United States Patent

[11] 3,597,890

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[45] Patented Aug. 10, 1971
Continuation-in-part of application Ser. No. 647,463, June 20, 1967, now abandoned.

[54] CONSTRUCTION ASSEMBLY
9 Claims, 25 Drawing Figs.

[52] U.S. Cl. 52/86, 52/309, 52/381, 52/439, 52/444, 52/577
[51] Int. Cl. E04b 1/32, E04b 2/14, E04c 2/16
[50] Field of Search 52/454, 443, 309, 381, 444, 577, 576, 439

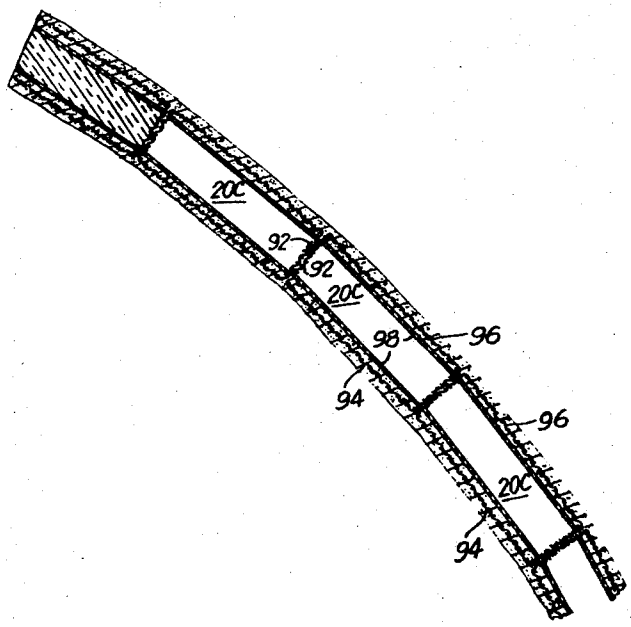
[56] References Cited

UNITED STATES PATENTS

345,046	7/1886	Gilman	52/89 X
1,397,301	11/1921	Solan	52/577
1,694,542	12/1928	Hedden	52/454
1,875,131	8/1932	Pentland	52/577
1,965,601	7/1934	Kotrbaty	52/381
2,101,073	12/1937	Kotrbaty	52/381
2,242,834	5/1941	Price	52/344
2,405,116	8/1946	Cullen	52/381
2,642,920	6/1953	Simon	161/93
3,108,406	11/1963	Ellis	52/381
3,248,275	4/1966	Lincoln	117/98
3,331,173	7/1967	Elsner	161/DIG. 4
3,376,629	4/1968	Baumann	52/454

Primary Examiner—John E. Murtagh
Attorney—Philip D. Amins

ABSTRACT: A construction assembly comprising a plurality of individual construction units connected together. Each of the construction units comprises a pervious resin-impregnated fibrous mesh material. The walls of the construction units have a cementitious material secured to the exterior surface thereof by permeating the pervious resin-impregnated fibrous mesh material and forming an integral structure therewith.



5 Sheets-Sheet 1

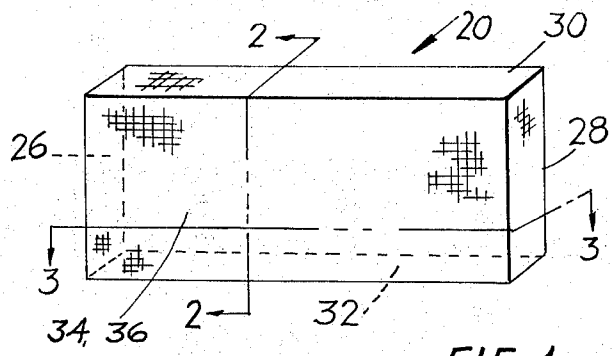


FIG. 1.

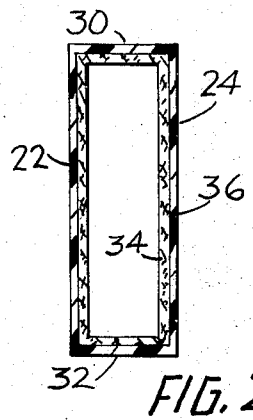


FIG. 2.

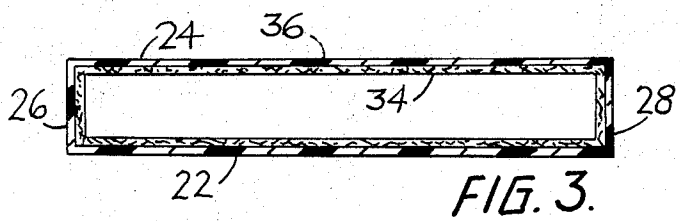


FIG. 3.

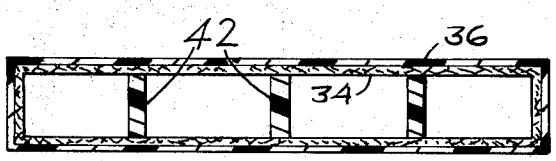


FIG. 5.

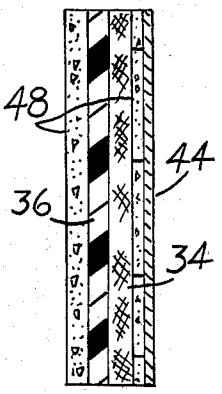


FIG. 7

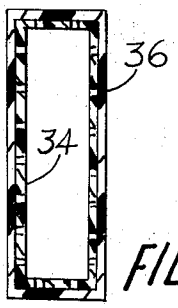


FIG. 6.

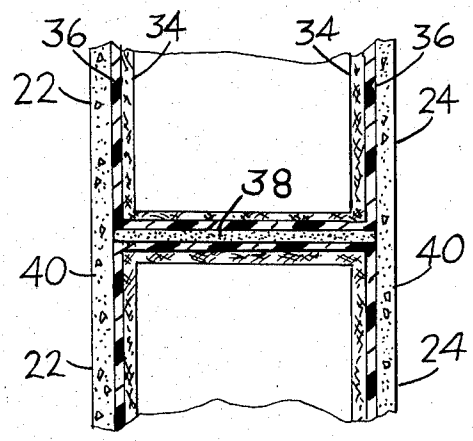


FIG. 4.

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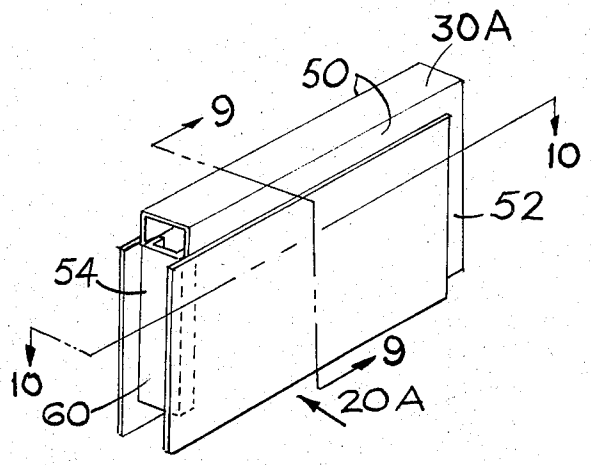


FIG. 8.

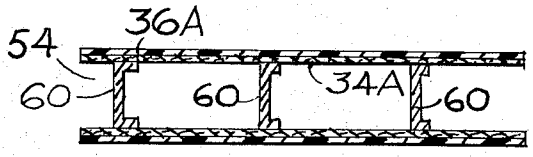


FIG. 10.

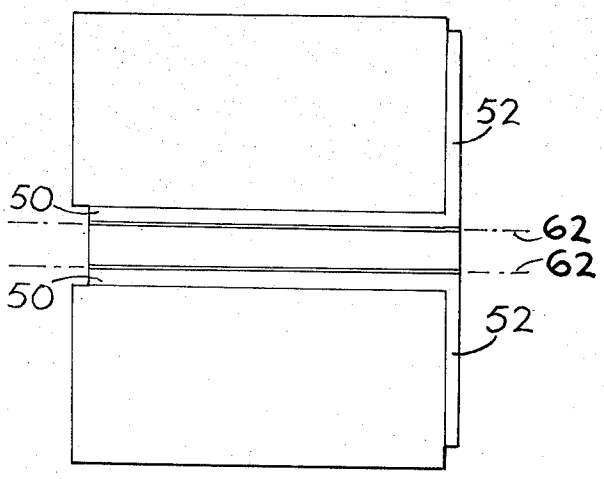


FIG. 11.

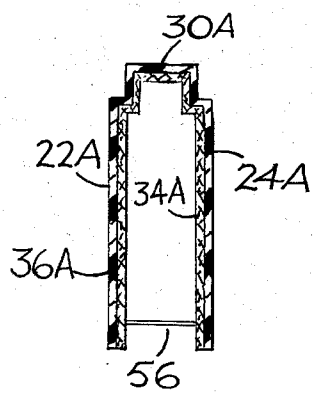


FIG. 9.

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FIG. 13

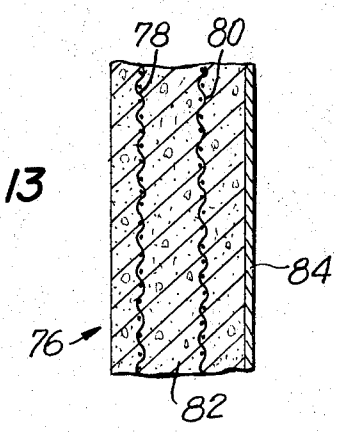


FIG. 12

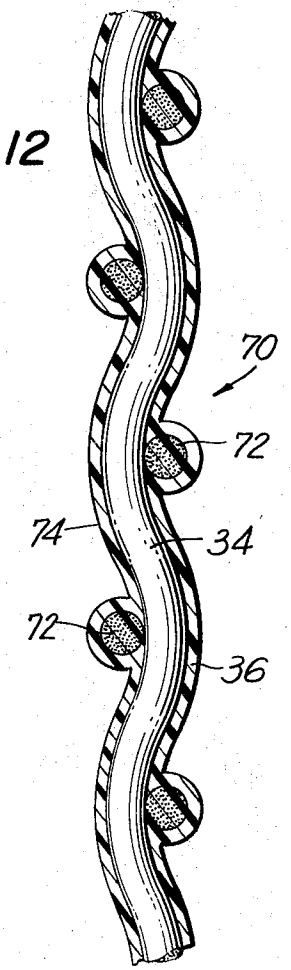


FIG. 16

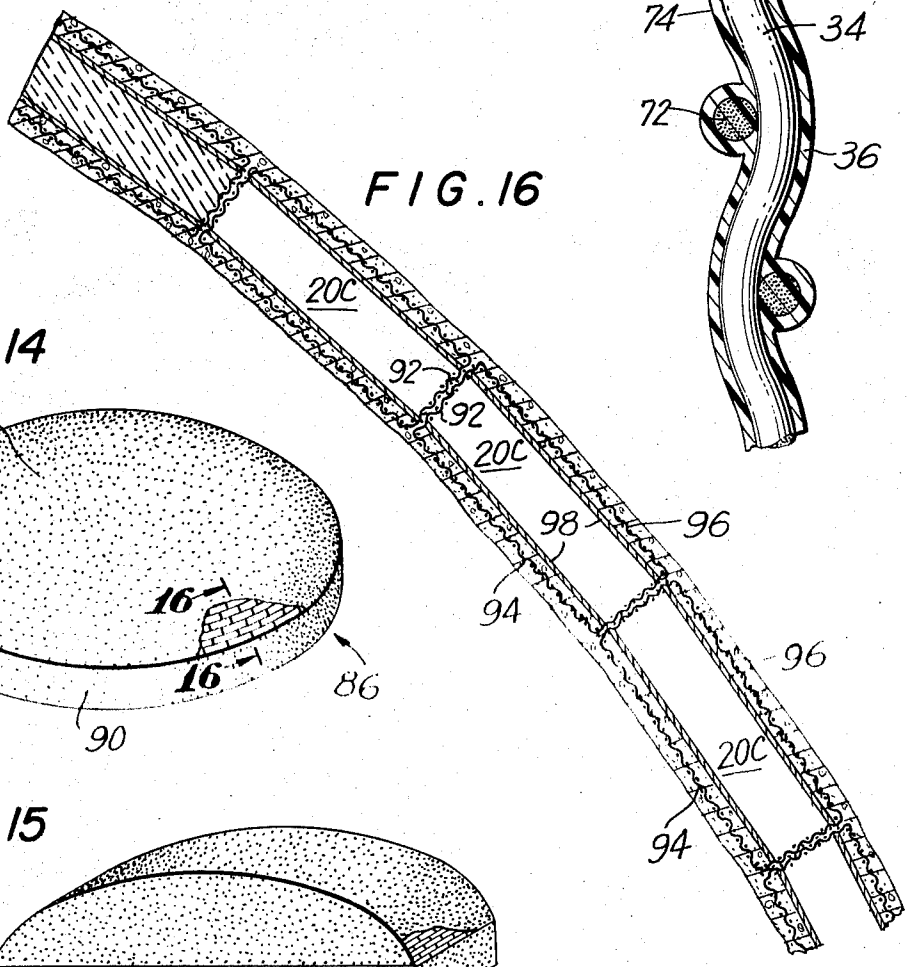


FIG. 14

FIG. 15

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FIG. 17

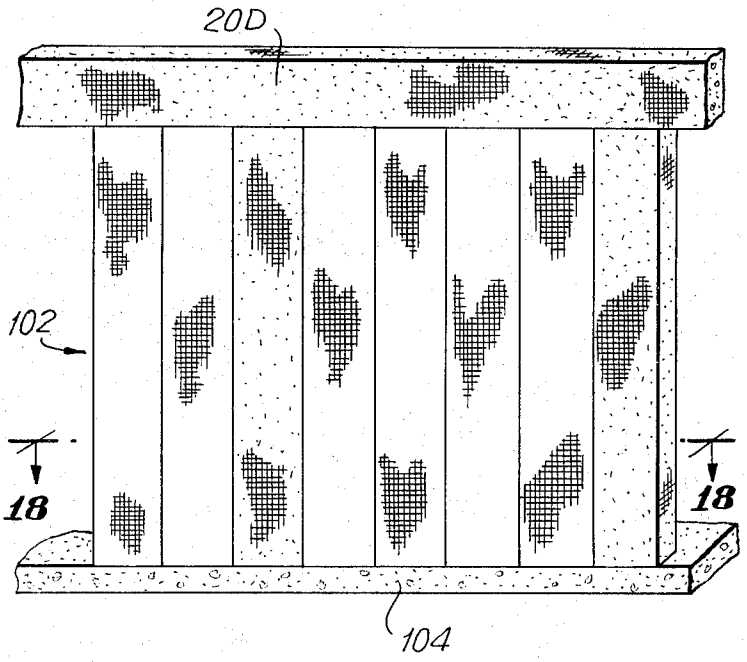


FIG. 18

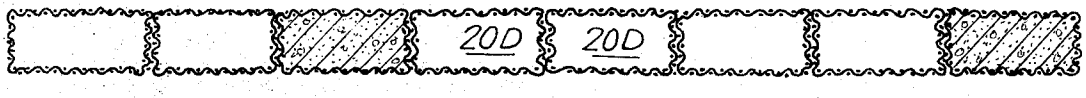


FIG. 19

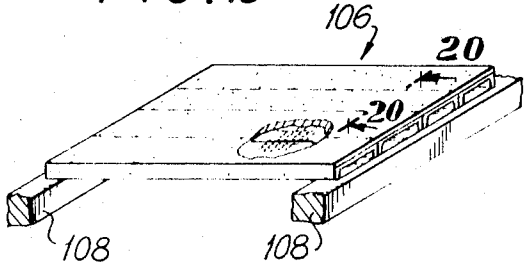
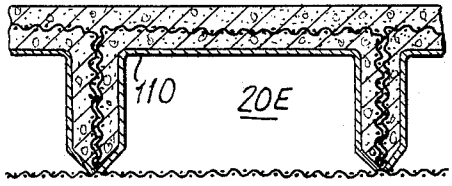


FIG. 20



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FIG. 21

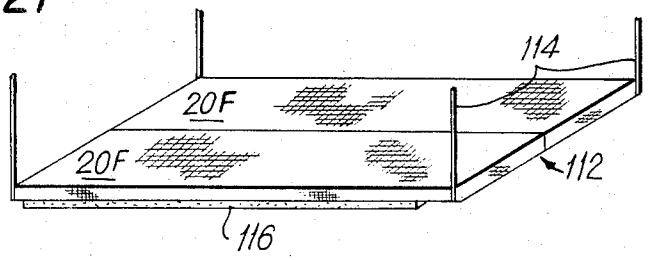


FIG. 22

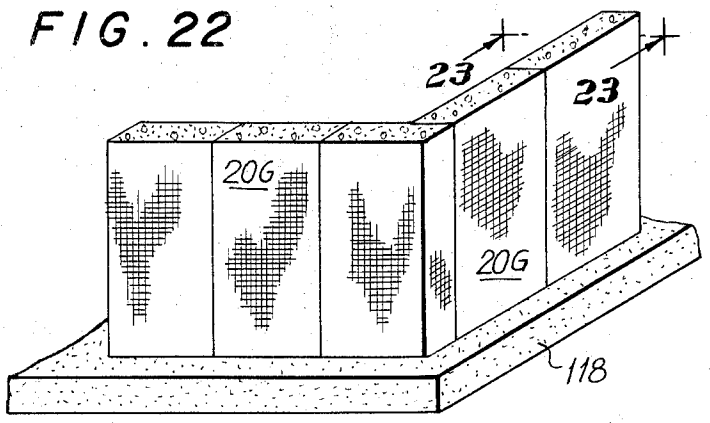


FIG. 23

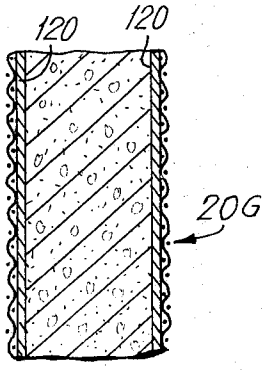


FIG. 25

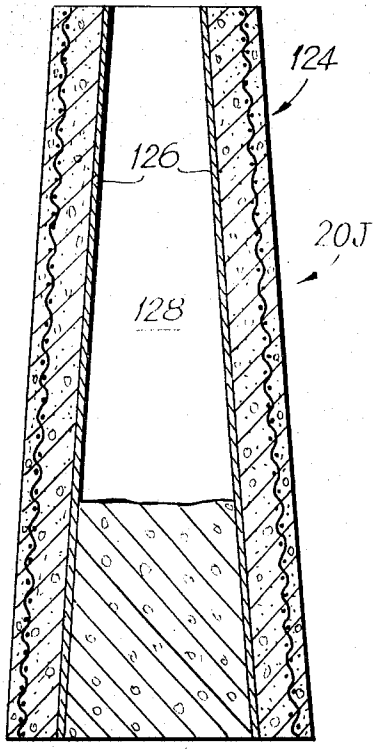
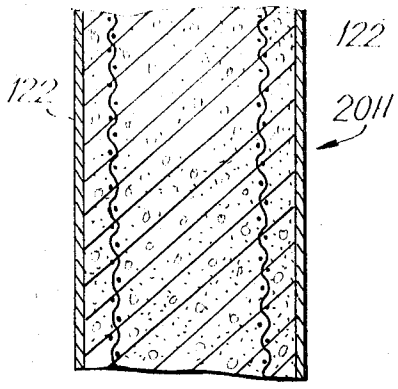


FIG. 24



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CONSTRUCTION ASSEMBLY

The present application is a continuation-in-part of my earlier filed application, Ser. No. 647,463 entitled CONSTRUCTION UNIT and filed on June 20 , 1967 now abandoned.

BACKGROUND OF THE INVENTION

The construction assembly of the present invention is primarily intended for use in the fabrication of building partitions and walls. The construction assembly permits construction of the cores of walls and partitions having a weight of approximately 0.1 pounds per square foot, as compared to approximately 20 pounds per square foot for masonry and approximately 3.5 pounds per square foot for stud partitions. Additionally, construction assemblies formed of metal sheet or mesh-type materials are extremely difficult to shape and install. They are not readily workable and the utilization of metal mesh building units has been shown to be highly impractical.

SUMMARY

It is therefore the principal object of the present invention to provide a construction assembly of very light weight for use in the construction of partitions and walls.

It is another object of the present invention to provide a new and novel construction assembly which is easily fabricated and which exhibits a high degree of workability.

It is another object of the present invention to provide a new and novel construction assembly which is relatively brittle and which has a relatively high tensile strength.

It is a further object of the present invention to provide a construction assembly employing construction units which are fabricated from a sheet material and more particularly from a mesh-type sheet material.

It is another object of the present invention to provide a construction unit fabricated from mesh-type sheet material having a thermosetting plastic applied to at least one of the surfaces thereof.

It is yet a further object of the present invention to provide a construction assembly which is water and fire-resistant and whose size is substantially unaffected by changes in temperature and humidity.

It is still a further object of the present invention to provide construction units which are capable of having exterior surface materials secured thereto, such as plaster, gypsum board, stucco and the like to form the construction assembly.

It is yet another object of the present invention to provide construction units having generally hollow rectangular parallelepiped configurations.

It is still a further object of the present invention to provide construction units having tongue and groove portions to permit the units to be placed in engaging relationship with one another.

It is yet a further object of the present invention to provide hollow construction units having reinforcing members disposed therein.

It is another object of the present invention to provide a construction assembly for the fabrication of dome and arch-type roof structures.

It is a further object of the present invention to provide a construction assembly for the fabrication of bearing walls.

It is still another object of the present invention to provide a construction assembly for the fabrication of floors, rooves and ceilings.

It is yet a further object of the present invention to provide a construction assembly for the fabrication of structural support columns.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects, features and advantages of the present invention will become more apparent when considered in conjunction with the accompanying drawings, wherein:

FIG. 1 is a perspective view of a construction unit employed in the construction assembly of the present invention utilized to form interior partitions, walls and the like;

FIG. 2 is a sectional view taken on the line 2–2 of FIG. 1;

FIG. 3 is a sectional view taken on the line 3–3 of FIG. 1;

FIG. 4 is a sectional view similar to FIG. 3 of two units joined together, wherein said units have a highly impact-resistance material applied to the sides thereof to form the construction assembly;

FIG. 5 is a sectional view similar to FIG. 3 depicting a construction unit having reinforcing crossmembers;

FIG. 6 is a sectional view similar to FIG. 2, wherein the walls of the construction unit are formulated of a perforated plastic-type material;

FIG. 7 is a sectional view similar to FIG. 2, wherein the walls of the construction unit are formed of a mesh-type material having an interior backing layer;

FIG. 8 is a perspective view of a construction unit fabricated in accordance with a second embodiment of the present invention;

FIG. 9 is a sectional view taken in the line 9–9 of FIG. 8;

FIG. 10 is a sectional view taken on the line 10–10 of FIG. 8, showing the construction unit having stiffening members positioned therewithin; and

FIG. 11 is a top view of a sheet of mesh-type material used to fabricate the construction unit shown in FIG. 8;

FIG. 12 is an enlarged cross-sectional view of a portion of the pervious resin impregnated fibrous mesh material used in the fabrication of the walls of the construction assembly of the present invention;

FIG. 13 is a partial cross-sectional view of an alternate embodiment of a wall of the construction assembly of the present invention;

FIG. 14 is a perspective view of a dome roof construction assembly;

FIG. 15 is a perspective view of an arch roof construction assembly;

FIG. 16 is a sectional view taken on the line 16–16 of FIG. 14;

FIG. 17 is a partial perspective view of a bearing wall construction assembly;

FIG. 18 is a sectional view taken on the line 18–18 of FIG. 17;

FIG. 19 is a partial perspective view of a floor or flat roof construction assembly;

FIG. 20 is a sectional view taken on the line 20–20 of FIG. 19;

FIG. 21 is a perspective view of a hung ceiling construction assembly;

FIG. 22 is a perspective view of a construction assembly fabricated by the formation of nonreinforced concrete form walls;

FIG. 23 is a sectional view taken on the line 23–23 of FIG. 22;

FIG. 24 is a sectional view similar to FIG. 23 wherein the resultant walls are reinforced;

FIG. 25 is a section elevational view of one type of column construction assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings and more particularly to FIG. 1 thereof, there is shown a construction unit 20 having the configuration of a rectangular parallelepiped whose interior is void. The block consists of sidewalls or wall members 22 and 24, end walls 26 and 28, top wall 30 and bottom wall 32. The walls are preferably formed of a mesh layer 34, such as fiberglas mesh cloth to which is preferably applied a ther-

mosetting plastic resinous layer 36, such as an epoxy layer (as shown in FIG. 2 through 7). The application of a thermosetting plastic resinous material to the fiberglass mesh cloth results in walls which are relatively brittle and which have relatively high tensile strength; the usefulness and desirability of these features will be described more fully hereinafter. The thermosetting plastic resinous layer 36 may be applied to the fiberglass mesh cloth layer 34 by spraying, painting, brushing, or any other suitable method.

It is herein to be noted that although the construction unit of the present invention has been described as being fabricated from a fiberglass mesh, the unit may also be fabricated from any other suitable mesh-type material, other examples of which are tempered glass and spun mineral fiber.

In FIG. 4 there is shown a sectional view of two construction units utilized to form a partition wall or other construction assembly, which units are joined together at a junction 38 by means of mortar, adhesive or other suitable bonding agent. The wall 22 has cement plaster or cement stucco 40 applied thereto as the exterior surface thereof, the materials forming the walls of said unit being compatible with plaster, gypsum board, stucco and similar surface materials. It will be apparent to those skilled in the art that the resulting structure utilizing one of the aforementioned hydraulic cementitious materials is a reinforced concrete structure.

In some applications it is necessary to provide construction units having greater structural rigidity than those previously described. When this is required, the construction unit may be fabricated having reinforcing members 42 as shown in FIG. 5. The reinforcing members may be made of cardboard, plastic, or any other suitable material, but are constructed so that they do not add appreciably to the weight of the unit while enhancing the support characteristics thereof.

In FIG. 6 there is depicted a sectional view of the construction unit 20, the walls thereof having been fabricated from perforated plastic-type sheet material. The walls in this case also have an epoxy resin layer 36 applied thereto.

FIG. 7 depicts a modification of the wall structure of the construction unit hereinbefore described. The walls are formed of a fiberglass mesh cloth layer 34 having a backing layer 44 applied to the inner surfaces thereof, the layer 44 being formed of paper, cloth, or any other suitable material. The outer surfaces of the layer 34 have an epoxy resin layer 36 applied thereon. The use of the backing layer permits the stucco or cement layer 48 applied to the wall as the outer layer thereof to flow through the mesh structure, and thus allows it to become positioned against said backing layer. This results in a wall member wherein the stucco or cement layer has the mesh structure as a reinforcing member therein, thereby resulting in the rigid wall structure desired.

The brittleness of the unit enables the mesh to shatter at its point of impact by means of a sharp blow. This feature permits easy cutting and fitting of the units, as well as cutting thereof to build in pipes and other types of obstructions required in the construction of partitions, walls and the like. The unit may thus be cut or fitted by hitting it with a hammer, hatchet or the edge of a mason's trowel. The units may also be cut be utilizing a hand saw or knife.

The high tensile strength of the block permits it to be effectively utilized to fabricate walls, partitions and the like.

When an impact resistant material such as cement plaster, cement stucco, plastic board, wood panelling, masonry or the like, is connected to the surface of the brittle, high tensile strength sheet material, there results a highly practical and durable partition. Moreover, the interior of the unit may be filled to comply with specific requirements. It will thus be apparent that by utilizing the various constructions hereinabove set forth in a selective manner, walls and other construction assemblies having almost any desired characteristics can be obtained.

It will be apparent to those skilled in the art that the construction unit of the present invention will permit the construction of interior walls and partitions having extremely light weight, thus resulting in the use of lighter structural members, due to the lower floor loads, thereby permitting building designs which are substantially less expensive than those presently employed. The light weight of the unit also permits much faster installation, with a resultant saving in the cost of the structure. This type of partition also lends itself to easy removal, should removal become desirable. As discussed hereinbefore, a construction assembly such as a partition fabricated by the use of the construction unit of the present invention will shatter when dealt a sharp blow, thus permitting easy removal thereof by any unskilled craftsman.

A second embodiment of the present invention is depicted in FIG. 8 through 11, wherein similar parts are denoted by similar reference numerals.

In this embodiment, the unit 20A is formed having sidewalls 22A, 24A and a top wall 30A, again resulting in a unit which has a configuration which is substantially that of a rectangular parallelopiped. The top of the unit is formed having a tongue portion 50, while the right-hand side portion (as seen FIG. 8) is formed having a tongue portion 52. The left-hand portion (as seen in FIG. 8) defines a recess 54, while the bottom of the block defines a recess 56, as best seen in FIG. 9.

One method of forming the unit 20A would be to utilize the printed sheet 58 depicted in FIG. 11, which sheet is preferably made of Fiberglas mesh cloth. The sheets are prestamped so as to form indentations which form the tongue portions 50 and 52 previously described. The sheets are coated along the entire length thereof, except for the longitudinally extending fold lines 62, with an epoxy resin or other suitable thermosetting plastic, which results in the layer 36A upon the walls of the unit. After the coated sheet has set, it may be folded along the uncoated flexible fold lines. The fold lines may then be coated with the epoxy resin, and channel or stiffening members 60 made of epoxy resin coated Fiberglas mesh or any other suitable material may be secured within the unit to lend further rigidity to it.

When the units are utilized to form a wall, the tongue portion 52 of one of the units will fit into the recess 54 in the adjacent unit disposed to the right thereof, while the tongue portion 50 at the top thereof will fit into the recess 56 of the unit positioned on the top thereof. The units may then be bonded together by a liquid adhesive, or by any other similarly suited method.

It will be appreciated that this type of unit may be readily and easily constructed on a job site, thus making the problem of transporting the units, or alternatively the materials therefor, a rather simple one.

It is also to be noted that, although the three-dimensional unit of the present invention has been described as having a rectangular solid configuration, the same may be fabricated having a three-dimensional triangular, cylindrical, hemispherical, wedge-shaped, or any other suitable or desirable configuration. In this context, it should be noted that a flat sheet of the aforesaid materials can be corrugated, to thus form a unit having a substantially solid rectangular configuration.

With particular reference to FIG. 12, there is illustrated an enlarged detailed cross-sectional view of the previous resin-impregnated fibrous mesh material, herein generally designated by the reference numeral 70. The mesh material 70 comprises the mesh layer 34 and the plastic resinous layer 36. The layer 34 includes a plurality of parallel spaced horizontal and also vertical members 72 which are herein shown as having substantially circular cross sections but which may have any other suitable cross-sectional configuration. The plastic resinous layer 36 completely surrounds and impregnates the individual strands such as members 72 while still leaving the material 70 with apertures such as at 74 so as to provide the resultant pervious structure.

FIG. 13 depicts a double thickness construction assembly 76 having two layers of resin-impregnated fibrous mesh 78 and 80 having a cementitious material, such as concrete, 82 which permeates the mesh layers 78 and 80 and forms the integral construction assembly 76 therewith. The permeation of

the cementitious material through the apertures (not Shown) in the layers 78 and 80 is limited by means of a paper backing layer 84 positioned in back of the layer 80 and secured thereto, such as by stapling or any other suitable attachment means.

The construction assembly 76 is employed in applications where a stronger wall structure is desired.

Referring now to FIG. 14, there is shown a dome roof construction assembly 86 fabricated in accordance with the principles of the present invention. The assembly 86 includes an arcuate dome portion 88 having an annular base portion 90 depending therefrom and secured thereto.

The dome portion 88 comprises a plurality of construction units 20C of substantially trapezoidal configuration which are connected together by having their end wall 92 which are disposed in abutting engagement secured together, such as by adhesive bonding or by any other suitable securing means. The inner walls 94 of the units 20C are smaller than the outer walls 96 thereof to provide the trapezoidal configuration and both the walls 94 and 96 are provided with inwardly positioned paper backing layers 98 secured to each of the walls, as described hereinbefore.

A cementitious material such as concrete, plaster or the like is then coated or sprayed on the inner and outer walls 94 and 96 to form the dome construction 88. The annular base portion 90 may be fabricated in a manner similar to the dome 88 and prior thereto; i.e., the base portion 90 is formed first and the dome 88 is fabricated thereon. The interior of the units 20C may be filled with insulating material, if the same is desirable.

The resultant dome roof construction assembly is one which is extremely light weight, durable and strong. It will be appreciated that the foregoing construction assembly can be utilized in the building of enclosed structures, such as sports stadiums, at a cost which is much less than for existant type of structures. In FIG. 15, there is depicted an arch-type roof construction assembly 100 which is constructed in a manner substantially the same as that of the dome roof assembly 86.

FIG. 17 depicts a bearing wall construction assembly generally depicted by the reference numeral 102. The assembly comprises a concrete footing 104 upon which are vertically disposed a plurality of interconnected mesh-type construction units 20D. Spaced ones of the units 20D are filled with concrete, as best seen in FIG. 18. An upper construction unit 22D disposed horizontally is also filled with concrete and positioned atop the vertically disposed construction units. The entire assembly 102 is then coated or sprayed with concrete to provide the finished bearing wall construction assembly.

FIG. 19 illustrates a floor or flat roof construction assembly 106 which includes a pair of concrete filled mesh-type construction units which serve as bearing members 108. Disposed across the bearing members 108 are a plurality of interconnected construction units 20E. The units 20E have a paper backing layer 110 secured to the upper and end walls, as best seen in FIG. 20 and as described hereinbefore. When the interconnected units 20E are coated or sprayed with a cementitious material, the interior remains void (FIG. 20) and may thereafter be filled with insulation or have electrical wires inserted therethrough.

FIG. 21 depicts a hung ceiling construction assembly 112, wherein a plurality of construction units 20F are interconnected, as described hereinbefore. The interconnected units are suspended as by wires 114 or other convention means and a suitable ceiling material 116 which is similar to partition covers is secured to the underside of the units. The units may be left exposed, filled with insulation material or sprayed with acoustical material.

Another embodiment of a construction assembly is depicted in FIG. 22, wherein construction units 20G are interconnected and vertically positioned upon a concrete footing 118. The units are interconnected so as to form a right angle configuration and serve as forms for the pouring of concrete columns. In this regard, reference is had to FIG. 23 wherein it is seen that the units 20G are provided with internally disposed paper-backing layers 120 secured to each of the walls of the units. The cost of the units 20G is so small that they need not even be removed after the concrete has cured. It will also be appreciated that the units are set up very quickly and very easily, in contradistinction with present methods and apparatus for providing forms for the pouring of concrete.

Another type form for the pouring of concrete is depicted in FIG. 24. In this embodiment the units 20H have backing layers 122 secured to the outer surfaces of the walls of the unit. Thus, when the concrete is poured into the forms the mesh-type units become part of the concrete and serve as reinforcing members therein, thereby forming a reinforced construction assembly.

Another construction assembly fabricated in accordance with the principles of the present invention is shown in FIG. 25 and depicted generally by the reference number 124. In this embodiment a pillar of tapered configuration is defined by a construction unit or units 20J having concrete secured to the outer surface thereof and forming an integral structure therewith. A paper backing layer 126 is secured to the inner walls of the unit 20J to limit the permeation of the concrete thereinto. To increase the density of the assembly 124 concrete fill may be added to the hollow inner core 128 of the unit 20J.

It is thus seen that I have described new and novel construction assemblies for use in the fabrication of various types of walls, roofs, ceilings and the like which are extremely lightweight, workable, sturdy, durable and which are relatively inexpensive in their manufacture.

I claim:

1. A construction assembly comprising in combination a structural base, a plurality of individual construction units having spaced walls, means for interconnecting adjacent ones of said individual units, said connected construction units being positioned upon said structural base, each of said units comprising a pervious resin impregnated fibrous mesh material forming the walls of said units, and a hydraulic cementitious material filling the interior of selective ones of said construction units and forming an integral structure with said base.

2. A construction assembly in accordance with claim 1, wherein said construction units have a backing layer secured to the walls thereof exteriorly of said units enabling said units to serve as a form for the pouring of said cementitious material and forming an integral structural assembly therewith.

3. A construction assembly in accordance with claim 1, including another construction unit filled with a cementitious material disposed substantially perpendicularly to said connected construction units and positioned thereon, and a cementitious material applied to the exterior of all of said construction units thereby forming an integral structural assembly between said construction units and said base.

4. A construction assembly in accordance with claim 1, wherein

said assembly is in the form of an arcuate roof construction, selective ones of said construction units being of trapezoid configuration, and the ends of adjacent end walls of said units being disposed in abutting secured engagement, whereby the outer and inner walls of said units define an arc.

5. A construction assembly in accordance with claim 1, wherein

said assembly is in the form of an arcuate roof construction, the ends of adjacent end walls of said units being disposed in abutting secured engagement and the outer and inner walls of said connected units defining arcs which are substantially concentric with one another.

6. A construction assembly comprising in combination a structural base, a plurality of individual construction units, means for interconnecting adjacent ones of said individual units, said connected construction units being positioned upon said structural base, each of said units comprising a pervious resin impregnated fibrous mesh material forming the walls of

said units, a cementitious material filling the interior of selective ones of said construction units and forming an integral structure with said base, and said construction units having a backing layer secured to the walls thereof interiorly of said units enabling said units to serve as a form for the pouring of said cementitious material.

7. A construction assembly in accordance with claim 6, wherein said backing layer is fabricated of paper.

8. A construction assembly comprising in combination a structural base, a plurality of individual construction units having spaced walls, means for interconnecting adjacent end walls of said individual units, each of said units comprising pervious resin impregnated fibrous mesh material forming the walls thereof, a hydraulic cementitious material permeating the walls of said units and forming an exterior surface thereon and an integral structure therewith, the outer and inner walls of said connected units defining arcs substantially concentric with one another so that said units comprise an arcuate roof construction, and means for positionally securing said arcuate roof construction upon said structural base.

9. A construction assembly in accordance with claim 8, wherein

at least selective ones of said construction units are of trapezoidal configuration.