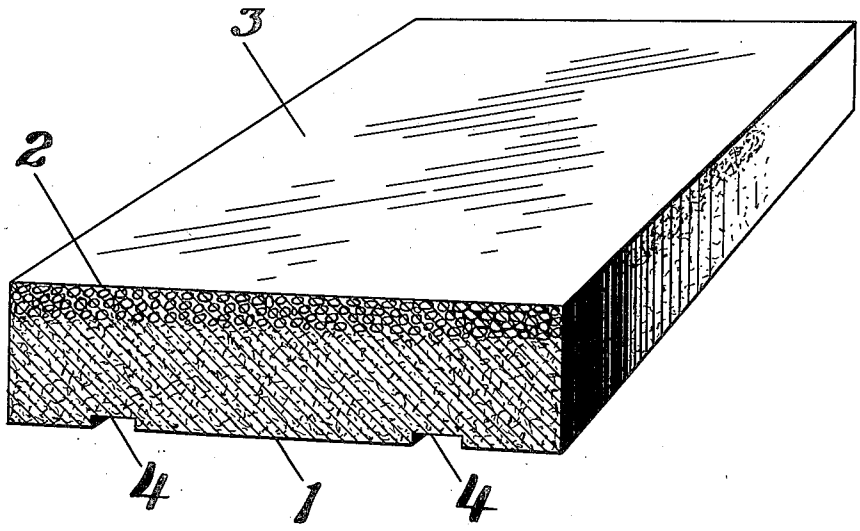
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SAFETY TREAD CERAMIC TILE.

ORIGINAL FILED JUNE 5, 1918.



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UNITED STATES PATENT OFFICE.

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SAFETY-TREAD CERAMIC TILE.

Continuation of application Serial No. 238,404, filed June 5, 1918. This application filed April 25, 1922. Serial No. 556,505.

To all whom it may concern:

Be it known that we, GEORGE N. JEPPSON and MILTON F. BEECHER, citizens of the United States of America, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Safety-Tread Ceramic Tiles, of which the following is a full, clear, and exact specification.

Our invention relates to a safety tread and more particularly to a ceramic tile having an anti-slipping surface comprising hard, durable and wear-resisting granular material. This case is a continuation of the application filed on June 5, 1918, Serial Number 238,404, by George N. Jeppson which became forfeited and was renewed as Serial No. 506,918, October 10, 1921. One object of our invention is the provision of a safety tread tile having an inexpensive ceramic body and a surface portion comprising a hard, anti-slipping granular material, which is simple in its construction and economical to manufacture, which is hard, durable and of high tensile strength capable of withstanding the crushing effect of heavy objects moving over the tile, and which will be highly efficient for flooring and tread surfaces.

With this and other objects in view, as will appear from the following disclosure, our invention resides in the subject matter set forth in the specification and covered by the claims appended hereto.

It has been proposed to incorporate hard, wear-resisting granular material, such as previously fused alumina or silicon carbide, in a ceramic tile for use as a floor tread. Such tiles containing the bonded granular material uniformly distributed throughout their entire volume have been very expensive to manufacture, owing to the fact that alumina and silicon carbide are electric furnace products requiring a large current consumption. It is not possible, however, to avoid using such costly materials, since hardness and durability are prime requisites, and since no other form of safety tread has been found satisfactory; hence we propose to reduce the initial cost of these articles by utilizing a construction and a composition of tile which permit a material reduction of the amount of the expensive ingredient necessary for making a safety tread. Furthermore, as a more important consideration, it is desirable that safety treads intended for use where heavy traffic occurs should possess high tensile strength, durability and capability for withstanding the shocks and strains of such traffic. Since the trussed structure of bonded granular material is not as strong as a tile having a solid, homogeneous mass of ceramic material alone, it is desirable to form the body of the tile of such a durable material.

We accordingly have found it feasible to make a satisfactory tile body, not by bonding a large percentage of expensive granular material with a relatively small amount of ceramic material, but by utilizing a ceramic substance alone as the main body portion and rendering the tile anti-slipping by combining therewith a surface tread portion having wear-resisting, anti-slipping material embedded therein and preferably suitably held in place by a ceramic bond. We furthermore provide a ceramic tile in which the backing preferably has the same shrinkage and warpage as the top portion, so that during drying and burning the tile will not be seriously injured by fractures or splitting, and we make the two portions of such relative thicknesses that when the top anti-slipping portion has worn away the tile is then too thin for further wear and must be replaced, this ultimate thickness of the tile body depending upon the nature of traffic to which it is to be exposed.

In accordance with our invention, we make the tile backing of a vitrified ceramic material, which may comprise a pure ball clay, such as that variety known as Mississippi ball clay, or modifications thereof containing various ingredients. In order to modify the properties of this clay material, we may combine with clay various substances such as feldspar, whiting, flint talc, steatite, etc., these various ingredients being utilized to change the burning temperature or vitrifying point of the mass or to modify the physical characteristics of

the tile to conform with the uses to which it may be put. A specific example of a satisfactory composition may comprise ball clay mixed with feldspar and flint in the following proportions:

	Parts by weight.
Ball clay	35
Feldspar	25
Flint	40

If such materials as above described are heated to a vitrifying temperature for a proper length of time the mass is rendered exceedingly tough and durable.

In order to provide a satisfactory safety tread surface, we combine with the backing a ceramic bonded mass of extremely hard granular material which is wear-resisting and durable under the abrasions of footwear and, for treads intended to be exposed to severe traffic conditions, we preferably utilize a material having a hardness of 9 or more on Mohs' scale. Of the best available materials for the anti-slipping substance, which are found to be crystalline or previously fused alumina and silicon carbide, we prefer crystalline alumina because of its durability and wear-resisting qualities under the strains and stresses of foot abrading action. The granular crystalline alumina, which may be of the nature of corundum and contain other ingredients besides pure alumina, may be prepared by any suitable process, such as, for example, by fusing alumina or bauxite in an electric furnace, allowing it to cool slowly in the pig, and then crushing and grading it to obtain the desired size. This granular alumina is combined with a suitable ceramic bond and burned to a hard composition adapted to resist foot wear and prevent slipping thereon.

Since the ceramic material containing the alumina granules which are substantially non-fusible at the burning temperatures has a different shrinkage from the ceramic material used alone for the tile body, there is a tendency for the combined body to warp or to split apart between the two portions. We may adopt various expedients to overcome this difficulty. For example, the shrinkage of the backing might be reduced by adding to the clay material a granular non-plastic substance such as flint, burned clay, etc., in suitable proportions to make the shrinkage of the backing correspond with that of the facing containing the alumina granules. We, however, prefer to control the shrinkage of the two portions by altering the composition of the bond utilized in the face layer, so as to cause a high shrinkage of the mixture of alumina granules and the bond, this bond being so constituted that the shrinkage of the face is approximately that of the vitrified backing, whereby warping of the body and cracking, parting or other detrimental effects are obviated.

To accomplish this purpose, we may incorporate a shrinkage-increasing material such as manganese carbonate with the clay and other ingredients, although it is obviously within the scope of our invention to utilize various combinations which prevent such warpage or breaking of the tile. A specific example of the composition of a satisfactory tile may be given as follows:

Facing bond.

	Parts by weight.
Feldspar	167.4
Whiting	70.0
Ball clay	51.6
Flint	108.0
Manganese carbonate	28.0
	425.0

Nonslip facing.

Bond	20%
Alumina	80%

Body or backing material.

	Parts by weight.
Ball clay	35
Feldspar	25
Flint	40
	100

As a specific method of combining the tread portion with the backing and making a safety tile embodying one phase of our invention, we may mix the desired proportions of alumina and facing bond with water so that the mass may preferably be molded by pressing a plastic mass. This is placed in the bottom of a mold of suitable dimensions and the mold is filled with the vitrifiable clay backing material which has been moistened with water to the desired amount to render the material capable of being molded in a dry press. After subjecting the mass to pressure to form the body, it is dried and then burned in a suitable ceramic kiln to a maximum temperature of about 1300° C. for a suitable length of time, e. g., one hundred hours, after which it is cooled slowly for a similarly long time. By this firing operation the alumina granules are bonded together by the ceramic material, the backing is formed into a hard vitrified body and the two portions of the tile are intimately and permanently united into a unitary wear-resisting tile.

The grain size of the particles may be as desired, but it is to be noted that the coarse, large particles have too severe an abrading action upon leather or other foot-covering materials and that a tile made of

such coarse particles tends to be too porous to be sanitary and kept clean easily. Hence we prefer either to utilize a medium sized or a fine grain or to combine coarse particles which have large anti-slipping characteristics with fine grains which fill in the interstices between the larger particles and render the tile dense and of low porosity.

Referring to the drawing, which represents a perspective view, partly in section, of a ceramic tile, we have there shown one embodiment of our invention comprising a ceramic body 1 having a tread portion 2 of bonded alumina granules, which has a wear-resisting surface 3 and forms the same as the tile wears away. If desired, grooves 4 may be provided in the under side of the tile, these grooves being adapted to be filled with concrete in which the whole tile is embedded and thereby constituting means to keep the tile from shifting from its original position. If desired, holes may be provided through the tile for bolting or screwing the same to a wooden or any type of surface. While the tile may be made of any desired shape, it is found preferable to have the upper surface of a rectangular or other form which may be laid in patterns over an extended area.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A safety tread tile comprising a body of vitrified ceramic material having abrasive granules embedded mainly in the tread portion thereof, said granules being integrally bounded by said material and forming therewith an anti-slipping, wear-resisting surface.

2. A safety tread tile comprising a vitrified ceramic backing integrally united with a tread layer of abrasive granules bounded by vitrified ceramic material, said abrasive forming the major portion of the tread surface.

3. A safety tread tile comprising a vitrified ceramic backing, a tread layer of anti-slipping granules of a hardness of 9 or more united by a vitrified ceramic bond, said backing and bond forming an integral vitrified mass.

4. A safety tread tile comprising a porcelain backing and a tread layer of abrasive granules bonded by a vitrified ceramic material, said backing and layer being integrally united by vitrification.

5. A safety tread tile comprising a vitrified ceramic backing integrally united with a tread layer of crystalline alumina granules bonded by a vitrified ceramic material.

6. A safety tread tile comprising a porcelain body united by vitrification with a surface layer of anti-slipping granular material of a hardness of 9 or more bonded by a vitreous material.

7. A safety tread tile comprising a porcelain backing united by vitrification with a tread layer of crystalline alumina granules bonded by a vitreous ceramic mass, said granules forming the major portion of the wear-receiving surfaces.

8. A safety tread tile comprising a tread portion of anti-slipping granules bonded by a vitrified ceramic material and a backing integrally united with the tread portion consisting of a vitrified ceramic material of substantially the same vitrification shrinkage as the tread portion.

9. A safety tread tile comprising a surface tread portion of crystalline alumina granules bonded together by a vitrified clay material having a high shrinkage value, and a backing of vitrified clay material having substantially the same shrinkage as the tread portion during burning and a high tensile strength and durability under the shocks of foot wear.

Signed at Worcester, Massachusetts, this 18th day of April 1922.

GEORGE N. JEPPSON.
MILTON F. BEECHER.