

June 2, 1970

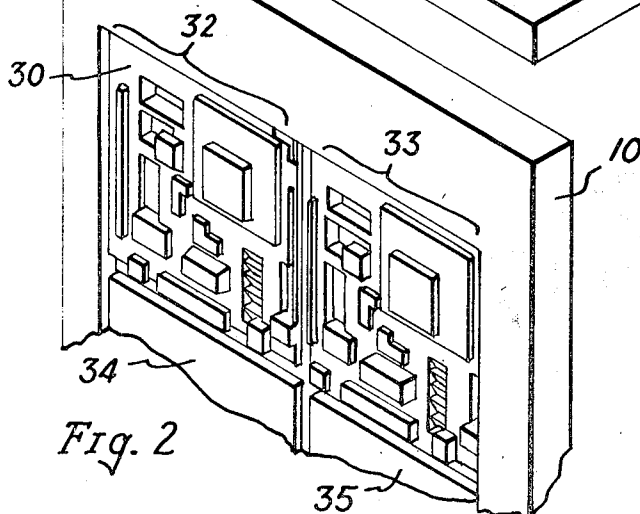
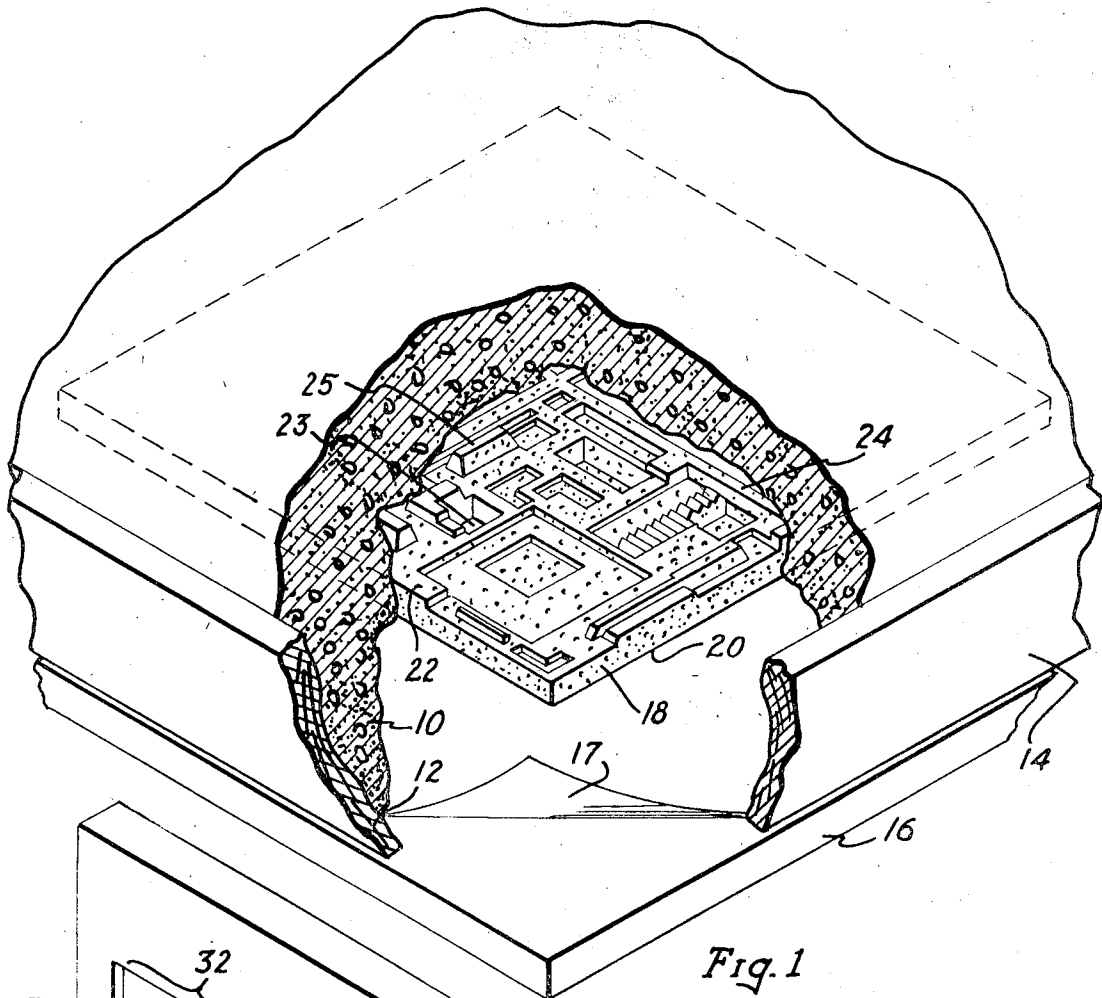
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3,515,779

MOLD AND METHOD FOR CASTING CONCRETE PANELS

Filed Aug. 1, 1966

2 Sheets-Sheet 1



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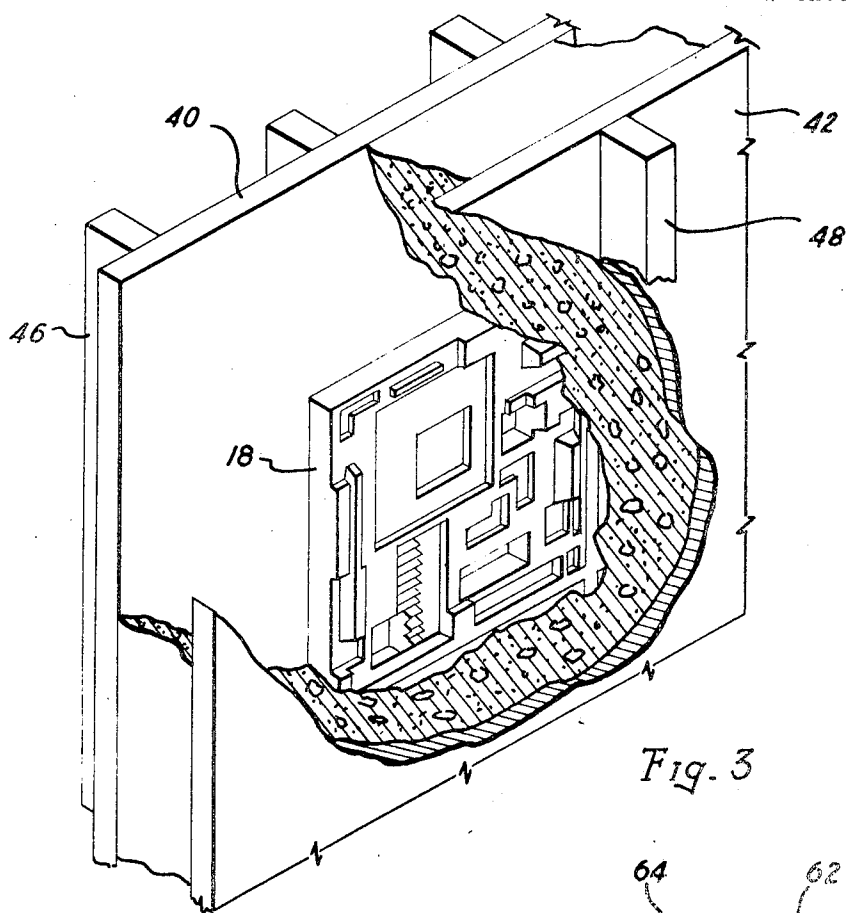


Fig. 3

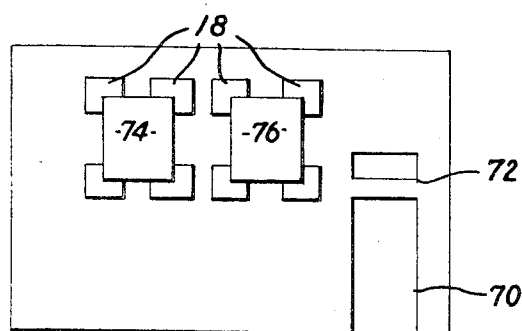


Fig. 5

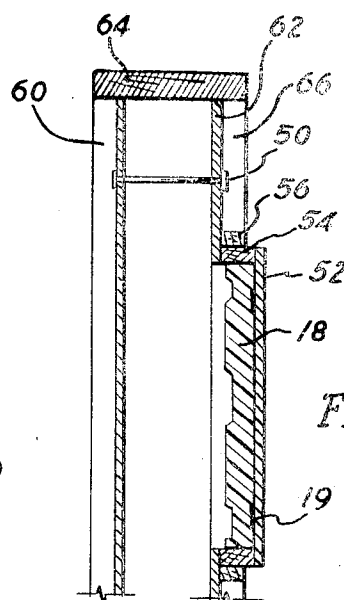


Fig. 4

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1

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MOLD AND METHOD FOR CASTING CONCRETE PANELS

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10 Claims

ABSTRACT OF THE DISCLOSURE

A mold and method are provided for casting a concrete wall. The mold comprises an outer frame structure defining the periphery of the wall to be cast and an artistic mold placed within the frame structure and fastened to the bottom of the mold. The artistic mold has an unobstructed open face bearing an intaglio pattern of an artistic relief facing away from the bottom of the mold and comprises a generally flat, thin plate formed from a rigid and substantially noncompressible cellular plastic foam. In the method for casting the wall, the frame structure is provided and the artistic mold is formed and secured to the bottom of the mold within the frame. Concrete is then poured into the mold and about and over the artistic mold. The concrete is permitted to cure and the frame and artistic mold are removed to obtain the finished wall.

This invention relates to a mold and a method for its use to cast artistic reliefs in concrete structures, particularly concrete walls and ceilings. This invention also relates to the combination of the frame used to form the concrete structure and the mold for casting of artistic reliefs in said walls.

Concrete has become a commonly used material of construction for walls and other flat exposed surfaces of modern buildings. The walls of these buildings are cast in place or are formed with "tilt-up" panels. In the latter construction, the foundation and flooring of the building is constructed, generally from concrete and, then, forms to contain the concrete for the wall panels are framed on the floor or other adjacent flat area. The frame is built with the desired thickness for the wall, generally from 3 to 15 inches. Door and window spaces are placed in the frame and then concrete is poured into the frame, compacted with vibration, the upper surface is finished and the concrete permitted to cure. After curing, the concrete forms are removed and the concrete wall is tilted upright and moved into place on the foundation. The wall is secured to adjacent walls and braces.

A major disadvantage of the concrete wall construction is the unattractiveness of the large expanse of wall which heretofore has not been provided with any integral artistic relief or design. This has been compensated to some degree by mosaic or tile work which has been applied to the walls; however, the expense of this finishing of the walls has precluded the use of artistic relief and limited it to the more costly construction. Accordingly, there exists a need for inexpensive means to provide artistic relief to the concrete walls used in the building industry.

Ideally, both from a materials and labor viewpoint, the means for creating the artistic relief should utilize the concrete itself to form the relief pattern since precast relief patterns require additional labor for attachment to the wall and are subject to breaking during storage and handling. Difficulty is experienced however in attempts to create a molded relief in the precast concrete walls because such relief must be formed with molds that are efficient and operative without requiring any major variation in the normal practice of casting the walls or the resultant labor requirements would greatly increase the

cost of the construction to levels that would prohibit use of the molds. Because such molds are to be used in rough construction environments, they must be able to withstand considerable abuse in handling without damage. Preferably, the molds should be disposable and used only once to avoid the necessity for cleaning the intricate intaglio pattern in the mold.

It is an object of this invention to provide a mold useful for casting artistic reliefs in concrete walls.

It is also an object of this invention to provide a disposable mold for such purpose.

It is an additional object of this invention to provide a method for the casting of concrete walls.

Other and related objects will be apparent from the following description of the invention.

I have now found that the preceding objects can be obtained by the use of a concrete mold which comprises a generally flat or thin plate of a rigid, noncompressible, cellular plastic foam having a thickness slightly greater than the depth of the desired relief and bearing an intaglio impression of the artistic relief on one of its faces. The opposite face of the plate is smooth for resting upon a floor or other support within the frame used for forming the concrete wall or for attachment to one of the inner faces of the form used for a poured in place wall. Of particular advantage when used for the plate is rigid polystyrene foam which possess the maximum of every desirable property for this use. Some of these properties are low cost, low density, high water repellancy, high compressive and bending strengths and a surface of variable texture to permit control of the texture of the concrete panel.

The invention will now be described by reference to the figures, of which:

FIG. 1 illustrates the casting of a "tilt-up" concrete wall in accordance with my invention;

FIG. 2 illustrates a portion of the concrete wall of FIG. 1;

FIG. 3 illustrates the casting in place of a concrete wall in accordance with my invention;

FIG. 4 illustrates an alternative construction of the framing used for casting in place of a concrete wall; and,

FIG. 5 illustrates the layout of a typical wall using the molds of my invention.

Referring now to FIG. 1, there is illustrated a concrete panel 10 that is contained within a form defined by frame members 12 and 14. Suitable metal reinforcing members of conventional shape, e.g., rods, are placed within the form to add structural strength to the wall. The form is generally constructed from wood framing members at the construction site, although metal or plastic forms can be used when a large number of identical panels are to be constructed. The panel is cast on a table or floor 16 which can be covered with a parting agent such as the plastic film 17. The concrete is poured into the form and after curing, the form is removed and the panel is tilted up on one edge and moved to the perimeter of the floor 16 and secured to structural members and adjacent panels to define a vertical wall of a building. Alternatively, the panel 10 could be a ceiling panel which is raised into engagement and secured to structural beams or rafters.

As previously mentioned, the plainness and monotony of the large exposed surfaces that are normally constructed results in an artistically uninteresting building, particularly when the expensive decorative dressing can not be economically justified.

My invention, however, readily and inexpensively provides an artistic relief for the concrete panels. This is shown in FIG. 1 as comprising the mold 18 having a generally flat side 20 that rests on floor 16 and an exposed flat side or face 22 having an intaglio pattern of a suitable artistic relief. Mold 18 is illustrated resting

on the upper surface of floor 16 to which it can be secured by any suitable means, e.g., fasteners such as concrete nails or preferably an adhesive or mastic. The mold 18 could also be contained within a frame on a subfloor so that the intaglio face of mold is flush with floor 16. In this manner, use of the mold does not reduce the wall thickness. An example of this type of placement of mold 18 will be described in greater detail in reference to FIG. 3 where the technique is applied to a poured in place wall. With most walls, however, a series of molds 18 can be placed to provide a ribbed wall that is substantially as strong as the solid, unrelieved wall and the offset mounting shown in FIG. 4 is not necessary.

Mold 18 is illustrated with a modernistic relief on its face and has four repetitive patterns that are divided by ribs 24. The mold is formed from cellular plastics that are rigid and that possess a sufficient compressive strength to withstand the loading of the concrete without appreciable strain. The mold illustrated measures 2 feet on each side with an area of 4 square feet; however, the size can be greatly varied if desired, e.g., panel molds that have an area from 0.1 to 100 square feet can be fabricated, if desired. Preferably, the molds have from 4 to about 100 square feet for ease of fabrication and handling. The thickness of the mold can also be greatly varied, depending on the depth of the desired relief. Mold 18 as illustrated has a maximum thickness of 1.75 inches at 25 and a minimum thickness at 23 of 0.5 inch. The ribs 24 are 1.5 inches thick. In general, the molds should be sufficiently thick to have a resistance to flexing. The minimum thickness should be from 0.005 to 0.2 times the longest length of the panel; preferably from about 0.05 to about 0.1 times this length.

Although polystyrene foam is the most preferred material for construction of mold 18, any other suitable plastic foam that is rigid and substantially non-compressible can be used. The foam chosen should have a compressive strength sufficient to withstand up to about 150 pounds per square foot without appreciable strain since concrete walls with thickness up to about 12 inches may be formed above the mold. For poured in place walls, foams having compressive strengths of from 10 to 20 p.s.i. are adequate and will be useful on walls up to about 20 feet in height. An example of a suitable foam is cellular polystyrene having a density of about 1.5 pounds per cubic foot. Suitable plastic foams include polyurethane foams of the closed cell or rigid type, cellulose acetate foams, phenolic foams, closed cell polyvinyl chloride foams, and epoxy foams. The mold 18 is fabricated from the plastic foams using conventional technology, e.g., "steam molding" of the polystyrene beads where the beads are pre-expanded into a mold cavity with the pattern of the artistic relief and then fused together by heat, generally steam. Polystyrene can also be foamed in place in the mold cavity by direct injection of the polymer and a gas blowing agent. Polyurethane foams can be used by foaming directly in the mold cavity containing a pattern of mold 18. The vinyl foams can be formed into mold 18 by injection molding.

The cellular plastics are ideally suited for mold 18 because of their water repellantcy and, after the concrete has cured, the wall is tilted into place and the mold 18 is stripped from the panel. The use of polystyrene foam insures a substantially nonadhering mold without the need for any parting agent. Polystyrene foam also provides control of the texture of the relieved surface of the concrete. The surface of polystyrene foam can be widely varied from a smooth surface illustrated in mold 18 of FIG. 3 to a coarse surface shown in FIG. 1. This variation is achieved by control of the molding conditions in forming mold 18, i.e., temperature and pressure and by variation in the size of the polystyrene expandable beads which are commercially available with diameters ranging from 0.4 to about 2.0 millimeters; the larger

beads being chosen for a coarser textured concrete surface.

FIG. 2 illustrates a portion of the wall 10 which is tilted into a vertical position. The mold cavity is shown at 30 and the desired artistic pattern appears in contiguous blocks 32 and 33. A similar relief is also formed at 34 and 35, although this relief has been omitted from the drawing.

FIG. 3 illustrates the use of the mold of my invention as applied to concrete walls that are poured in place. In this construction, vertical forms are constructed with opposing and generally parallel panels 42 and 44 which have stiffing braces 46 and 48. Frequently tie rods such as 50 shown in FIG. 4 are used to support the panels at the desired spacing and these rods are spaced across the panels at sufficient intervals so as to prevent the weight of the concrete from bowing the panels 42 and 44. The mold of my invention, 18, is employed in this type of construction simply by affixing the mold to the inside surface of one or both of panels 42 and 44. Again, this can be accomplished with mechanical fasteners such as staples or with an adhesive on the back side of the panel. After the panel has been secured onto the panel 40 at the desired location, the panel 40 is then used to frame the form in the conventional manner. Thereafter, concrete is poured into the mold and permitted to cure to produce a wall with a suitable artistic relief.

FIG. 4 illustrates an alternative mounting of the mold 18 which, contrary to the mountings of FIGS. 1 and 3, does not reduce the wall thickness. In this mounting, panel 62 is cut out and an offset panel 52 is attached opposite the cut out portion of this wall with side walls 54 and furring strips 56. Mold 18 is placed within this cavity so that its outer surface is flush with the inner face of panel 62. The remainder of the forming is conventional with tie rods 50, panel braces 60 and 66 and, often, wooden bracing 64. FIG. 4 also illustrates the mastic or adhesive 19 on the back side of mold 18 which is used to secure the mold in the form and prevent accidental movement of the mold during the pouring of the concrete. In a preferred embodiment, this adhesive is placed on the mold at the factory and the adhesive is covered with a thin plastic film, e.g., polyethylene of 0.5 to 5 mils thickness. When the molds are used, the film is stripped from the mold and the mold is pressed against the supporting panel 52. The back surface of the mold can be covered with an adhesive such as a water soluble adhesive, e.g., partially hydrolyzed polyvinyl acetate or an organophilic adhesive such as tar, cellulose acetate, etc. A double faced tape can also be applied to the back, of the panel. Preferably, the adhesive can be spotted at one or more points across the surface, e.g., at each corner and in the center as shown at 19.

A typical wall layout showing the positioning of the molds 18 is shown in FIG. 5. In this illustration, a tilt-up wall is to be fabricated with an opening 70 for a door and opening 72 for a transit. Window openings 74 and 76 are shown in the wall and at each corner of the windows, molds 18 are shown. This also illustrates another advantage of the rigid plastic foams for this purpose since these foams can be readily cut at the job site with a saw or knife to permit placing the artistic relief at any desired location in the wall.

The preceding description of the invention and illustration thereof by FIGS. 1 through 5 is intended solely to illustrate the best mode of practicing my invention and it is not intended to be unduly limiting of the invention. Instead, it is intended that the invention be defined by the elements and method steps and their obvious equivalents set forth in the following claims:

I claim:

1. A mold combination for casting a concrete wall comprising an outer frame structure defining the periphery of said wall with a first wall area and a first wall

5

thickness, at least at one selected location on said first wall area an artistic mold having an unobstructed open face bearing an intaglio pattern of an artistic relief and secured to said first wall area against movement, said artistic mold comprising a generally flat, thin plate formed from a rigid and substantially non-compressible cellular plastic foam, having an area less than the said first wall area and from 0.1 to about 100 square feet and a thickness sufficient to resist flexing, between about 0.005 and 0.2 times its length and less than said first wall thickness, and having a substantially smooth face secured to said first wall area opposite said open face bearing said molded intaglio pattern of said artistic relief.

2. The mold combination of claim 1 wherein the artistic mold has an area from about 4 to 100 square feet.

3. The mold combination of claim 1 wherein the artistic mold is formed from expandable polystyrene beads.

4. The mold combination of claim 1 wherein the artistic mold is formed of a polyurethane foam.

5. The mold combination of claim 1 wherein the artistic mold is formed of a plastic foam having a compressive strength from 1 to about 20 p.s.i.

6. The mold combination of claim 1 wherein the artistic mold bears an adhesive on its substantially smooth face to secure it to said first wall area.

7. A method for constructing a concrete wall having an artistic relief on a surface thereof that comprises:

preparing a pattern of the artistic relief;

forming a cellular plastic foam mold by molding a cellular plastic selected from the class consisting of polystyrene, polyurethane and vinyl foams against said pattern to form a flat thin foam plate having a substantially smooth first face and bearing on its opposite face an intaglio impression of said pattern and having a thickness sufficient to resist flexing and from 0.005 to 0.2 times its length and greater than the desired depth of the relief in said concrete wall and an area from 0.1 to 100 square feet;

preparing a wall defining form having a wall area greater than the area of said thin foam plate and a wall thickness greater than the thickness of said thin foam plate;

6

securing the smooth first face of said thin foam plate to a wall facing of the wall defining form at selected locations while permitting said opposite face of said thin foam plate unobstructed exposure in said wall defining form;

pouring concrete into said wall defining form and about and over said thin foam plate;

permitting said concrete to cure and form a rigid wall; separating said wall defining form and thin foam plate from said concrete wall to obtain said wall with said artistic relief.

8. The method of claim 7 wherein said plastic is cellular expandable polystyrene beads with diameters from 0.4 to 2.0 millimeters.

9. The method of claim 8 wherein artistic reliefs with varied texture are provided in said concrete wall by varied selection of the size of the polystyrene beads to mold said thin foam plate.

10. The method of claim 7 wherein said concrete is vibrated after pouring into said frame.

References Cited

UNITED STATES PATENTS

1,598,132	8/1926	Ham.	
1,623,625	4/1927	Lake.	
2,830,343	4/1958	Shroyer.	
3,329,749	7/1967	Elet	264—45
3,381,066	4/1968	Lowe et al.	264—71
3,054,146	9/1962	Griffin	264—51 X

OTHER REFERENCES

Rene J. Bender: Handbook of Foamed Plastics, 1965, pp. 10, 11, 79—81, 83, 84, 87, 148.

ROBERT F. WHITE, Primary Examiner

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U.S. Cl. X.R.

264—51, 69, 220, 316; 249—104, 134, 140