Feb. 15, 1966 K. G. BIERLICH 3,234,692

TILE CONSTRUCTION

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FIG. 1.

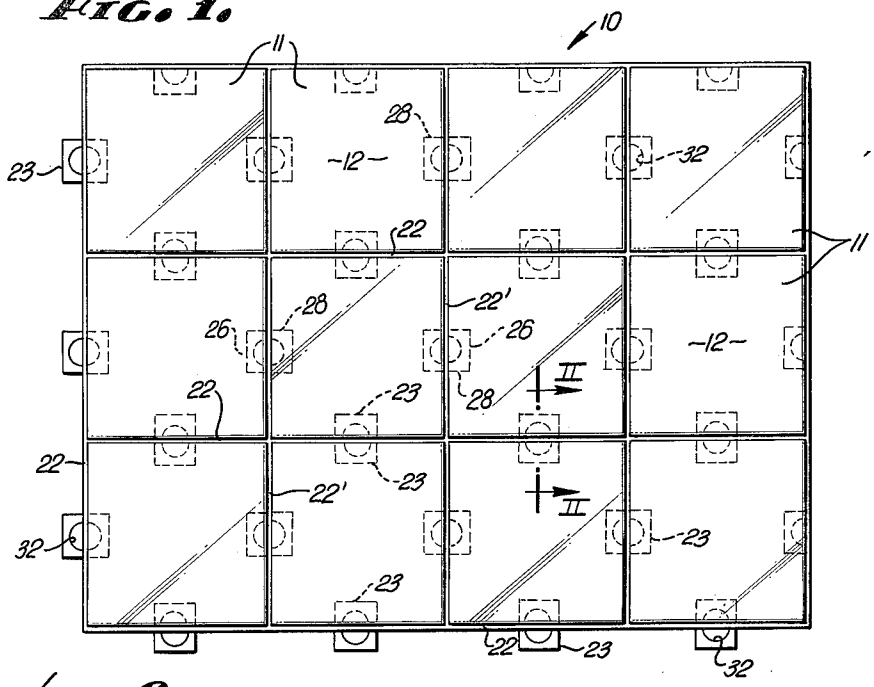


FIG. 3.

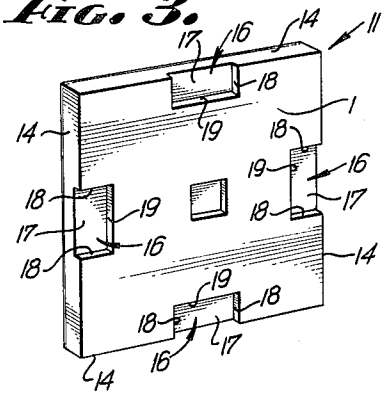


FIG. 2.

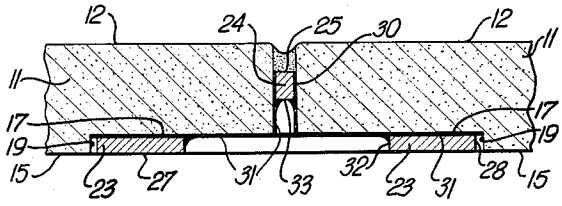
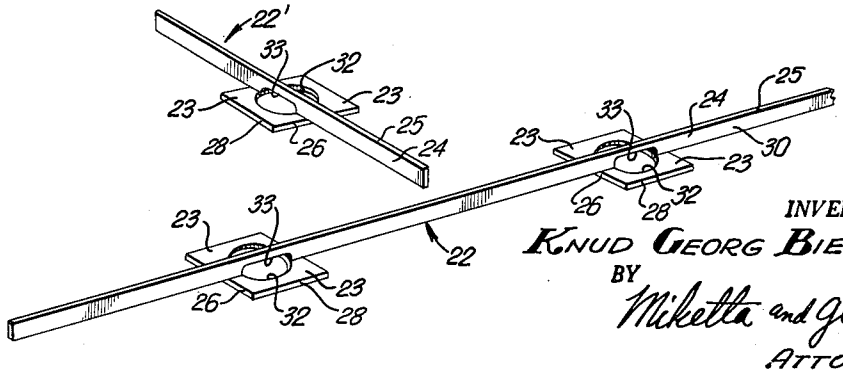


FIG. 4.



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TILE CONSTRUCTION

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FIG. 5.

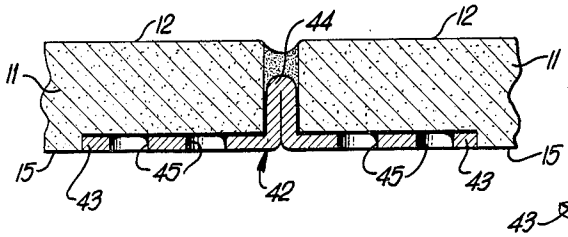


FIG. 6.

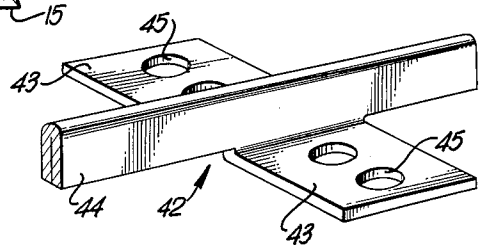


FIG. 7.

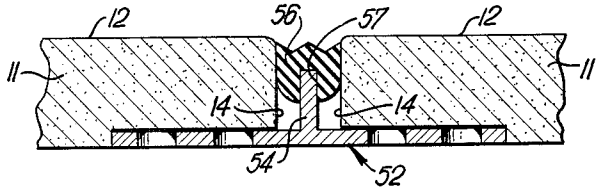


FIG. 8.

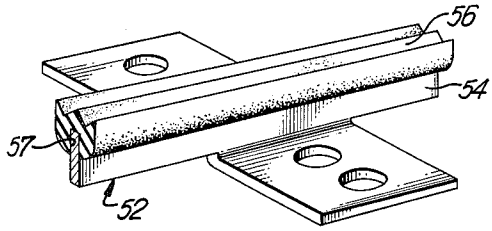


FIG. 9.

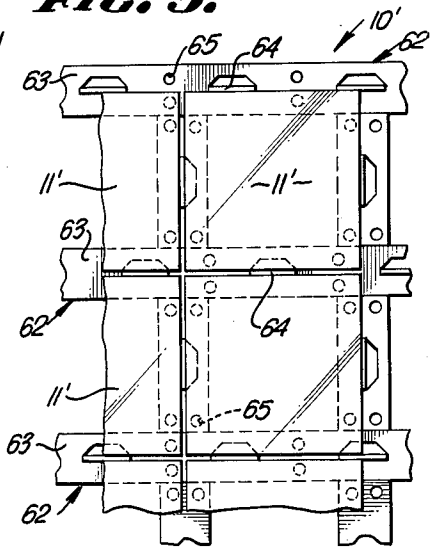


FIG. 10.

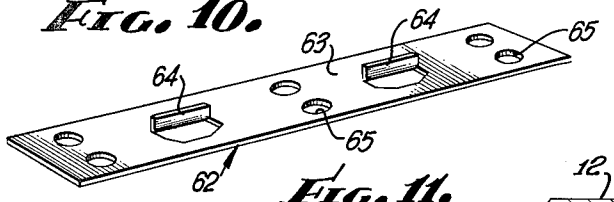


FIG. 11.

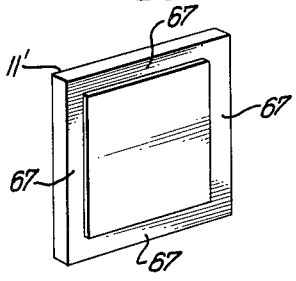


FIG. 12.

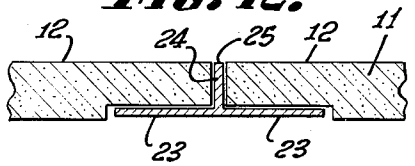
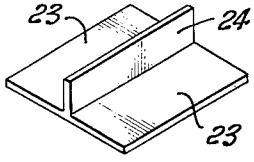


FIG. 13.



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TILE CONSTRUCTION

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FIG. 14.

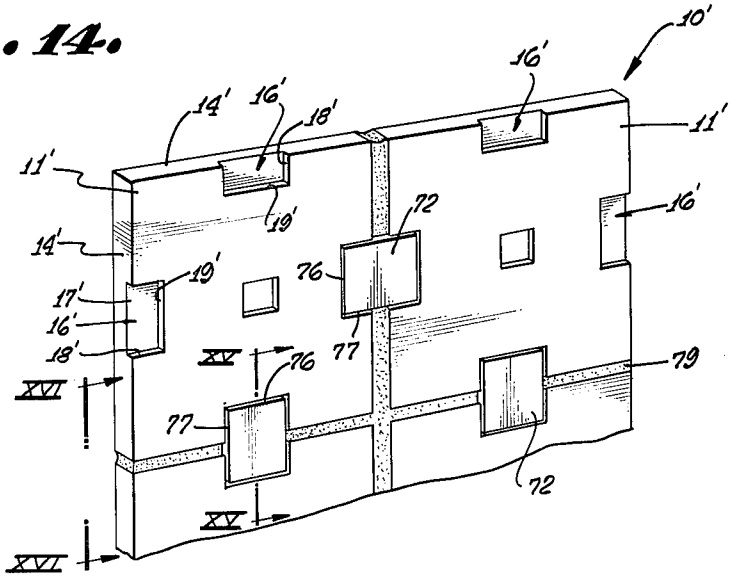


FIG. 15.

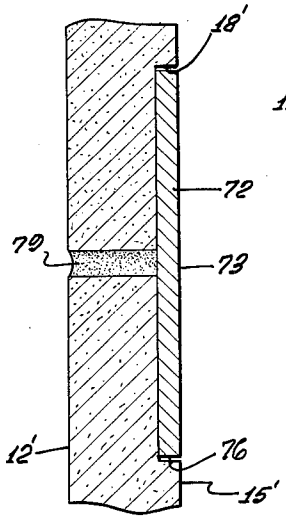


FIG. 16.

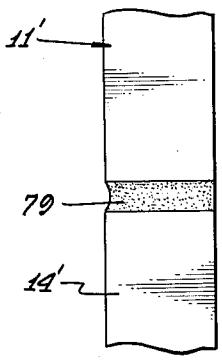
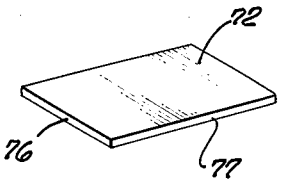


FIG. 17.



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United States Patent Office 3,234,692 Patented Feb. 15, 1966

3,234,692

TILE CONSTRUCTION

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Filed Jan. 16, 1964, Ser. No. 340,848
6 Claims. (Cl. 52—392)

This application is a continuation-in-part of my pending application Serial No. 65,682 filed October 28, 1960, which is being abandoned in favor of the present application.

This invention relates to a unitary construction or an integrated article made by assembly of a plurality of discrete tile or like bodies and more particularly to a unitary rigid panel construction comprising a multiplicity of discrete polygonal flat tile rigidly held in spaced relation by a plurality of stiff, rigid elements interconnecting adjacent tile and bonded thereto so that the entire panel assembly may be readily handled as a structural unit.

Tile, such as ceramic tile, is extensively utilized for decorative wall, floor, countertops, and the like, and normally such tile are individually laid in a prepared bed of mortar or mastic. Great care and skill is required in order to position each individual tile in proper spaced relation to adjacent tile in order to provide joint lines which are straight and true and to position the front faces of the tile in a common plane. After the tile are laid in such a bed the joints or spaces between tile are filled with a joint material such as a cement grout. Because of the requisite skill and large amount of time required to properly lay individual tile, various devices and attempts have been made to facilitate the setting of tile by interconnecting individual tile elements, particularly mosaic tile by means of flexible fabrics, strips of material, tapes, and the like so that a pre-assembled group of tile may be handled together. Such prior proposed devices have contributed to the ease in handling and in laying such tile under certain circumstances.

The present invention contemplates a novel unifying construction made by assembling a plurality of individual discrete tile so that a rigid, integrated, readily handleable prefabricated rigid structural unit is provided. The present invention contemplates factory assembly of discrete tile into a unitary panel construction of a size capable of being readily handled, shipped, stored and installed as a structural unit. Preassembly of such tile at the factory rather than at the job site in this manner permits the use of jigs and equipment for the precise, accurate arrangement of selected decorative wall patterns in which each tile may be a component or part of an overall pattern. Final assembly of a plurality of panels containing pattern components may be quickly and readily found, selected, assembled and installed at the job site with a minimum of time and without the extreme care and skill previously demanded when laying individual tile.

The primary object of the present invention is to provide a novel unifying construction for a plurality of individual tile to provide an integrated article of enhanced utility and appearance.

An object of the present invention is to disclose and provide a unitary panel construction composed of a plurality of discrete tile precisely and rigidly interconnected so that the panel is dimensionally accurate and may be handled as an integral structural unit.

An object of the invention is to disclose and provide a tile assembly wherein adjacent tile are interconnected by rigid elongated elements firmly bonded to the tile.

A more specific object of the invention is to disclose and provide a rigid unitary panel construction composed

of a plurality of tile each tile having a back face provided with means cooperable with rigid, interconnecting, elements bonded thereto whereby the tile are positioned, retained and held in a planar zone.

A further object of the invention is to provide a rigid assembly of a plurality of discrete tile in spaced relation wherein the space between tile is at least partially occupied by a rigid tile connecting element, and wherein remaining joint space may be filled with suitable joint material.

A still further object of the invention is to provide such an assembly of tile as above mentioned wherein such a rigid connecting element supports a preformed resilient joint filling member.

Still another object of the invention is to provide a rigid elongated element which may extend for one or more tile lengths and which may cooperate with more than one pair of opposed adjacent tile.

Many other objects and advantages of the present invention will be apparent to those skilled in the art from the following description of the drawings in which exemplary embodiments of the present invention are shown.

In the drawings:

FIG. 1 is a front or plan view of an integrated panel construction embodying this invention.

FIG. 2 is a sectional view taken in the plane indicated by line II—II of FIG. 1.

FIG. 3 is a back view of a tile used in the construction shown in FIG. 1.

FIG. 4 is a perspective exploded view of metal elements used in the construction of FIG. 1.

FIG. 5 is a fragmentary sectional view showing a modification of a metal element.

FIG. 6 is a perspective view of the element shown in FIG. 5.

FIG. 7 is a fragmentary sectional view of another modification of a metal element with a joint filling member adapted for use in a construction similar to FIG. 1.

FIG. 8 is is a perspective view of the metal element and joint member in FIG. 7.

FIG. 9 is a fragmentary front or plan view of a modified panel construction.

FIG. 10 is a perspective view of a metal element used with the construction shown in FIG. 9.

FIG. 11 is a perspective view of the back of a tile used in the construction shown in FIG. 9.

FIG. 12 is a fragmentary sectional view taken in the same plane as that of FIG. 2 and showing a modification of the metal element connecting tile.

FIG. 13 is a perspective view of another modification of a metal element for interconnecting tile.

FIG. 14 is a perspective view of an integrated panel embodying another modification of this invention.

FIG. 15 is a sectional view in the plane indicated by line XV—XV of FIG. 14.

FIG. 16 is an end view taken from plane indicated by lin XVI–XVI of FIG. 14.

FIG. 17 is a perspective view of a rigid metallic element used in the indication of FIG. 14.

Generally speaking, an exemplary, unitary integrated article or panel construction **10** embodying this invention may include a plurality of ceramic tile **11** arranged to lie in a planar zone in spaced relation and in parallel rows or courses. The panel **10** may be made of any selected length and width and may include square tile as shown or may include other polygonal-shaped tile such as rectangular tile. Each tile **11** is immovably rigidly associated with an adjacent tile by an interconnecting elongated element of rigid material having laterally extending lip portions received within recesses provided on the back face of the tile and bonded to recess surfaces. The space between the tile may be wholly or partially occupied

by the rigid interconnecting elements and where partially occupied may be filled with a joint material of cement grout or a resilient joint filling material or member carried by the rigid elements.

Each tile **11** in this example may be a ceramic tile having a front decorative face **12** which may be glazed and which may bear a two or three dimensional pattern or a component part of such a pattern. The front faces **12** of tile **11** may lie in a common plane. Each tile **11** may include side edges **14** which are normally opposed to the side edges **14** of adjacent tile. The side edges **14** may be plane, precisely ground and finished so that the pairs of opposite side edges on each tile are in parallel and squared relation, and may include spacer projections or lugs if desired. Each tile **11** has a finely porous rear face which is normally unglazed and which is adapted to be pressed against a bed of mortar or other cementitious material for firmly bonding the tile to the bed of material. The rear face **15**, in this example, may be provided with a plurality of polygonal or rectangularly shaped or contoured recesses **16**, each recess **16** having a recessed surface **17** starting at a side edge **14**. Each recess **16** includes recess side walls **18** in parallel relation and a back recess wall **19**. Such a recess **16** is provided at each side edge **14** and in this example is disposed centrally between ends of the associated side edge **14**. The recessed surfaces **17** lie in a common plane and the recess walls **18** of opposed recesses **16** of adjacent tile are aligned when the side edges **14** of tile **11** are in selected spaced relation and in vertical and horizontal alignment.

Means for immovably and rigidly interconnecting the plurality of dircrete tile **11** may in this example include a plurality of rigid, metallic elements **22** having portions of T section. In this example a horizontally disposed element **22** may be formed of an integral strip of suitable metal which extends for the length of panel **10**. Horizontal element **22** comprises a plurality of longitudinally spaced oppositely directed and laterally extending lips or lateral portions **23** which extend into opposed aligned recesses **16** on adjacent tile. Element **22** also includes a medial leg or longitudinal portion **24** extending the entire length of panel **10** and projecting upwardly between the spaced side edges **14** of adjacent tile. The top edge **25** of medial leg **24** is spaced below the common plane of the front faces **12** of said tile.

In this example the oppositely directed lips **23** are each of generally rectangular section and have a planar contour substantially coextensive with planar contour of recess **16** so that each lip **23** is provided a close fit between recess walls **18**. Thus abutment of edges **26** of lip **23** against recess walls **18** of recess **16** will restrain and hold each tile against movement longitudinally of element **22** and will positively and precisely position each tile **11** in selected spaced relation. The thickness of each lip **23** does not exceed the depth of recess **16** and the back face **27** of each lip **23** may lie substantially in or slightly below the plane of rear face **15** of the tile. The back edge **28** of each lip **23** may normally lie in spaced relation to the back wall **19** of recess **16** so that side edges **14** of opposed tile may be urged into abutting contact with side surfaces **30** of the medial leg **24** to precisely position the tile in lateral relation to the element **22**.

Each lip **23** may be provided with a through opening **32** which may communicate with an aligned through opening **33** provided in medial leg **24** for receiving and containing a part of the cementing or bonding material **31** by which the element **22** is adhesively secured and fixed to each of the tile **11**. It will be apparent that bonding material which fills the openings **32** and **33** will also provide bonding contact at said openings between opposed side edges **14** of adjacent tile as well as bonding contact with recessed surfaces **17** of adjacent tile. A bonding material may be applied to all of the surfaces of recess **16** including the side walls **18** and recessed surface **17** and may be applied to portions of side edges **14** if desired.

The bonding material **31** may be an organic cement capable of setting or curing as for example an epoxy resin type of cement. Epoxy resins (linear polymers containing epoxide groups) have been found desirable to use as an adhesive because of their high degree of toughness and structural properties. It is understood, however, that other types of cementitious compositions and adhesives may be employed, as for example, other organic adhesives including urea-formaldehyde type, phenol-formaldehyde types, vinyl compounds, and other compounds containing synthetic rubber or rubber hydrochlorides capable of providing a strong structural bond between the elements **22** and the ceramic tile.

In this example, rigid, metallic, horizontal elements **22** have been described as extending for the length of panel **10** and interconnecting adjacent horizontal courses of tile. Between adjacent tile of each horizontal course may be a metallic element **22'** of identical construction as that of element **22** except that it has a length only sufficient to extend between and abut the medial legs of the adjacent horizontal elements **22** at the intersection of horizontal and vertical joint lines. Elements **22'** may be cut from an element **22** at precise lengths and may include only one pair of oppositely directed lips **23**. The cooperation between lips **23** and between the recesses **16** in which the lips are received is similar to that described above. Such element **22'** may be bonded to the adjacent tile by a bonding material **31** as described above.

In fabrication of the unitary panel construction **10** a plurality of tile **11** may be arranged in a jig of selected dimensions, bonding material applied to the recessed surfaces **17** and/or to the rigid elements **22**, **22'**, and the elements **22**, **22'** then positioned between the tile with the lips **23** received in said recesses **16**. After the bonding material has set and dried, the unified panel **10** may be placed so that the spaces above the top edge faces **25** of medial legs **24** may be filled with grouting material in well known manner.

To facilitate assembly of two or more panels **10** at the job site, one horizontal edge and one vertical edge of the panel is provided with elements **22**, **22'** while the opposed panel edges are not provided with such elements so that adjacent panels may be interlocked. It should be noted that in this example the rigid element at the vertical panel edge may be continuous and integral as is horizontal element **22**. Bonding material **31** may be applied to such mating and interlocking panel edges at the job site, however it will be understood that the mechanical interlock between the panels will serve to hold the panels in aligned relation while the bedding material sets and dries.

The completed panel construction **10** will embody all of the characteristics of a rigid, integrated, unitary, structural panel. The front faces of tile **11** will precisely lie in a common plane and the vertical and horizontal joint lines will be accurately formed and aligned. When the panel construction **10** is handled as a unit it will be readily apparent that the horizontally extending rigid elements **22** serve to integrate and support horizontal courses of tile and that said horizontal courses of tile are interlocked against relative longitudinal and lateral movement by the lips **23** which extend between and interconnect horizontal courses and by the medial legs **24**. Individual tile in each course are also firmly held by the oppositely directed lips **23** on the elements **22'** and as a result an interconnected structurally cooperative metallic framework lying in the planar zone of the plurality of discrete tile is provided by the metallic elements **22** and **22'**. Thus a panel construction **10** made of a selected length and width may be readily handled as a unit and easily installed on a wall or floor or counter upon which a suitable bed of cementitious material has been provided. It will be readily apparent that since only a small portion of the area of the back faces of the tile **11** have

been occupied by the metallic lips **23** a major portion of the porous rear face of the tile is available for adhesive and bonding contact with the bed material.

Various modifications of the above described panel construction are contemplated by the present invention. For example, as shown in FIG. 12 the medial leg **24** may be extended so that its top edge face **25** may lie in the plane of the front faces **12** of the tile. Thus, the general appearance of such a tile assembly will be one in which the joints are filled with metal and an inlaid effect may be produced. In such an arrangement, the side edges **14** of the tile are preferably plain and the usual spacing projections are removed.

Another modification contemplated by the present invention is that shown in FIG. 13 wherein longitudinal portions of the medial leg **24** which extend beyond the lips **23** are removed so that a T section metallic element having a length only the length of the lips **23** is provided. In such instance the space between the side edges **14** are filled with a cement grout material. Likewise, the medial leg **24** may be entirely omitted and the lips **23** serve as the sole interconnecting means. It will be apparent that the side walls **18** and back walls **19** of the recesses **16** may cooperate with the side and back edges of the lips **23** in order to rigidly position and firmly hold adjacent tile elements in desired spaced relation.

Another modification is shown in FIG. 5 wherein a metallic, interconnecting element **42** is formed with a medial leg **44**, formed as by rolling. Oppositely directed lips **43** may cooperate with recesses **16** in tile **11** as above shown and described. Lips **43** may be provided with perforations **45** so as to receive, hold and contain suitable adhesive material as above described.

A further modification of the invention is shown in FIG. 7 wherein element **52** may be provided with a medial leg **54** of slightly less height and a preformed, flexible, resilient, longitudinally grooved or configured joint filling member **56** may be supported upon a medial leg portion **54** to fill the space between the tile side edges **14**. In this example, the joint filling material or member **56** may be made of any suitable plastic or synthetic rubber composition material extruded to a selected configuration. Member **56** may be provided with a longitudinal extending groove **57** which embraces and grasps medial leg portion **54**. Member **56** is tightly held between adjacent side edges of adjacent tile and may normally be placed under slight compression.

In FIGS. 9–11 inclusive a further modification of an integrated assembly of a plurality of discrete tile is shown. A panel construction **10'** may comprise tile **11'** arranged in parallel courses and wherein a longitudinally extending metallic element **62** includes a flat base strip **63** provided with a plurality of longitudinally spaced, aligned, longitudinal upstanding portions **64** formed as by stamping from the base strip. Base strip **63** may be provided with suitably spaced openings **65** for reception of bonding material such as **31** and the spaced longitudinal portions **64** may carry a resilient, preformed, joint filling member such as **56**. In this instance the back face of each tile **11'** may be provided with a peripheral marginal recessed surface **67** which extends around the back face of the tile. A joint filling member such as **56** may be omitted and space between the side edges **14** of the tile may be filled with suitable cement grout material in well known manner. Longitudinal portions **64** serve to space and to support and position adjacent tile in proper relationship in the same manner as medial leg **24**. In certain instances it may be desirable that the longitudinal portion **64** be made of substantially less height than the thickness of the tile and that the portion **64** be received within recesses provided in the side edges of the tile adjacent to the rear face of the tile or at the elongated recessed surfaces **67** in order to more closely space adjacent tile.

In FIGS. 14–17 inclusive there is fragmentarily illustrated an integrated article or panel **10'** embodying this invention, only a few of the tile being shown so as to illustrate this modification, it being understood that a panel of tile three tiles wide and four tiles long as shown in FIG. 1 may be assembled or fabricated. Reference numerals with a prime sign or following the multiple sequence of the prior modifications will be used to identify like parts.

Each tile **11'** may comprise a configuration similar to that shown in FIG. 3 wherein side edges **14'** are contiguous and form a square, said edges being interrupted by recesses **16'** each having a recess face **17'**, recess side walls **18'** and end wall **19'**. Each tile **11'** includes a front face **12'** and a back face **15'**, the front and back faces lying in parallel planes and the tile being arranged in horizontal and vertical parallel rows or courses. In such arrangement the recesses **16'** are aligned and receive rigid metallic interconnecting elements **72**.

Metallic element **72** may be rectangular in shape and has a width only slightly less than the width of recesses **16'** and a length only slightly less than the distance between opposed recess end walls **19'**. Metallic element **72** has a thickness lightly less than the depth of recess **16'** so that when a rigid metal element **72** is positioned in a pair of opposed recesses **16'** the back face **73** will lie in the same plane as the plane of the back face **15'** of the tile.

Rigid element **72** thus extends across joint space **75** defined by opposed side edges **14'** and abutment of end edge faces **76** of element **72** with recess end walls **19'** serves to establish the width of joint **75**. The side edges **77** of element **72** relatively closely fit between the recess side walls **18'** and thus serve to align adjacent tile about the long axis of the rectangular element **72**. Since the long axes of elements **72** are disposed both vertical and horizontal or at right angles to each other with respect to adjacent sides of tile it will be apparent that elements **72** and recesses **16'** cooperate to align tile both vertically and horizontally. Moreover, when elements **72** are seated against the flat recess faces **17'** such seating relationship establishes and tends to position adjacent tile in the same plane.

As in the prior modifications the elements **72** may be bonded to the tile in said recesses with a suitable adhesive or bonding material such as the epoxy bonding means heretofore described.

In addition to the interconnecting and bonding of the tile together by such an adhesive means and elements **72** further bonding of the discrete separate tiles into an assembly which may be readily handled may comprise the use of a joint filling material **79** which preferably will include an epoxy type adhesive. The material **79** thus bonds the opposed side edges **14'** of the tile together as well as completing the panel unit so that it may be installed as a unit on a selected supporting wall surface.

As in the prior modifications the assembly of such a panel **10'** may be made in a jig and the units in the discrete tile precisely and accurately aligned and held in such alignment while the metal elements **72** are being firmly bonded to the back faces of the tile upon curing and final setting of the adhesive means. The joint filling material **79** will also be setting during this period. It will be understood by those skilled in the art that the coaction of the discrete tile **11'** the discrete elements **72** and the edge bonding means **79** structurally join together the plurality of tile so as to provide a rigid panelized assembly having a thickness substantially that of the thickness of the tile and in which the discrete tile are interlocked and held together by the metal elements **72** in precise alignment.

It will be readily understood by those skilled in the art that various other modifications and changes may be made in the method and means for forming a unifying panel construction, and all such changes and modifications which come within the scope of the appended claims are embraced thereby.

I claim:

1. A unifying construction whereby a multiplicity of discrete tile are cooperatively combined into an integrated readily handleable article of enhanced utility and appearance, comprising:

a plurality of discrete tile each having a front face, a rear face and side edges, the rear face of each tile including a recessed surface starting at a side edge;

a multiplicity of such discrete tile being arranged with their edges in aligned spaced relation and with their back faces in a common plane;

and elongated, individually rigid metallic elements of T section having their oppositely directed lips extending into opposing recesses of adjacent tile and their medial leg extending between the spaced edges of adjacent tile, said metallic elements being firmly bonded to the recessed surfaces by a cementing material and the abutting contact of the surfaces of said metal elements with the surfaces of said tile being the sole means for precisely positioning said tile in said aligned relation; and

a preformed, resilient, longitudinally grooved joint filling member carried by said medial leg and sealing the space between said spaced edges of tile.

2. A readily handleable integrated panel unit including a multiplicity of discrete tile, each having a porous rear face, cooperatively combined in aligned relation with such rear faces in a common plane, said panel unit being adapted to be readily set in bonding cement in adjoining and aligned relation with other such integrated panel units, comprising:

a multiplicity of discrete tile, each having a front face, a rear face, and side edges, the rear face of each tile being porous and including a recessed surface starting at each side edge; the multiplicity of said tile being arranged with their edges in aligned spaced relation and with their rear faces in a common plane;

elongated, individually rigid metallic elements having portions of T-section, said elements including a medial leg extending between spaced edges of adjacent tile and oppositely directed lips extending into opposing recesses in the rear faces of such adjacent tile, and a cementing material firmly bonding said lips to the recessed surfaces, such bond and contact between said elements and the tile surfaces being the sole means for maintaining the multiplicity of tile in an integrated handleable unit having a planar back face, the porous rear faces of the tile in said unit lying in a common plane and being adapted for bonding with a cementitious bedding material, the outer edges of tile in said unit being adapted for abutment and connection with another unit.

3. A readily handleable integrated panel unit including a multiplicity of discrete tile, each having a porous rear face, cooperatively combined in aligned relation with such rear faces in a common plane, said panel unit being adapted to be readily set in bonding cement in adjoining and aligned relation with other such integrated panel units, comprising:

a multiplicity of discrete tile, each having a front face, a rear face, and side edges, the rear face of each tile being porous and including a recessed surface starting at each side edge; the multiplicity of said tile being arranged with their edges in aligned spaced relation and with their rear faces in a common plane;

elongated, individually rigid metallic elements having portions of T-section, said elements including a medial leg extending between spaced edges of adjacent tile and oppositely directed lips extending into opposing recesses in the rear faces of such adjacent tile, grout-like means contacting said medial leg and opposing spaced edges of adjacent tile and a cementing material firmly bonding said lips to the recessed surfaces, such bond and contact between said elements and tile surfaces being the sole means for maintaining the multiplicity of tile in an integrated handleable unit having a planar back face, the porous rear faces of the tile in said unit lying in a common plane and being adapted for bonding with a cementitious bedding material, the outer edges of tile in said unit being adapted for abutment and connection with another unit.

4. A panel unit as stated in claim 3 wherein said oppositely directed lips are perforated.

5. A readily handleable integrated panel unit including a multiplicity of discrete tile, each having a porous rear face, cooperatively combined in aligned relation with such rear faces in a common plane, said panel unit being adapted to be readily set in bonding cement in adjoining and aligned relation with other such integrated panel units, comprising:

a multiplicity of discrete tile each having a front face, a rear face and side edges, the rear face of each tile being porous and including a recess starting at each side edge and defined by recess side walls, a recess end wall and a recess surface parallel to the rear face; the multiplicity of said tile being arranged with their edges in aligned, spaced relation and with their rear faces in a common plane;

a plurality of individually rigid metallic members each having flat portions positioned in opposed recesses of adjacent tile, said flat portions having edges adapted to cooperate with side and end walls of recesses to align and space the tile with respect to each other; and a cementing material firmly bonding said flat portions to the recessed surfaces, said rigid members, said recesses and cementing material maintaining the multiplicity of tile with edges of such tile in alignment in the form of an integrated handleable unit having a planar back face composed of porous back faces of tile in a common plane and adapted for bonding with a cementitious bedding material, the outer edge portions of tile in said unit being adapted for abutment and connection with another unit.

6. A readily handleable integrated panel unit as stated in claim 5 wherein each of said recesses is at a predetermined zone along the edge of a tile.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,234,692 February 15, 1966

Knud Georg Bierlich

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, line 1, for "Knud Georg, of Bierlich, Los Angeles," read -- Knud Georg Bierlich, of Los Angeles, --; in the heading to the printed specification, line 3, for "Knud Georg, Bierlich, Los Angeles," read -- Knud Georg Bierlic Los Angeles, --.

Signed and sealed this 31st day of January 1967.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNEI
Commissioner of Patents