July 3, 1962 H. G. MACDONALD ETAL 3,041,785

MULTIPLE UNIT CERAMIC TILE ASSEMBLY

Filed Jan. 9, 1959

FIG. 1.

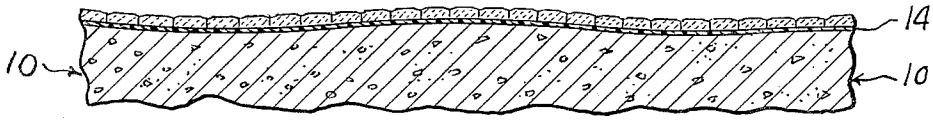


FIG. 2.

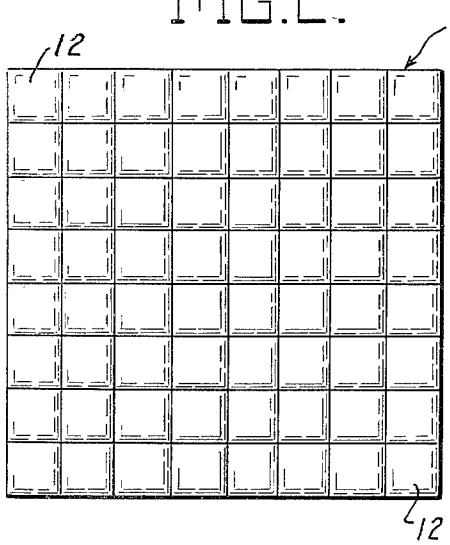


FIG. 3.

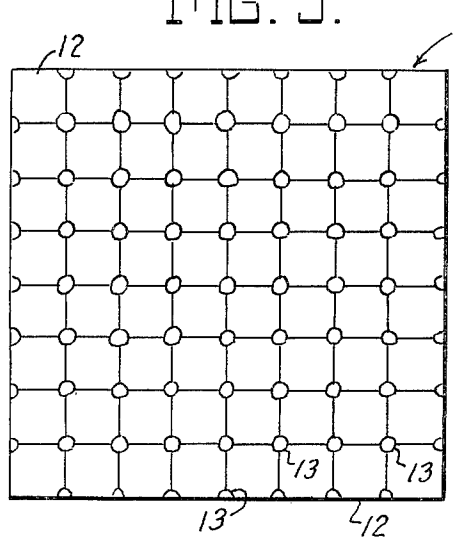
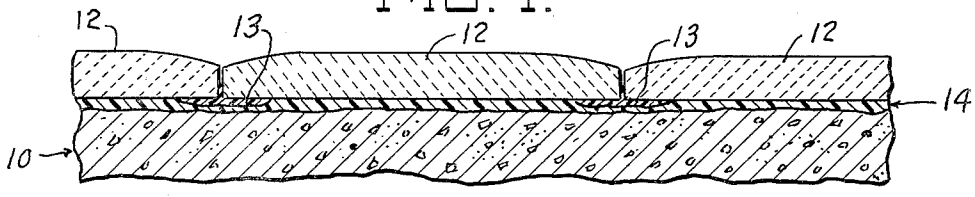


FIG. 4.



HERBERT G. MACDONALD
DAVID J. BARBOUR
KARL M. CLAUS
BY INVENTORS
Owen + Owen
ATTORNEYS

United States Patent Office

3,041,785

Patented July 3, 1962

3,041,785

MULTIPLE UNIT CERAMIC TILE ASSEMBLY

Herbert G. Macdonald, Corona, Calif., and David J. Barbour and Karl M. Claus, Zanesville, Ohio, assignors to The Mosaic Tile Company, Zanesville, Ohio, a corporation of Ohio

Filed Jan. 9, 1959, Ser. No. 785,917
3 Claims. (Cl. 50—268)

This invention relates to a multiple unit ceramic tile assembly consisting of a plurality of individual complementary ceramic pieces and bonding and spacing means for said pieces for retaining the same in the assembly.

Ceramic tile floors and walls are usually laid from a plurality of small ceramic pieces which may be squares, hexagons, octagons, triangles, etc., and which are laid in a heavy cement and usually held in place by special grouting that is applied by the tile setter and which fills spaces of uniform width between each of the individual ceramic pieces.

Numerous suggestions have been made in the past for adhering these individual tiles to sheets of paper, the sheets of paper being adhered to the front faces and then removed after the tiles are initially set in the cement, or adhered to the back faces and perforated so that the cement will penetrate through the perforations and bond to the tiles. In either of these arrangements, it is necessary to apply the grouting after the tile has been placed in the cement and, of course, it is necessary to carefully prepare the cement bed so that the tile floor or wall will be flat. It has also been suggested that the process of setting tiles may be simplified by connecting the multiple small pieces to each other by means of strips or small pieces of paper or other film adhered to the backs of the tiles to hold them in sheet form until they are placed in the cement bed.

In previously suggested assemblies where perforated sheets, or strips of paper are adhered to the back surfaces of the ceramic pieces, such a large percentage of the areas of the backs of the ceramic pieces is covered by the paper in order to firmly attach the pieces thereto that a minimal area is exposed to provide secure bonding of the ceramic pieces to the base surface, such as a wall or floor, without the additional security provided by the grouting.

One of the difficult phases of tile setting has been the necessity for the spreading and leveling of a cement bed not only to provide a bonding medium for the tile but also to compensate for unevenness in the supporting surface behind the tile.

Heretofore the setting of tile for floors or walls has been a project requiring the craftsmanship of a skilled tile setter. It has been very difficult if not impossible for for amateurs to set ceramic tile successfully because of the critical nature of the cement backing and the grout application. Thus far it appears that "do-it-yourself" ceramic tile floors have not been at all feasible.

It is the principal object of the present invention to provide a multiple unit ceramic tile assembly which can be placed directly upon a floor or wall without the necessity for the preparation and leveling of a cement bed.

It is another object of the invention to provide a flexible assembly of ceramic tiles in which a multiplicity of small ceramic tiles are arranged with their edge surfaces in close spaced relationship or adjacency and held in a group so that the entire group of tiles may be placed directly upon a supporting wall or floor and held in place by only a thin coating of cement.

It is yet another object of the invention to provide a flexible ceramic tile assembly which can be directly bonded by a thin cement or adhesive layer to the supporting floor without the necessity of preparing a cement bed and which is flexible to a degree sufficient to permit its adhesion even to some of the irregular surfaces such as a concrete floor.

It is a further object of this invention to provide a unitary assembly of ceramic tiles held together by means on the rear faces thereof which cover only a small percentage of the back area so as to provide a substantial surface for adhesion.

It is yet another object of the invention to provide a flexible assembly of ceramic tiles which can be laid as a unit in a manner sufficiently simple so as to permit laying of ceramic floors or walls by amateurs.

It is yet another object of the invention to provide a flexible assembly of small complementary ceramic tiles arranged in edge to edge relationship which can be held in place by a thin backing layer of adhesive and which does not require the usual surface grouting.

These and other objects and advantages of the invention will be better understood from the specification which follows and from the drawings illustrating an assembly of ceramic tiles embodying the invention. In these drawings—

FIG. 1 is a fragmentary, vertical, sectional view through a portion of a supporting floor over which a plurality of tile assemblies according to the invention have been laid;

FIG. 2 is a plan view of a flexible assembly of ceramic tiles fabricated according to the invention;

FIG. 3 is a rear view in elevation of the flexible assembly of ceramic tiles shown in FIG. 2; and

FIG. 4 is a fregmentary, vertical, sectional view, on a greatly enlarged scale, of a portion of a flexible assembly of ceramic tiles fabricated according to the invention.

For purposes of illustration throughout the following specification, a flexible assembly of ceramic tiles consisting of 64 square, individual tiles assembled into a unit will be described. It is to be appreciated, of course, that this particular number of individual modular tiles in a flexible assembly according to the invention is merely illustrative and the invention includes within its scope tile assemblies of other numbers, different dimensions, and different shapes of individual tile pieces. The invention also includes assemblies comprising more than one specific shape of individual tile pieces, it being necessary only that the pieces fit together in selected edge to edge relationship to form a continuous assembly of ceramic tile according to the invention.

In the figures in the drawings, a concrete supporting floor is generally indicated at **10**. The concrete floor **10** is shown merely as an illustration, i.e., the flexible tile assemblies of the invention are intended for use on floors or walls of virtually any material and no limitation as to the type of material upon which the tile assemblies of the invention can be laid is intended by this illustrative use.

A flexible assembly of ceramic tiles according to the invention is generally indicated in FIGURE 2 by the reference number **11**. In this illustration there are shown 64 individual, square ceramic pieces **12**. Each of the individual pieces of tile **12** may be identical with each of the other pieces or it may differ in color or shape, the only requirement being that a plurality of individual tile pieces **12** may be assembled in close selected edge to edge juxtaposition or spaced relationship in order to build up an assembly **11** of apparent continuity, suitable for surfacing either a floor or a wall. For examples, individual tiles **12** of hexagonal shape may all be nested together, squares and triangles may be used together, and other arrangements of the same or different shapes may be assembled according to the invention as is desired to achieve particular patterns in the finished floor or wall

surfacing. The quality of being able to be used together is referred to hereinafter as "complementary."

The individual tiles **12** are assembled together either in assemblies of definite number as illustrated in FIGS. 2 and 3, or in sheets having any desired width and almost any desired length. For example, instead of there being merely 64 individual pieces in an assembly fabricated according to the invention, the assembly might be any number of tiles wide and, due to the flexibility achieved, the assembly might be a considerable number of feet long with the entire sheet rolled so that it can be unrolled when the floor or wall is prepared.

In assembling a plurality of individual tiles **12** together, they are arranged in inverted position upon a flat surface. An assembly of 64 tiles, such as the assembly **11** illustrated in the drawings, is placed as shown in FIG. 3 with their bottom surfaces uppermost in an assembly tray or box or on an assembly table or belt. After the individual tiles **12** are assembled together, suitable means are actuated for depositing at each of the adjacent corners of contacting tiles, a small mass of liquid resinous bonding material indicated in FIGURE 3 by the reference number **13**. The particular constituents of the resinous mass per se, do not constitute a part of the instant invention and numerous types of resinous bonding materials or adhesives may be employed in practicing the invention. However, whatever particular resinous material or group of materials is employed, the mass must have certain essential characteristics. These include:

(1) The resinous mass must adhere tightly to the back surfaces of the individual ceramic pieces **12**.

(2) The resinous material or adhesive must remain flexible even after it is "set up."

(3) The resinous material in the masses **13** must be compatible with usual bonding materials used for adhering assemblies of the invention to a supporting surface. A thin layer of such a bonding material is indicated in the drawings at **14**.

(4) The resin in the masses **13** must set up to stability, flexibility, and compatibility with surface bonding materials at room temperature.

It is also desirable that the resinous material in the masses **13** preferably should be water resistant. This is desirable not only because ceramic floors and walls are usually washed with water solutions of soaps and detergents, but also because when cutting ceramic tile assemblies it is customary to employ diamond wheels and water base cutting solutions are usually used to lubricate such wheels.

The resin should also have a tack-free surface and be vermin proof. Preferably, the resin in the masses **13** should set up without the necessity for the application of heat to complete its polymerization to the desired degree, but heat setting resins having the desired properties may also be employed if desired.

The individual tile elements **12** which are assembled to form a flexible assembly according to the invention should be placed in close juxtaposition, but preferably they should not be in tight contact with each other. (See FIG. 4.) The maintenance of the individual ceramic pieces **12** out of close contact with each other results in very thin protrusions of the resin in the masses **13** into the spaces between the corners of adjacent tiles. These small protrusions of resin not only assist in holding the tiles in assembled relationship but they also provide "hinges" upon which adjacent ceramic pieces **12** may pivot slightly relative to each other in order to accommodate a tile assembly **11** to a wavy or uneven surface as illustrated in FIG. 1. The particular spacings shown in FIGURE 4 are of course, not critical and are merely illustrative of this facet of an assembly of ceramic tiles.

It should be noted that a flexible assembly of ceramic tiles fabricated according to the invention is not intended to be curved around short radii as at the corners between floors and walls. It is, however, intended that such flexible assembly whether of fixed size, such as the assembly **11** shown in FIGURES 2 and 3 or of larger size or sheet shape, shall be flexible enough so that it can be laid on a relatively uneven floor, such as a typical basement floor, and adhered to the floor with only a thin layer **14** of surface bonding material.

The small masses of resin **13** cover only a small percentage of the total area of the ceramic piece **12** or of the entire assembly. Thus, a maximum proportion of the entire back surface is exposed for adhesion by the bonding material employed in laying the assemblies **11**.

A flexible assembly of ceramic tiles according to the invention may thus be laid by an unskilled person in the same manner that "tiles" of rubber, asphalt, vinyl and other materials are currrently laid in "do-it-yourself" operations. The person laying a flexible assembly embodying the invention need only prepare the surface of the supporting wall or floor by cleaning it so that the surface bonding material **14** will adhere and by removing any abrupt irregularities in the same manner in which it is necessary to prepare such a supporting wall or floor for the laying of asphalt, rubber and vinyl tiles. The person then spreads a thin layer of surface bonding material over the supporting floor and can then lay the flexible tile assemblies of the invention directly upon this thin surface bonding material. If individual assemblies such as the assemblies **11** illustrated in FIGURES 2 and 3 are employed, these individual assemblies may be handled as units and the resinous masses **13** have sufficient integrity to retain all of the individual tiles **12** as a group in the assembly **11**. If, on the other hand, an assembly of substantially greater width and length is being laid, the resin in the individual masses **13** serves to retain the individual tiles **12** in their positions and its flexibility permits the large sheet or roll which constitutes the flexible assembly to be handled as a unit and to be laid upon the bonding material **14**.

In common with the laying of other unitary floor and wall materials such as the rubber, asphalt and vinyl tiles mentioned above, the person laying the flexible assemblies of the invention may roll the assemblies in order to secure tight bonding of the material **14** to both the supporting floor **10** and the rear surfaces of the individual tiles **12** of the assemblies embodying the invention.

A suitable adhesive possessing the necessary qualities for use in the method of the invention in fabricating flexible assemblies of ceramic tiles according to the invention is compounded from the following constituents:

	Ccs.
Emulsion "A"	432
Glyoxal	5
Dibutyl phthalate	21
A glycol *	32

* E.g. diethylene glycol or hexylene glycol.

Emulsion "A" in the above formulation is a dispersion of polyvinyl acetate in water containing about 55.3% solids, polymerized to such a degree that it has a Brookfield viscosity of 1454 cp. @ 20° C. with less than 1% of vinyl acetate monomer by weight and a pH of 4.42. It may be purchased on the market by these specifications.

The glyoxal, dibutyl phthalate and diethylene or hexylene glycol in the above formulation are conventional constituents and are used herein for their usual purposes.

If greater resistance to water is desired a small quantity of a suitable material such as a polymeric silicone fluid containing some unhydrolyzed chlorine silicone bonds with a chlorine content of, say, 16% to 27% by weight and a specific gravity of 1. to 1.03 may be employed. Such a fluid is acidic and during admixture produces a small amount of hydrochloric acid due to the hydrolysis of the chloro silane present. This silicone fluid may be puchased on the market by these specifications. In the above formulation the addition of about 9 cc. of such a fluid considerably increases water resistance.

We claim:

1. A multiple unit ceramic tile assembly consisting of a plurality of individual complementary ceramic pieces, each of said pieces having front and back major faces and edge surfaces, each of said major faces being at least substantially planar and said major faces being parallel to and spaced from each other, said edge surfaces extending between and generally normal to said front and back major faces, said pieces being arranged with all of their corresponding major faces lying in at least substantially the same plane and with their edge surfaces in selected spaced relationship, and bonding and spacing means for said tile pieces consisting of small, discrete, spaced masses of set-up synthetic resinous material each of said masses being securely bonded directly to and in contact with only edge portions of the back surfaces of at least two of said tile pieces and to only portions of the edge surfaces of the same ones of said tile pieces contiguous to said edge portions of said back surfaces, each of said masses being homogeneous and substantially solid throughout and fully occupying the space between said portions of said edge surfaces and bridging between said portions of said edge surfaces, there being at least two of said masses bonding each of said tile pieces to other adjacent tile pieces, the resinous material in said masses being compatible with adhesives capable of retaining said assembly on a surface, stable at room temperature, flexible to a degree providing for slight angular movement of adjacent tile pieces relative to each other and being resistant to deformation and maintaining said selected spaced relationship of said tile pieces, preventing engagement of adjacent tile pieces with each other and resisting separation of adjacent tile pieces, all under forces normally encountered in shipping, handling and laying such assemblies.

2. A multiple unit assembly according to claim 1 in which all of said tile pieces are arranged with their front major faces lying in the same plane.

3. A multiple unit assembly according to claim 1 in which each of said tile pieces is polygonal in plan configuration and each of said resinous masses is bonded to the corner portions of the back faces and edge surfaces contiguous thereto of all tile pieces meeting at such corner.

References Cited in the file of this patent

UNITED STATES PATENTS

2,018,711	Elmendorf	Oct. 29, 1935
2,052,229	Hyde	Aug. 25, 1936
2,714,750	Facciolo	Aug. 9, 1955
2,718,829	Seymour et al.	Sept. 27, 1955
2,741,909	Hartlmair	Apr. 17, 1956
2,844,955	Talbott	July 29, 1958
2,852,932	Cable	Sept. 23, 1958
2,887,867	Burchenal	May 26, 1959

FOREIGN PATENTS

1,143,692	France	Apr. 15, 1957

OTHER REFERENCES

Architectural Forum, July 1946, p. 126.