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TILE FLOOR AND METHOD OF PRODUCING

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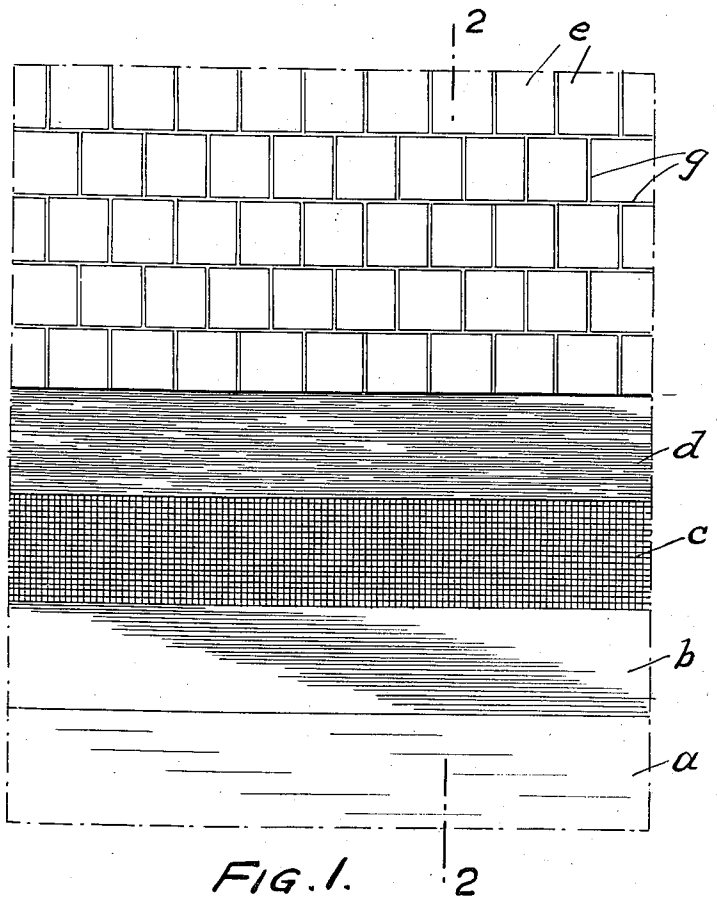


FIG. 1.

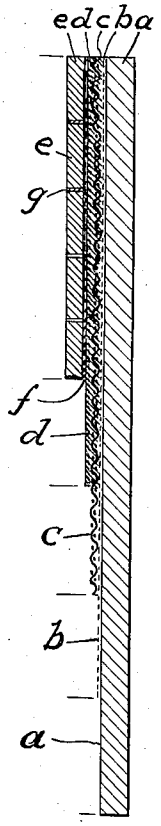


FIG. 2.

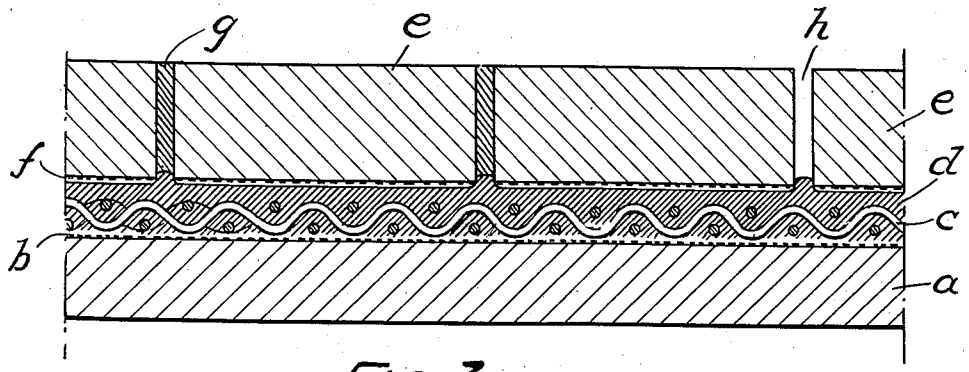


FIG. 3.

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TILE FLOOR AND METHOD OF PRODUCING

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9 Claims. (Cl. 94—3)

This invention relates to a tile structure and method for its production.

Heretofore, as is well known, it has been customary in the production of tile structures, as tile floors, walls, ceilings, roof decks, and the like, to provide a relatively thick base of concrete on which tiles are set in a bed of Portland cement mortar, or other hydraulic cement mortar. The construction is completed by grouting the tiles with Portland cement mortar or other form of hydraulic cement mortar.

In the construction of tile structures, as, for example, tile floors, heretofore, it has been necessary to provide a concrete base of very substantial thickness in order that it have sufficient rigidity and resistance to fracture to support the tile. In view of the required very substantial thickness of the concrete bed heretofore provided in tile floor construction, it has been impractical to lay tile floors over original floors, since the thickness of the concrete bed would raise the surface of the tile very considerably above the surface of adjacent floors. It has been necessary heretofore in new construction to provide for the necessary concrete base so that the surface of the tile when set will be level with adjoining floors and in the case of old construction, where a tile floor is to be laid, it has been necessary to remove the original floor and cut away the upper portion of the floor timbers to provide for the concrete base.

Thus, heretofore the construciton of tile structures involved careful consideration and presented a substantial expense in providing therefore in new construction and presented substantial difficulty and expense in old construction.

Further, tile structures as heretofore constructed presented very substantial difficulty and was generally unsatisfactory when formed in or on a structure subject to vibration, as, for example, the deck of a ship.

Now, in accordance with this invention a tile structure adaptable for the formation of floors, walls, ceilings, roof decks, and the like, and method for its construction is provided of such a character as to enable the laying of tile structures with efficiency and economy in either new or old construction and also of such a character as to enable the laying of such structures with complete satisfaction in or on structures having resiliency, as the decks of ships.

Essentially, in accordance with this invention, there is provided a thin setting bed and one having a substantial degree of flexibility in which the tiles are set directly and, desirably though not essentially, grouted with a mortar similar to that used in the formation of the setting bed.

By virtue of this invention tile structures may be constructed with a minimum of depth so that such structures may be laid without any special preparation therefor in new construction and may equally well be laid in old construction without special preparation. Thus, for example, tile floors in accordance with this invention may be laid on any type of original flooring, as wood flooring, concrete, metal, or the like, it being only necessary that the flooring or base upon which the tile floor is laid be firm and free from undue springiness, excessive cracks, weak spots, and the like. The tile structures in accordance with this invention may be laid on a wooden sub-floor and, due to the thinness of the setting bed for the tile, the surface of the tile may readily be maintained on a level with, for example, hard wood flooring, or similar type of flooring, laid over the sub-flooring in areas adjacent to the tile. Thus, in old construction, tile flooring may be readily constructed in accordance with this invention over a desired area on a sub-floor after removal of the finished flooring.

Tile structure in accordance with this invention from the broad standpoint will comprise a base which may comprise an old or new floor, wall or deck of wood, concrete, metal, or the like, and a setting bed in which the tile is set, comprising a mortar including a bitumen and a hydraulic cement, by which term I intend to include Portland cement, high alumina cement, pozzulana and other natural cements, Keene's cement, plaster, and the like. The mortar will desirably also include an aggregate, as sand.

With more particularity, the base, whether of board, concrete, built-up roofing or metal, will be desirably primed with a bitumen, also, the backs of the tile will be primed with bitumen. The edges of the tile may, if desired, also be primed with bitumen. Variously, the setting bed will desirably be reinforced, as, for example, by means of wire mesh or metal lath secured to the surface of the base.

The tiles will be grouted and may be grouted with any suitable material. However, desirably, they will be grouted with a bitumen—hydraulic cement mortar, which will be desirably free from sand where the joints are narrow.

The method in accordance with this invention will comprise essentially the application to a base, as a wood or concrete floor, or wall, a built-up roofing structure, a metal deck, or the like, of a thin bed of bitumen-hydraulic cement mortar,

the setting of tile thereon and the grouting of the tile, more particularly, with a bitumen-hydraulic cement mortar.

Having now indicated in a general way the nature and purpose of this invention, I will proceed to a detailed description of a preferred construction of, for example, a tile floor, from and in connection with which the carrying out of the method in detail will become apparent, all with reference to the accompanying drawing in which:

Figure 1 is a plan view showing the several steps and material used in the construction of a tile floor in connection with operation of the method thereof.

Figure 2 is a sectional view on line 2—2, Figure 1, showing in detail the several steps and materials used in the construction of a tile floor in accordance with this invention and also showing in detail a completed structure.

Figure 3 is an enlarged sectional view of a completed floor in accordance with this invention.

In the several figures of the drawing *a* indicates a base, which may be any wooden, concrete, metal, or other type of floor. The base *a* may be, for example, an area of sub-floor in a total floor of old or new construction where it is desired that the surface of the tile shall be on a level with adjacent finished flooring, as hard wood flooring.

The base *a* will be adequate for the construction of tile floor in accordance with this invention if it be sound and well supported and free from weak spots, cracks, or other structural defects. If it be in any way weakened or defective, it should be strengthened and repaired.

The base *a* will be prepared by thorough cleaning. The base *a* having been prepared, it will be primed, with a primer *b*. The primer will desirably comprise a bitumen which may be applied to the floor in the form of a suitable solution or in the form of an emulsion. By way of example, an emulsion comprising 67.5 parts by weight of asphalt cement, as oil asphalt or native asphalt cement of 50 penetration at 77° F. under a load of 100 gm. acting for 5 seconds, emulsified in 32.5 parts of a solution containing 1.2% alkali hydroxide and 2.0% sulphonated castor oil will be found to provide an adequate primer. Desirably, the primer will be applied to the base by spraying, which may be accomplished with any suitable form of spraying device. In the case of wooden floors, two coats of primer will be desirable. In the case of concrete floors a single coat of primer will usually be sufficient. When the base has been properly primed, if it be of wood, a wire mesh *c*, or expanded metal lath, or the like, which will engage, reinforce and secure a setting bed to the base, will desirably be secured to the surface of the base *a* by means of nails, staples, or other suitable means. The wire mesh, expanded metal, or the like, will be desirably painted or galvanized and may, if desired, after it is fixed to the base, be coated with primer similar to that applied to the base.

The base having been primed, if the base be of concrete, or the like, or if the base be of wood having been primed and a wire mesh, expanded metal lath, or the like having been secured to the surface thereof, a thin setting bed for the tile is formed by application to the base, as by troweling, of a mortar comprising essentially bitumen and hydraulic cement. The mortar will desirably also include sand and will be mixed with water to a consistency about that of a stiff paste, in any event, a consistency which will enable the mortar to be conveniently troweled onto and through the wire mesh *c*, if such be used.

Where the base *a* comprises a concrete, or the like floor, the use of a wire mesh or of metal lath, or the like, is not essential, inasmuch as the base will have sufficient rigidity to render the use of wire mesh, metal lath, or the like, unnecessary, though such may be used if desired.

The bitumen-hydraulic cement mortar may vary widely in composition and may comprise various cements as defined above. However, by way of illustration, a satisfactory mortar and one which will provide a highly efficient setting bed may be made up on the following formula:

	Pounds
Portland cement	90
Sodium metasilicate solution (2 lb./gal. of water)	22
Bituminous emulsion	64
Sand	300

The bituminous emulsion used in the above formula may vary widely in composition. However, it will be of such a character as to resist breaking on mixing with the Portland cement and will desirably include as the emulsifying agent an emulsifier such as clay, waste sulphite liquor, petroleum sulphonate, or the like.

The bituminous emulsion may be the same as that described above for use in priming the base *a*. Thus, it may comprise 67.5 parts of an oil or native asphalt cement of 50 penetration at 77° F. under a load of 100 gm. acting for 5 seconds, emulsified in 32.5 parts of a solution containing 1.2% alkali hydroxide and 2.0% sulphonated castor oil. The amount of water added to the mixture should be gaged with respect to the water in the bituminous emulsion so that the final mortar will have the proper consistency for ready spreading or troweling on the floor and finishing.

In preparing the bitumen-Portland cement mortar, the sand and Portland cement will first be thoroughly mixed with the addition of only such an amount of water as will thoroughly dampen the mixture and make it stiff, but not over plastic. When the Portland cement and sand are thoroughly mixed, the sodium metasilicate solution is mixed in and the bituminous emulsion then gradually added with vigorous mixing.

The setting bed *d* may be formed in any desired manner. Preferably, and most conveniently, the mortar will be troweled or screeded on and through the wire mesh *c* if used, or uniformly spread on the primed surface of the base, if the base be of concrete, or the like, and given a smooth, level surface finish by troweling, or with a float. The setting bed will be of sufficient thickness if it be of a thickness of say, for example, ⅛" where laid over a concrete floor without the use of wire mesh, expanded metal lath, or the like, or of a thickness of $\frac{3}{16}$" measured from the top of the wire mesh or metal lath, where such is used, as, for example, on wooden floors.

The surface of the setting bed *d* having been finished, the tile *e*, which may be of any desired type, as, for example, glass tile, asphalt tile, cork tile, rubber tile, cut stone; glazed or unglazed porcelain or clay-type ceramic mosaics, paver tile, quarry tile, or the like, will then be laid upon the surface of the setting bed and gently beaten in and rubbed in the usual manner

of tile setting. Desirably, the backs and also desirably the edges of the tiles will be primed with a primer *f* of bitumen before application to the setting bed. The tiles may be primed with bituminous emulsion such as described above for priming the base *a*, or they may be primed with any suitable solution of bitumen and the tiles will be applied to the setting bed when the primer is dried sufficiently to firmly adhere to the tiles.

The tiles having been set in the usual manner, and the setting bed having stiffened, the tiles will then be grouted with a grout *g*, within the scope of which term I mean to include pointing mortars, and the like. The grouting may be of any desired composition, but preferably the tiles will be grouted with the same mortar as that forming the setting bed, with omission of the sand if the joints are narrow.

It will now be observed that the tile structure in accordance with this invention presents the great advantage of thinness and lightness of weight as compared with the relatively great thickness and weight of tile structures as heretofore produced. The structure in accordance with this invention will have the further very great advantage that the setting bed *d*, despite its relative thinness, will have great strength and, at the same time, substantial resiliency, thus permitting the laying of the tile structure without the requirement for any special form of base and upon bases having themselves a certain amount of resiliency and subject to vibration, as, for example, the decks of ships.

It will be understood that various modifications in detail may be made in the structure in accordance with this invention as described above and in the method for its production without, however, departing from the scope of this invention.

What I claim and desire to protect by Letters Patent is:

1. A tile structure comprising a base, a setting bed of bituminous mortar including bitumen, an aggregate and hydraulic cement laid on said base, the aggregate and hydraulic cement together being in amount in excess of the amount of bitumen by weight, a plurality of individual tiles set in said bed in spaced relation and grouting filling the spaces between the tiles.

2. The method of forming a tile structure which includes forming on a base a setting bed comprising a plastic mixture of bitumen, water, aggregate and hydraulic cement in which the aggregate and hydraulic cement together are in an amount in excess of the amount of bitumen by weight and setting tile in the bed while the bed is still plastic and before the hydraulic cement becomes hydrated.

3. The method of forming a tile structure which includes coating a base with bitumen, forming on the coated base a setting bed comprising a plastic mixture of bitumen, water, sand and hydraulic cement in which the aggregate and hydraulic cement together are in an amount in excess of the amount of bitumen by weight and setting tile in the bed while the bed is still plastic and before the hydraulic cement becomes hydrated.

4. The method of forming a tile structure which includes providing a base, applying to the base a mortar comprising a mixture of hydraulic cement and a bituminous emulsion of the oil-in-water type, in which the hydraulic cement is in amount in excess of the amount of bitumen contained in the emulsion by weight, for the formation of a setting bed and setting tile in the bed while the bed is in a plastic condition and before the hydraulic cement becomes hydrated.

5. A tile structure comprising a base, a setting bed of bituminous mortar, including bitumen and hydraulic cement, laid on said base, the hydraulic cement being in amount in excess of the amount of bitumen by weight, and a plurality of individual tiles set in said bed.

6. A tile structure comprising a base, a setting bed of bituminous mortar, including bitumen, an aggregate and Portland cement laid on said base, the Portland cement being in amount in excess of the amount of bitumen by weight, and a plurality of individual tiles set in said bed.

7. A tile structure comprising a base, a setting bed of bituminous concrete including bitumen, an aggregate and a hydrated hydraulic cement superimposed on said base, the hydrated hydraulic cement being in amount in excess of the amount of bitumen by weight, and a plurality of individual tiles set in said bed.

8. A tile structure comprising a base, a coating of bitumen on said base, a setting bed comprising bitumen, an aggregate and a hydrated hydraulic cement superimposed on said bituminous coating, the hydrated hydraulic cement being in amount in excess of the amount of bitumen by weight, and a plurality of individual tiles backcoated with bitumen and set in said setting bed.

9. A tile structure comprising a base, a relatively thin setting bed of bituminous mortar including bitumen, an emulsifying agent, an aggregate and hydraulic cement laid on said base, the hydraulic cement being in amount in excess of the amount of bitumen by weight, and a plurality of individual tiles set in said bed.

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