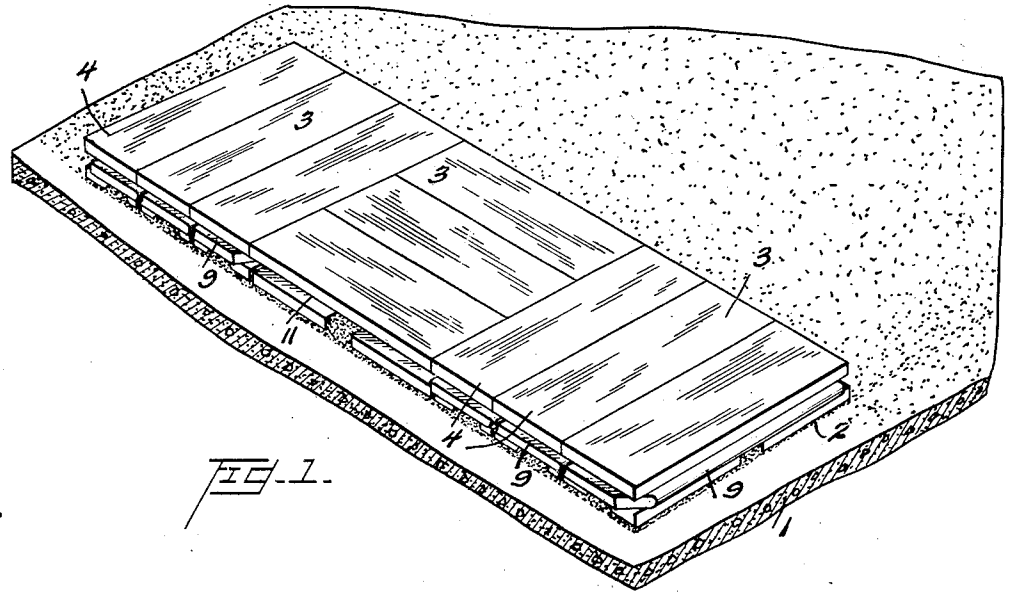


FIG. 1.

FIG. 2.

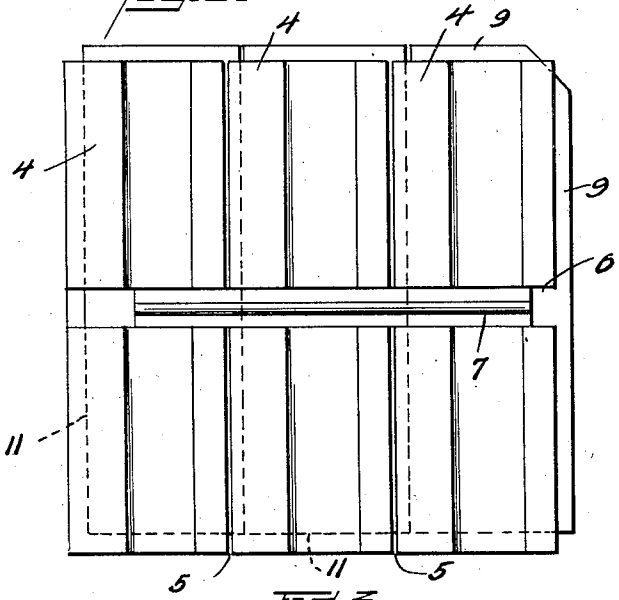
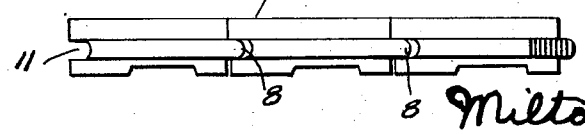


FIG. 3.



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UNITED STATES PATENT OFFICE

1,925,068

FLOOR

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Continuation of application Serial No. 559,991, August 28, 1931, and in Canada July 11, 1932. This application December 16, 1932. Serial No. 647,687

15 Claims. (Cl. 20—7)

My invention relates to the laying of wood block floors and the like, in a layer of mastic or plastic cement, that is spread on a concrete or other subfloor. The practice heretofore has been to lay such blocks on a subfloor by using what is known as a hot mastic. Such mastic was heated to a liquid condition at a temperature of about 200° F. and then applied, while hot, to the bottom of the block by dipping, with the object of securing only a thin film between the subfloor and the block, so that the bottom of the block in use was virtually in contact with the subfloor. The mastic contained constituents, volatile at the hot or working temperature, and if it became overheated in liquefying, preparatory to applying, these were driven off and in addition the mastic may have become partially carbonized, so that the mastic would become brittle when it had cooled down and the bond was easily broken without any chance of rebonding. On account of the very thin film of mastic between the block and the subfloor, there was no cushioning effect as one walked on the floor and the sound deadening effect was not appreciable. The hot mastic referred to was made from coal tar pitches and coming from many sources, its properties were not uniform.

While the hot mastic method may be used satisfactorily, where the block is a single narrow flooring strip or slat up to about 3 inches in width, it is not satisfactory when used in connection with a substantially wider block that is made up of a plurality of these slats, due to several causes. First, the relatively larger under area of the wider multiple slat block, when dipped into the hot liquid mastic, does not get entirely covered with the mastic, due to the formation of air bubbles and air pockets; and second, the larger under area of the wider multiple slat block must conform to a larger area of subfloor and since neither of such areas are generally entirely uniform or smooth, the thin hot fluid mastic, which works well where there is a thin layer between two surfaces close together, fails to hold the wider multiple slat blocks down in place on the subfloor. Moreover, the wider multiple slat block requires both hands when dipping in hot mastic, making uniform dipping much more difficult and coverage correspondingly less even than with the single narrow flooring strip or slat.

While the mastic that I use is particularly adapted for use with wide multiple slat blocks, whether flat-backed or hollow-backed, it may be used also with improved results for blocks of the single slat type, particularly relatively large surface area single slat blocks, which are sometimes as large in area as unit wood blocks made of a plurality of slats.

While floors of the single narrow slat type laid in a hot mastic have been in successful use abroad, such floors have not met with much commercial success in this country, due principally to the different laying conditions. Abroad, the concrete subfloor is given plenty of time in which to dry out. A more level type of concrete subfloor is also produced. Due to rapid construction methods in this country, less time is allowed for the concrete subfloor to dry out. It is generally more uneven.

The use of central heating plants in buildings in this country tends to drive the moisture from the concrete subfloor into the wood floor.

In order to overcome the difficulties arising from present day methods of building construction in this country, it has been found necessary to discard the old type of hot mastic which employed a very thin layer, for mastic that could be troweled or spread on the subfloor in a layer of substantial thickness and over the more or less green concrete and which would be moisture resisting. The layer of mastic should be spread in a continuous layer and without any holes or spaces through which the moisture might find its way. The substantial thickness of mastic applied in such a continuous form also takes care of the slight unevenness in the concrete subfloor.

One of the objects of my invention is to use a mastic having such properties as that the wood floor is free to expand or contract when moisture is absorbed or lost from the wood. In order to do this the mastic should have certain characteristics. Since the wood floor should not be rigidly bonded to the subfloor, the mastic should be so formulated as that it will permit the block to move under pressure from expansion or contraction and without breaking the mastic bond.

A mastic for suitably bonding wood block floors to the subfloor should have the following characteristics:

1. Permanence, i. e. the mastic should maintain the desired plasticity for the life of the floor.

2. Plasticity over the ordinary temperature range, i. e. the block should not crack loose from the floor when expansion of the wood occurs and thus produce a loose floor.

3. Adhesion must be greater than cohesion, i. e. when any movement of the floor takes place, the movement should occur in the mastic and without the mastic pulling loose from the wood floor or subfloor. In other words, the adhesion of the

mastic to the subfloor and wood blocks must be greater than the cohesion of the mastic itself.

4. Pressure required to move the block horizontally should be less than that required to move the block vertically; otherwise the floor will buckle when any expansion of the wood takes place.

5. Pressure required to move the block horizontally should be less than the pressure necessary to crush the fibres of the wood. This is necessary in order to prevent the raising of the wood at the joints.

6. The cohesion of the mastic should be such as will prevent the floor under normal conditions from sliding out of place relative to the subfloor but will permit movement of the floor due to expansion and contraction.

While various formulations of mastic can be employed having the necessary characteristics, I prefer to use what is known as a cold bituminous mastic. By a suitable mixture of selected asphalts and a volatile solvent, I produce such a cold mastic that can be spread or trowelled on the subfloor and after evaporation of the solvents will remain permanently plastic. A layer of about $\frac{1}{8}$ of an inch is spread on the subfloor and the blocks are then laid in it. This substantial amount of mastic between the block and the subfloor provides sufficient material so that its plasticity will be retained over a long period of time as compared with the thin layer of a hot mastic which will dry out hard and lose its plasticity in a relatively short time. By having a substantial thickness or layer of the plastic material, the minor inequalities in the subfloor and bottom side of the block are compensated for and there is also provided a real cushion effect as one walks on the floor. The substantial layer of plastic material under the blocks also provides a medium of high sound absorption value. This substantial layer of mastic is also continuous, or without breaks such as occur in the application of the hot mastic, all of which increases resistance to moisture absorption from the subfloor.

My mastic has the advantage also in that it can be removed easily from the container and is workable and can be applied at room temperatures. By a suitable selection of the ingredients of the mastic, it can be made to strongly adhere to the subfloor and the blocks and also have the desired strength or cohesiveness. The mastic that is used must be sufficiently plastic at all times so as to permit expansion and contraction of the floor after it is laid and in use. If the mastic does not have sufficient plasticity then the floor may buckle or open up at its weakest point due to its inability to move, on account of expansion or contraction.

The mastic should also be resistant to moisture and substantially waterproof as it is sometimes spread while the concrete subfloor is still damp. I have discovered that in connection with a mastic of this type and for this particular purpose, the presence of fillers in the mastic such as powdered asbestos, silica or limestone decreases the waterproofing properties of the mastic. The presence of solid fillers in the mastic also decreases its bonding qualities even to the point of failure. These solid fillers will absorb and/or adsorb the solvents in the mastic, all of which breaks the mastic down as a continuous, non-porous mass or aggregate, thereby materially decreasing the water or moisture resisting qualities, the bonding and cohesive strength and the long life of the product from a plasticity standpoint.

The mastic should have sufficient adhesion to the surface to which it is applied to form a strong bond between these surfaces. The mastic should have the proper cohesive strength so as to hold the floor in position. If the mastic is insufficiently cohesive, the blocks will slide out of place relative to the subfloor in normal use. If it is too cohesive, the blocks will not move freely enough under expansion and contraction so as to avoid buckling or opening up of the floor. Accordingly, in any movement that takes place between the floor and subfloor, the material of the mastic should flow so that the bond of the mastic with the wood floor and concrete subfloor will not be broken.

By a suitable selection of the ingredients of the mastic, I produce a mastic that has greater adhesive strength than cohesive strength and in which these properties are predetermined and so relatively proportioned that in the event of undue movement of the wood blocks relative to the subfloor, the body of the mastic will flow and stretch but will not pull away from the block or subfloor and thus break the bond and permit the block to raise up from the subfloor.

The composition of my preferred form of mastic is such that it can be spread or trowelled easily on the subfloor without the use of heat and at temperatures as low as 55° F. and it will not run or creep, after being spread to the required thickness when the temperature is as high as 115° F. At extremely low temperatures that may prevail in transportation and storage, it will remain plastic. The mastic should be resistant to the attack of insects and odorless, after the floor is laid. It should be non-absorbent so far as the wood is concerned, it being important that the wood flooring should not become discolored.

While various formulas may be prepared for making such mastic, I have found the following to be very satisfactory, the proportions being given by weight.

a. 31% of 125°–135° F. steam refined Mexican asphalt

b. 52% of 160°–170° F. blown Mexican asphalt

c. 4% of 225°–250° F. blown Mexican asphalt

d. 28% petroleum solvent of 49–51 Bé. gravity

The physical analysis of (*a*) is as follows:

Penetration @ 77° F. 60/70 (A. S. T. M. Standards)
Ductility @ 77° F. 100 centimeters
Insoluble in 86% naphtha, 26.5% minimum
Specific gravity @ 60° F. 1.0 minimum
Flash open cup 505° F.
Evaporation loss 50 grams 5 hours @ 325° F. 1.0% maximum

The physical analysis of (*b*) is as follows:

Penetration @ 77° F. 10/20 (A. S. T. M. Standards)
Specific gravity @ 60° F. 1.0 (minimum)
Flash open cup 450° F.
Insoluble in 86% naphtha, 26.5% minimum
Solubility in CS_2 99.5% (minimum)
Evaporation loss 50 grams 5 hours at 325° F. 1.0% maximum

The physical analysis of (*c*) is as follows:

Melting point (Ball & Ring) 225–250° F.
Penetration at 77° F. 2/3
Flash point 450° F.
Solubility in CS_2 (not less) 99.5%
Insolubility in 86% naphtha, 70% minimum

The petroleum solvent has an over-point of 290° F., dry point 410° F. and flash point Tagliabue open cup, 100° F.

The physical analysis of the completed composition is as follows:

Solvent by vacuum distillation 16–20% by wt.
Asphaltic content 80–84% by wt.
Melting point of asphaltic content 135° F.–145° F.
Penetration of asphaltic content at 77° F., 35–45 centimeters
Specific gravity .96 at 77° F.
Solubility in CS_2 99.7%
Weight per gallon at 77° F. 8 lbs.

In the above composition, the Mexican asphalts supply the desired adhesive and cohesive strength to the mastic. By combining the various grades of asphalts, a product is obtained that has in it the peculiar characteristics of each type. When the solvent evaporates the cohesive strength, the adhesive strength and the plasticity of the combination originally formed would remain constant. The components of my mastic are characterized by a wide range in melting points, that is, from the flow to the brittle point. Such a mastic does not tend to run in warm weather nor get brittle in cold weather.

While I prefer the type of mastic as hereinabove described, other plastic compositions may be used although they are not in all respects quite so effective.

For example, a straight run Mexican asphalt with a melting point of 145° F. will produce satisfactory results. Any asphaltic bitumen with a melting point between 128° and 175° F., any coal tar pitch with a melting point between 60–120° F., any stearine pitch with a melting point between 100–170° F. will satisfy fairly well, the requirements of a suitable mastic. Several resin pitches and wool grease pitches may also be used.

While I use a volatile solvent in my preferred composition as an aid in applying the mastic, good results can be had by omitting the volatile solvent and spreading the plastic mass on the floor while in a warmed condition. The purpose of the solvent is to make the material sufficiently fluid for easy spreading. The same condition can be obtained by warming the material. The advantage in applying the mastic in a warmed condition is that the final bond is obtained when the mastic has cooled to room temperature, whereas in using a volatile solvent, a period of time is necessary for the solvent to evaporate from the mastic and produce the final bonded condition. However, the practical difficulties of using mastic in a warmed condition makes the use of a solvent preferable. The essential property of my mastic is such that it must be substantially permanently plastic after the floor has been laid.

Referring to the drawing:

Fig. 1 is a perspective view of a block floor laid with mastic on a concrete subfloor,

Fig. 2 is a plan view of the underside of a wood block, and

Fig. 3 is an end view.

Over the concrete subfloor 1, a layer of the mastic 2, about $\frac{3}{8}$ of an inch is spread with a trowel. The blocks 3 are then pressed into place. It is advantageous to have grooves or some sort of an outlet in the bottom of the block to take care of excess mastic.

The block, as shown is made of flooring strips 4 that are provided with the customary groove or hollow back 14 in the underside, and relief grooves 5 between the strips. In a transverse groove 6 is a metal tie 7 for holding the three strips 4 in assembled relationship. The block as shown is disclosed in the patent to Fetz, #1,778,069, issued October 14, 1930.

The grooves in the underside of the blocks adequately take care of the excess mastic. The blocks are laid with the strips of adjacent blocks at right angles to each other, so that the grooves in the underside of adjacent blocks are at right angles to each other. The strips are united along their longitudinal edges by tongue and groove joints 8. The block is provided along two adjacent edges with integral tongues 9 and grooves 11, the cut away portion 12 permitting interfitting of the blocks by the said tongues 9 and grooves 11 of adjacent blocks.

A floor so laid is what might be designated as a floating floor, that is, it is not tied to or rigid with the subfloor like a nailed floor. In fact, the blocks are not intended to rest in direct contact with the subfloor but on the layer of mastic which acts as a resilient cushion. As such it dampens sound waves and cuts down the transmission of sounds through the floor or the reflection of sound which produces the well known "drumming" in the room itself.

While I have illustrated and described my invention in relation to a block with grooves in the underside, it is to be understood that it is not limited for use with this specific type of wood tile construction.

This application is a continuation of my application filed August 23, 1931, Serial No. 559,991.

What I claim is:

1. A floor panel or the like formed of a plurality of pieces, a subfloor, a layer of plastic mastic of substantial thickness spread on the subfloor and in which the pieces are laid, the said layer being of sufficient thickness so that the floor floats thereon and is substantially out of contact with the subfloor, the said mastic being substantially permanently plastic and having such predetermined adhesion as to stick strongly to the floor and subfloor and such predetermined cohesion as will prevent the floor from sliding out of place relative to the subfloor but will permit movement of the floor due to expansion and contraction.

2. A floor panel or the like formed of a plurality of pieces having recesses on the underside, a subfloor, a layer of plastic mastic of substantial thickness spread on the subfloor and in which the pieces are laid, the said layer being of sufficient thickness so that the floor floats thereon and is substantially out of contact with the subfloor, the said mastic being substantially permanently plastic and having such predetermined adhesion as to stick strongly to the floor and subfloor and such predetermined cohesion as will prevent the floor from slipping out of place relative to the subfloor but will permit movement of the floor due to expansion and contraction, the said recesses adapted to receive the excess mastic.

3. A floor panel or the like formed of a plurality of pieces, a subfloor, a layer of plastic mastic of substantial thickness spread on the subfloor and in which the pieces are laid, the said layer being of sufficient thickness so that the floor floats thereon and is out of contact with the subfloor, the said mastic being substantially permanently plastic and having such predetermined adhesion as to stick strongly to the floor and subfloor and such predetermined cohesion as will prevent the floor from sliding out of place relative to the subfloor but will permit movement of the floor due to expansion and contraction, the

composition of the said mastic being such that it can be spread without heating at temperatures as low as 55° F.

4. A floor panel or the like formed of a plurality of pieces having recesses on the underside, a subfloor, a layer of plastic mastic of substantial thickness spread on the subfloor and in which the pieces are laid, the said layer being of sufficient thickness so that the floor floats thereon and is substantially out of contact with the subfloor, the said mastice being substantially permanently plastic and having such predetermined adhesion as to stick strongly to the floor and subfloor and such predetermined cohesion as will prevent movement of the floor due to expansion and contraction, the said recesses adapted to receive the excess mastic, the composition of the said mastic being such that it can be spread without heating at temperatures as low as 55° F.

5. A floor panel or the like formed of a plurality of pieces, a subfloor, a layer of plastic mastic of substantial thickness spread on the subfloor and in which the pieces are laid, the said layer being of sufficient thickness so that the floor floats thereon and is substantially out of contact with the subfloor, the said mastic being substantially permanently plastic and having such predetermined adhesion as to stick strongly to the floor and subfloor and such predetermined cohesion as will prevent the floor from sliding out of place relative to the subfloor but will permit movement of the floor due to expansion and contraction, the composition of the said mastic being such that it can be spread without heating at temperatures as low as 55° F. and will not run or creep after being spread to the required thickness up to temperatures as high as 115° F.

6. A floor panel or the like formed of a plurality of pieces having recesses on the underside, a subfloor, a layer of plastic mastic of substantial thickness spread on the subfloor and in which the pieces are laid, the said layer being of sufficient thickness so that the floor floats thereon and is substantially out of contact with the subfloor, the said mastic being substantially permanently plastic and having such predetermined adhesion as to stick strongly to the floor and subfloor and such predetermined cohesion as will prevent the floor from slipping out of place relative to the subfloor but will permit movement of the floor due to expansion and contraction, the said recesses adapted to receive the excess mastic, the composition of the said mastic being such that it can be spread without heating at temperatures as low as 55° F. and will not run or creep after being spread to the required thickness up to temperatures as high as 115° F.

7. A floor panel or the like formed of blocks that are made up of a plurality of slats secured together to provide a unit having a substantially larger area than that provided by a single slat, a subfloor, a layer of plastic mastic of substantial thickness spread on the subfloor and in which the said blocks are laid, the said layer being of sufficient thickness so that the floor floats thereon and is substantially out of contact with the subfloor, the said mastic being substantially permanently plastic and having such predetermined adhesion as to stick strongly to the floor and subfloor and such predetermined cohesion as will prevent the floor from sliding out of place relative to the subfloor but will permit movement of the floor due to expansion and contraction.

8. A floor panel or the like formed of blocks that are made up of a plurality of slats secured together to provide a unit having a substantially larger area than that provided by a single slat, recesses on the underside of the blocks, a subfloor, a layer of plastic mastic of substantial thickness spread on the subfloor and in which the said blocks are laid, the said layer being of sufficient thickness so that the floor floats thereon and is substantially out of contact with the subfloor, the said mastic being substantially permanently plastic and having such predetermined adhesion as to stick strongly to the floor and subfloor and such predetermined cohesion as will prevent the floor from sliding out of place relative to the subfloor but will permit movement of the floor due to expansion and contraction, the said recesses adapted to receive the excess mastic.

9. A floor panel or the like comprising a subfloor, a layer of plastic mastic of substantial thickness spread on the subfloor with an unbroken surface and in which the floor panel is laid, the said layer being of sufficient thickness so that the floor floats thereon and is substantially out of contact with the subfloor, the said mastic being substantially permanently plastic and having such predetermined adhesion as to stick strongly to the floor and subfloor and such predetermined cohesion as will prevent the floor from sliding out of place relative to the subfloor but will permit movement of the floor due to expansion and contraction, the said mastic being free from solid fillers to provide a more moisture resistant and substantially waterproof medium between the floor and subfloor.

10. A floor panel or the like comprising a subfloor, a layer of bituminous mastic of substantial thickness, free from solid fillers, spread on the subfloor and in which the floor panel is laid, the said layer of mastic being moisture resistant and substantially waterproof and substantially permanently plastic and having such predetermined adhesion as to stick strongly to the floor and subfloor and such predetermined cohesion as will prevent the floor from sliding out of place relative to the subfloor but will permit movement of the floor due to expansion and contraction, the composition of the said mastic being such as that it can be spread at normal temperatures.

11. A floor panel or the like formed of blocks that are made up of a plurality of slats secured together to provide a unit having a substantially larger area than that provided by a single slat, a subfloor, a layer of plastic mastic of substantial thickness spread on the subfloor, the said mastic being free from solid fillers and laid with an unbroken surface on the subfloor to provide a moisture resistant and substantially waterproof support and bond in which the blocks are laid and having such predetermined adhesion as to stick strongly to the floor and subfloor and such predetermined cohesion as will prevent the floor from sliding out of place relative to the subfloor but will permit movement of the floor due to expansion and contraction.

12. A floor panel or the like formed of a plurality of pieces, a subfloor, a layer of plastic mastic of substantial thickness spread on the subfloor and in which the floor panel is laid, the said layer being of sufficient thickness so that the floor is substantially out of contact with the subfloor, the adhesion of the mastic to the floor and subfloor being greater than the cohesive strength of the mastic, whereby when movement of the floor relative to the subfloor takes place from expansion, the mastic will stretch without pulling loose from the floor or subfloor.

13. A floor panel or the like formed of a plurality of pieces, a subfloor, a layer of plastic mastic of substantial thickness spread on the subfloor and in which the floor panel is laid, the said layer being of sufficient thickness so that the floor is substantially out of contact with the subfloor, the said mastic being characterized by a plasticity that will be substantially permanent, the adhesion of the mastic to the floor and subfloor being greater than its cohesive strength, the pressure required to move the panel horizontally when expansion of the wood takes place, being less than that required to move it vertically and less than the pressure necessary to crush the fibres of the wood, the adhesive strength and cohesive strength being so relatively proportioned that in event of undue movement of the floor panel relative to the subfloor, the body of the mastic will flow and stretch but will not pull away from the floor or subfloor.

14. A floor panel or the like formed of a plurality of pieces, a subfloor, a layer of plastic mastic of substantial thickness spread on the subfloor and in which the floor panel is laid, the said layer being of sufficient thickness so that the floor is substantially out of contact with the subfloor, the said mastic being characterized by a plasticity that will be substantially permanent, the adhesion of the mastic to the floor and subfloor being greater than its cohesive strength, the cohesion of the mastic being such as to prevent the floor panel under normal conditions from sliding out of place relative to the subfloor but will permit movement of the floor due to expansion and contraction, the adhesive strength and cohesive strength being so relatively proportioned that in event of undue movement of the floor panel relative to the subfloor, the body of the mastic will flow and stretch but will not pull away from the floor or subfloor.

15. A floor panel or the like formed of wood blocks that are made up of a plurality of slats secured together, a layer of plastic mastic of substantial thickness spread on the subfloor and in which the said blocks are laid, the said layer being of sufficient thickness so that the floor is substantially out of contact with the subfloor, the adhesion of the mastic to the floor and subfloor being greater than the cohesive strength of the mastic, the pressure required to move the blocks horizontally when expansion of the wood takes place being less than that required to move it vertically and less than the pressure necessary to crush the fibres of the wood, the cohesion of the mastic being such as to prevent the floor panel under normal conditions from sliding out of place relative to the subfloor but permit movement of the floor due to expansion and contraction, the said mastic being characterized by a substantially permanent plasticity, the adhesive strength and cohesive strength being so relatively proportioned that in event of undue movement of the floor panel relative to the subfloor, the body of the mastic will flow and stretch but will not pull away from the floor or subfloor.

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