May 28, 1935. M. C. ROSENBLATT 2,002,510

BUILDING CONSTRUCTION

Filed Nov. 18, 1931

Fig. 1.

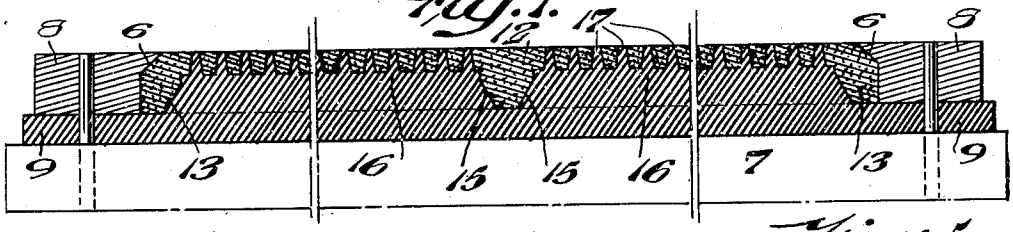


Fig. 2.



Fig. 6.

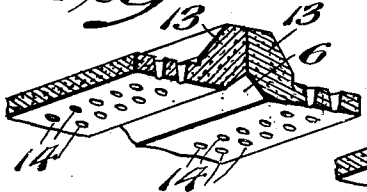


Fig. 7.

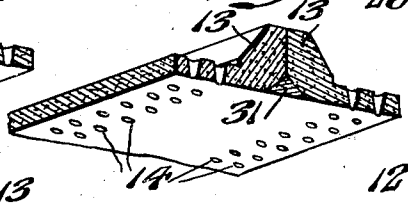


Fig. 8.



Fig. 4.

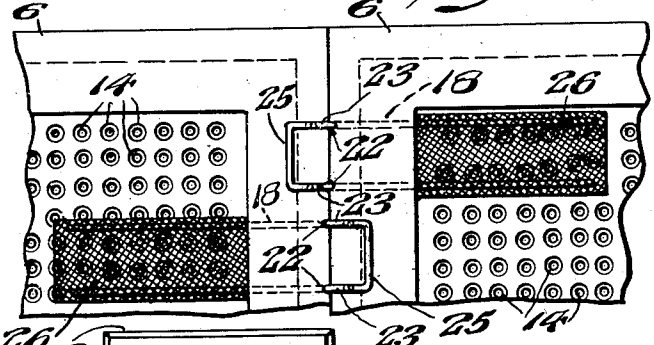


Fig. 3.

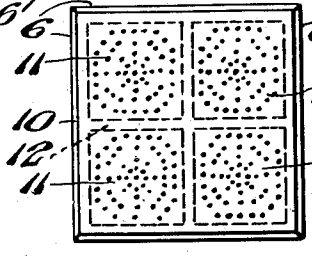
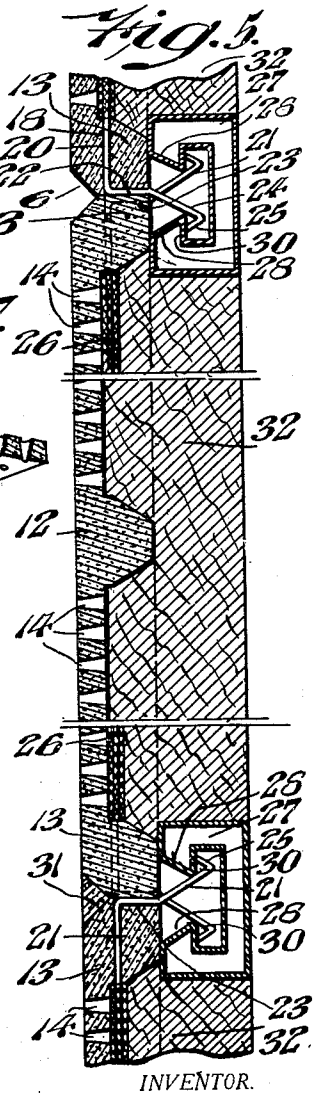


Fig. 5.



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BUILDING CONSTRUCTION

Maurice C. Rosenblatt, Philadelphia, Pa.

Application November 18, 1931, Serial No. 575,829

7 Claims. (Cl. 72—18)

This invention relates to building constructions and particularly to acoustical building constructions.

It has been proposed heretofore to provide a sheet metal pan with perforations drilled or punched in the face as the finishing exposed element of an acoustic treatment. Such pans were filled with sound absorbing materials and, in addition to being difficult of application, were possessed of certain disadvantages. The sheet metal employed was possessed of a resonance response which was highly undesirable, was subject to corrosion and rust, and was an electrical conductor necessitating great care in use in ceilings adjacent lights or conduits. Such sheet metal devices were difficult to work as they were not readily susceptible to curved forms nor capable of quick and easy cutting to accord with small areas to be treated or fitted as when working around columns and the like, and were primarily adapted for ceilings only and were not well adapted for use for side walls. The metal pans after punching were of substantially fixed acoustic properties and were susceptible to buckling, warping, and twisting, and formed an uneven, non-uniform surface. They also formed a poor base for subsequent painting operations as the paint film frequently became loose at the edge of the perforations unless the paint was baked on prior to application, and if it became chipped or rusted was difficult to refinish.

This invention contemplates the provision of a molded, apertured, reinforced, initially plastic but subsequently hardened material and a process for molding and treating same.

It is among the objects of the invention; to provide an acoustic tile block as the exposed element for an acoustic treatment which, is non-resonating, is reinforced, is water and fireproof, is cheaply made and attached, is of superior appearance, which forms a bond with a superficial coating, which can be worked easily and is susceptible to facile sub-divisions, and in which sound transmitting properties may be varied; to provide an improved mold for forming the tile blocks of this invention; to provide processes for forming and finishing the tile blocks of the invention; to provide tile blocks such that with a series, applied to a support, a uniform over-all surface may be provided; to provide a tile block arranged for use as a side wall as well as a ceiling; to provide a tile block of attractive superficial aspect; to provide a frangible tile with resilient anchoring devices; and many other objects and advantages as will become more apparent as the description proceeds.

In the accompanying drawing:

Fig. 1 represents a transverse vertical section through the mold of this invention with a tile in operative molded relation thereto,

Fig. 2 represents a fragmentary vertical section through a section of the finished tile and of the flexible mold disclosing the manner of disassociation of the two,

Fig. 3 represents a plan of a completed tile showing in dotted lines the reinforcing ribs on the rear face thereof,

Fig. 4 represents a fragmentary bottom plan of two juxtaposed tiles showing the disposition of the resilient locking lugs of each tile,

Fig. 5 represents a vertical section through an assembly of a plurality of tiles with the furring strips to which they are attached, with sound absorbing material in position behind the tiles, and showing the possible variations in the superficial aspect obtained by filling the space between adjacent tiles with the same or similar cementitious material as that with which the tiles are constructed toward the bottom of the figure,

Fig. 6 represents a fragmentary perspective of a pair of juxtaposed tiles,

Fig. 7 represents a similar perspective in which the line of jointure between tiles has been obliterated by a wedge of plaster subsequently sanded off to give a smooth finish, and

Fig. 8 represents a similar perspective in which the surface of a tile assembly has been given superficial markings simulating apertures in spaces in which there are no real apertures to impart a uniform superficial aspect to the whole.

The preferred form of tile of this invention comprises the block 10 having, preferably, four apertured areas 11 separated by thin ribs 12 on the lower side of the block merging with the peripheral or edge rib or reinforcement 13. It is important to note that the ribs 12 on the under side of the block, while adequate to reinforce the rigid unit, are so small as to have no adverse effect on the sound transmitting properties of the apertures to be described. In other words, the wave form entering the apertures in the apertured area to contact with the absorbing material behind the area, is inappreciably affected by the reinforcing rib. Each apertured area comprises a series of inwardly tapering apertures 14 extending from the outer exposed face of the tile block to the inner surface of the block. The taper of each aperture while preferably rather slight serves two functions, in that it minimizes

contact of the sound energy with the sides of the apertures and also serves the important purpose of providing enlargement of the exterior diameter of each aperture when the block is sanded down or otherwise treated to render it thinner than as initially formed. This feature of the apertures is of importance as it enables the visual aspect of the aperture to be very small while those on the ceiling may vary between large and small according to the ceiling height. Either side wall or ceiling apertures being variable as to exposed orifice diameter according to acoustic requirements as well. Of course, for certain purposes, it is contemplated that the apertures may be untapered or cylindrical. Obviously also, the apertures may if desired be closed by application of a skim coating of plaster.

The mold according to this invention comprises a base 7, removable side elements 8 and a flexible mat 9 removably disposed on the base 7. The removable side pieces 8 preferably are undercut as shown to form the bevelled edges 6 at the outer peripheral portion of the tile if such bevelled edge is desired. The resilient mat 9, which is preferably of rubber, has a cruciform channel or groove 15 dividing the mat into four similar areas 16, and each such area is provided with a plurality of vertically extending or upstanding nibs, generally of truncated conical form as shown at 17. The nibs may be cylindrical if desired. These nibs may be arranged in any desired pattern and may be of such length as desired. It is of importance, however, that they at least be formed of resilient material such as rubber, so as to be susceptible to flexing. The provision of the mat 9 and nibs 17 of flexible rubber has been found satisfactory for the purpose.

With the mold in the position shown in Fig. 1, the exposed surfaces of the mat and nibs are coated with a lubricant such as grease, oil, or soap, or the like, then cementitious material in a more or less fluid state is poured into the mold to a level just about at the end of the respective nibs 17. The cementitious materials may be plaster of Paris, acoustic plaster, or any other cementitious material which hardens when set, but preferably which is somewhat friable so as to facilitate abrasive responsiveness. For certain purposes it may be desired to use clay which may be baked or otherwise treated to secure a hardening action. Excellent results have been obtained from plaster which sets quickly so that the tile may be removed from the mold after a fairly short time interval. This removal is accomplished by removing the side strips 8 and the base 7, then by seizing the end of the mat 9 and pulling it outwardly and downwardly as shown in Fig. 2, the entire mat is quickly stripped from the finished wall.

The rubber stretches slightly, owing to the lack of adhesion of the block to the nibs due to the lubricant, and, possibly due to a slight shrinkage of diameter of the nibs when the rubber mat 16 is stretched, and is instantly withdrawn.

After the block or tile has been cast any roughness and any inequalities of the exposed surface may be quickly removed by a sanding or abrading or grinding operation, which makes the surface uniform, smooth and ornamentally attractive. This, as noted, is facilitated, by providing a tile which while being frangible is also somewhat friable. The abrading step also has the effect of equalizing the diameter of the surface end of the apertures in a given tile.

It is obvious that the tiles so made may be attached in any desired manner as by any desired form of attachment, but for ease and quickness of assembly it is preferred that some such device be provided as the resilient locking lugs shown in Figs. 4 and 5. These or similar lugs may be attached in any desired manner, but owing to the peculiarly desirable characteristics of the cementitious friable tile the lugs disclosed are quickly and easily attached by means of holes 18 drilled in the easily worked tile. It will be understood that the tile formed of plaster, although being hard and permanent is fairly friable, such as to respond readily to abrasion as by rubbing with sandpaper, so as to be quickly and easily smoothed or reduced in thickness, and can readily be drilled or sawed or otherwise worked in accordance with conditions. For additional strength the tile may have reinforcing rods or strands embedded in it between apertures. Each tile preferably carries two lugs oppositely but asymmetrically disposed relative the median line so that while one lug may be (for instance) one inch from a side edge, the other opposite lug might be two inches from the side edge so as to permit staggered engagement of the lugs on juxtaposed tiles for engagement with the same furring strip, to be described, and as shown in Figs. 4 and 5. The tiles are preferably sanded to the proper thickness for requirements so far as previously ascertainable, and then each tile is drilled transversely through the outer reinforcing bead 14 on lines coextensive with the inner surface of the tile so that the two legs 20 of a locking lug 21 may be laterally inserted to a position overlying the inner or under surface of the tile. Perpendicular intersecting grooves 22 may be formed in the edge of the tile to receive the perpendicularly extending shanks 23 flush with the edge. The free resilient end of each lug 21 includes the outwardly flared portions 24 joined in acute angular relation to the hook 25 arranged to engage over the lip of a furring strip. The free ends of the lug 21 comprised of legs 20 preferably are spaced from the inner surface of the tile by a layer of mesh material 26 bent about the legs for locking engagement with the mesh material, forming a bearing surface to distribute the strain over an appreciable area of the tile. As the spring lugs are inserted laterally and held frictionally only (preferably) they are quickly and easily attached and detached, but are not removable when adjacent edges of tiles are in substantial abutment, as they are when mounted. Of course the resilient locking lugs may be molded into the tile if desired.

Obviously the holes 18 and grooves 22 may be cast in the tile at the time of casting of the tile itself if desired. Also obviously as many attaching devices as may be necessary may be used.

It is contemplated that the resilient locking lugs will be separately formed and shipped, so that the tiles may be shipped flat, to the work or job, and then the spring lugs may be attached to the individual tiles before connection to the furring strips. This facilitates packing and shipping and, to a large degree, obviates breakage.

In order to attach the tiles, furring strips are provided which are suitably mounted in properly spaced relation and each strip 27 includes the inwardly sloping faces 28 and the lips 30. With the furring strips arranged in parallel alignment either on a ceiling or side wall, it will be obvious that the attachment of the tiles simply involves

pushing the resilient locking lugs inwardly against the tapering guiding surface 28 to resilient hooked engagement of the hook 25 over the lip 30 as shown in Fig. 5.

While each tile may be packed with a suitable quantity of sound absorbing material such as mineral or rock wool, whether granulated or nodulated, or felt, or other fibrous or other sound absorbent material, prior to its being attached to its furring strips, yet it is a part of this invention to provide a series of tiles to the furring strips, upon which insulating or sound absorbing material is thrown, or blown or otherwise applied to a suitable depth as shown by 32, in Fig. 5. Obviously the depth of sound absorbent material may be varied in accordance with conditions and according to the requirements of the particular compartment being treated.

It is of importance to note that so far as the use of the tile of this invention is concerned it makes no difference whether it is a ceiling or a side wall which is treated as the material can be dumped in behind it safely as the tiles are applied, and the superficial aspect of the tile is suitable for application to side walls.

It has been observed that the edge of each tile is preferably chamfered or bevelled to provide a satisfactory finish or line of demarkation when the tiles are juxtaposed as shown in Fig. 6 and the upper part of Fig. 4, and the panelling effect thus produced is satisfactory for some purposes and forms an economical assembly. As shown, however, in Fig. 7 and the lower part of Fig. 5 the V-shaped channel provided by the divergence of the bevelled edges 6 may be filled with plaster as in the wedge shaped plaster insert 31 shown in Figs. 7, 8 and the lower part of Fig. 5, which, when set, may be suitably sandpapered or otherwise abraded to form a smooth homogenous "over-all" finish which is highly desirable, especially for side wall purposes. The visual aspect being of a smooth uniform level plaster wall with regular series of ornamental designs in small apertures.

To enhance the "over-all" effect and the homogeneity of the assembly, it is contemplated to provide a stippling or stencil pattern of dots or spots 32, simulating the external appearance of the true apertures 14 in the area which is not apertured, as shown in Fig. 8.

It will be appreciated that the tile are subject to wide variations in size, and in superficial aspect and that the chamfered or bevelled edges 6 instead of being flat and smooth as shown may be serrated and curved in order to facilitate bond with the subsequently applied plaster 31, to more clearly avoid any line of jointure between the molded and the plastered surfaces.

It will be appreciated that the plaster, comprised as it is of multitudinous minute but rough particles, furnishes an excellent bond for any coating of paint or enamel that may be applied thereto.

It will be understood that the non-resonating characteristic of the tile of this invention is of particular importance in acoustic treatments, where, despite the effort to preclude reflection by providing a high degree of sound absorption, it has frequently been found that the association of a resonating surface in the treatment has resulted in such resonance (by co-vibration with the source of sound) as substantially to nullify the effect of the treatment. This is obviated due to the rigid character of the tile and by its practically complete absence of elasticity. The tiles of this invention are crystalline and non-elastic, in contrast to the amorphous characteristics of previous devices. For further development of resonance in acoustic treatments, reference is made to my earlier Patent No. 1,609,811, dated December 7, 1926.

The tile may be formed in large numbers, sanded and finished to the proper thickness, painted or enamelled as desired and then shaped to be worked as completed units so that a minimum of labor is required at the job.

In addition to the advantages previously pointed out, it may be emphasized that the tile is even more fireproof than the metal pans, and are not affected by moisture as are the metal receptacles and therefore may be used in natatoriums and in seashore structures where the metal pans would be unavailable.

In my former applications Ser. Nos. 420,668, filed January 4, 1930, and 456,364, filed May 28, 1930, there was disclosed "building constructions" in which the external exposed portion of the acoustic assembly was comprised of a multiple membrane, and specifically that this multiple membrane included a rigid self-sustaining apertured sheet, to which a woven membrane was secured, as by pasting or the like, and so arranged that the apertures were masked or concealed by the woven membrane, but without any appreciable diminution in sound transmitting effect. It is contemplated that the tile of this invention may form the rigid, self-sustaining, apertured element to which a woven membrane may be attached to form a multiple membrane, either after application of a series of tiles with subsequent plastering (if necessary) to form a continuous surface, as by pasting a membrane continuous over a plurality of tiles, or prior thereto as individual units, in accordance with the teachings of a former application of Stanley H. Rosenblatt and Maurice C. Rosenblatt, resulting in Patent No. 1,819,039, in which a membrane was applied to a unit, with the membrane prolonged past two edges for subsequent pasting to adjacent unit membranes, to obliterate the line of jointure between units.

It is also contemplated that instead of depositing sound absorbing material on the tiles, it may be supported in spaced relation thereto in accordance with the teachings of the recited applications on "building constructions".

It will be observed that the disassembly of an acoustic treatment including these tiles requires destruction of but one tile of an area to be able to detach all subsequent tiles in that area, as will be obvious. It will be obvious that owing to the cementitious character of the tiles any irregularities existing around columns and the like may be accounted for by sawing a tile to the required dimensions, or by simply plastering to fill the void.

I claim as my invention:

1. An acoustic block comprising a hardened sheet of cementitious material having a reinforcing rib formed on one surface and having a plurality of tapering apertures extending through the sheet from one surface to the other adjacent said rib, said apertures arranged with their larger ends in the surface having the rib.

2. In the art of acoustics, a finishing element comprising a rigid sheet of cementitious material adapted for reduction in thickness by abrasion, and having a plurality of tapering apertures extended completely through the material and so arranged that decrease in thickness of the sheet

by abrasion of the outer surface increases the diameter of the exposed ends of said apertures.

3. In combination, a furring strip, a cementitious tile having a reinforcing bead arranged to abut the furring strip, a resilient lug separably engaging the tile extending through the bead to contact with the tile surface adjacent the bead, and extending beyond the bead perpendicularly of the tile, a lip on the furring strip and a hook on the lug arranged for interlocking engagement when the bead is abutting the strip.

4. In a building construction, a wall surface comprised of a plurality of cementitious tiles, each comprising a thin sheet having reinforcing ribs formed in the sheet and having a plurality of apertures formed in the sheet adjacent the ribs, each tile having a bevelled edge, the tiles disposed in abutting engagement with the bevelled edges forming an outwardly flared groove, a cementitious plug mounted in the groove in bonded relation to each tile to form an over-all superficial continuous surface.

5. In acoustic treatments, a plurality of acoustic tiles each comprising a hardened sheet of cementitious material having a plurality of apertures extending through a sheet from one surface to the other, the tiles disposed in abutting edge relation to form a line of jointure between them, plaster disposed in the line to conceal the line of jointure between the tile and to give a superficial aspect as to a continuous over-all surface.

6. An acoustic tile, comprising a hardened sheet of cast plaster having intersecting reinforcing ribs on one surface and a reinforcing bead surrounding the tile on the same surface, a plurality of tapering apertures extending through the sheet and tapering from the first mentioned surface to the other between the ribs and the bead.

7. An acoustic block comprising a hardened sheet of cementitious material having an outer sound wave receiving surface and an inner surface arranged for concealment in use, means distinguishing the inner and outer surfaces to preclude satisfactory reversal, the block having a plurality of tapering apertures extending through the sheet from one surface to the other, said apertures arranged with their larger ends in the inner subsequently concealed surface and having small ends in the surface to be exposed to the sound waves.

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