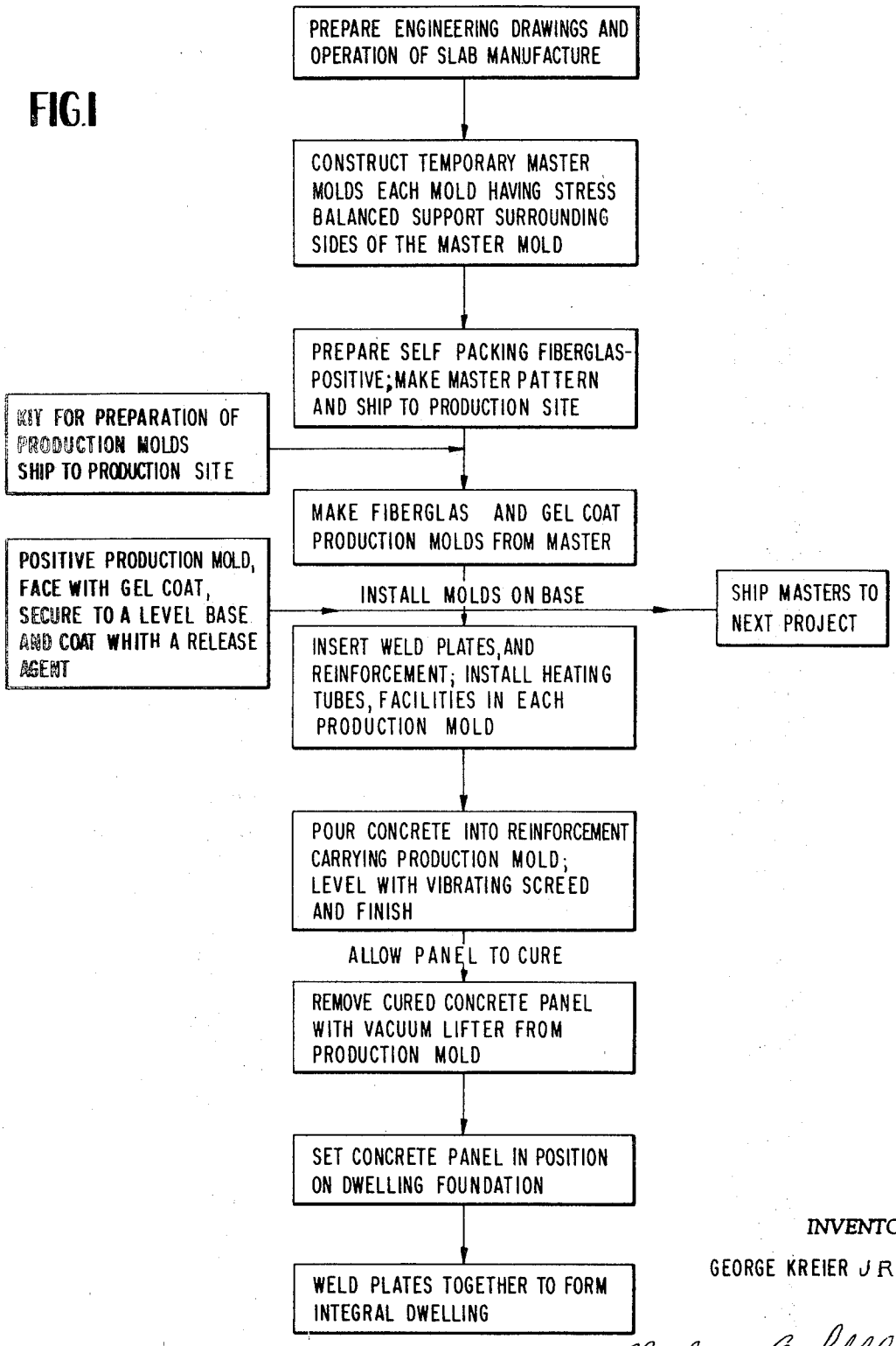
July 21, 1970 G. J. KREIER, JR 3,520,967

METHOD FOR MAKING THIN CONCRETE PANELS

Original Filed Oct. 31, 1966 4 Sheets-Sheet 1

FIG. 1



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METHOD FOR MAKING THIN CONCRETE PANELS

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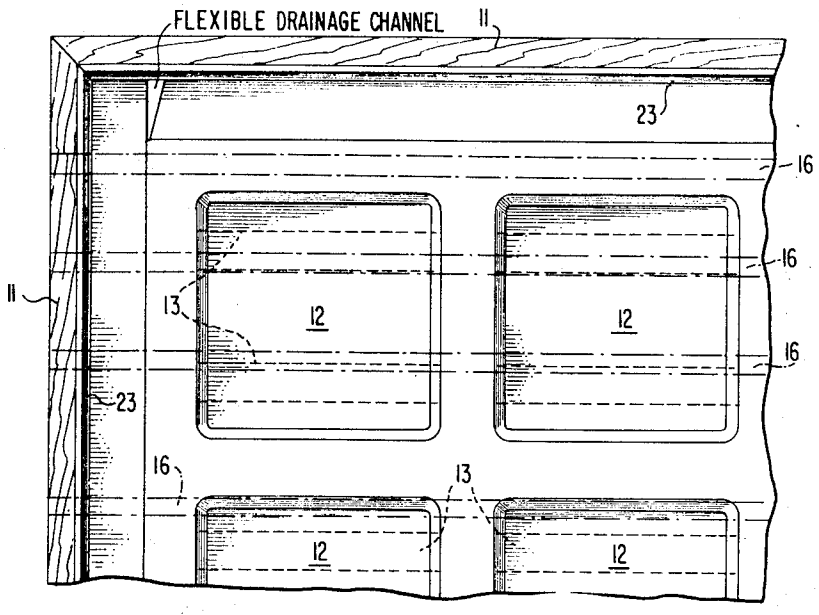
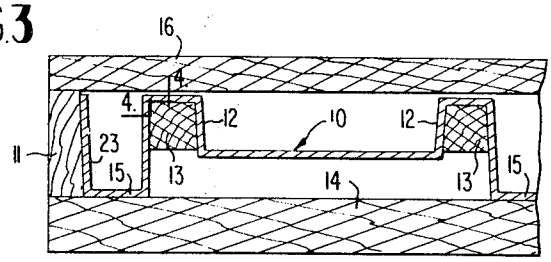


FIG.2

FIG.3



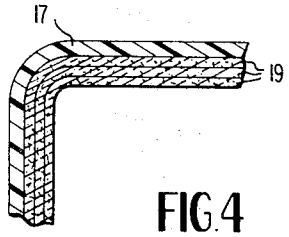


FIG.4

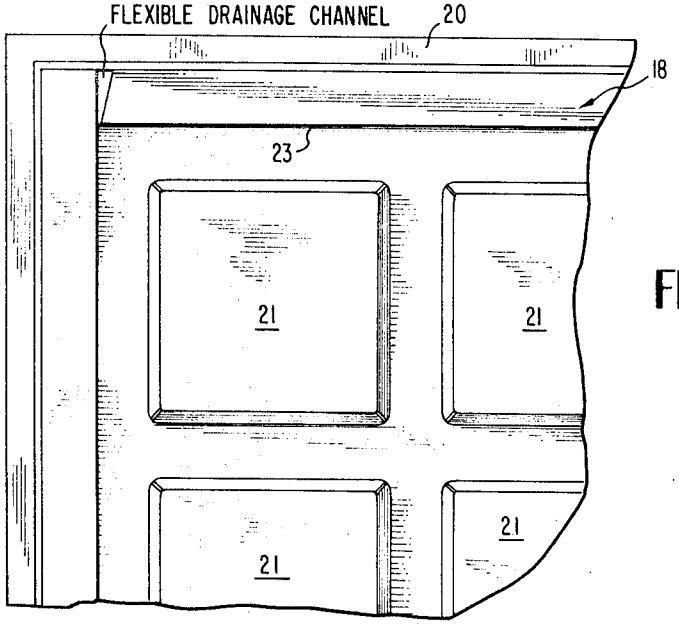


FIG.5

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METHOD FOR MAKING THIN CONCRETE PANELS

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FIG.6

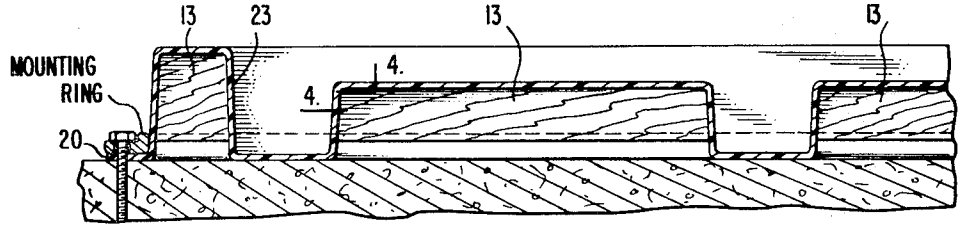


FIG.7

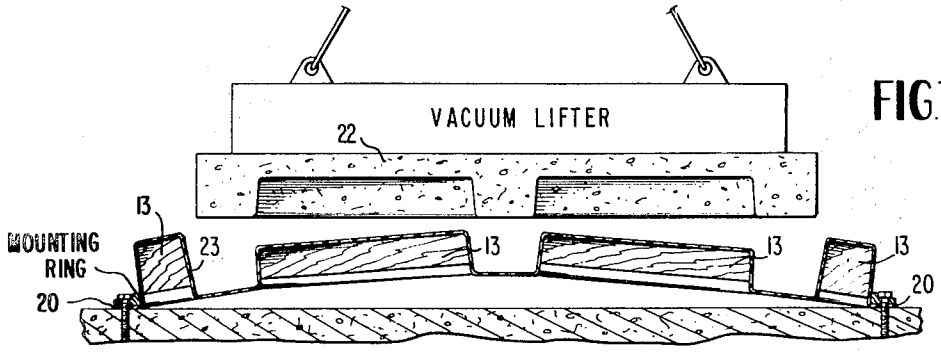
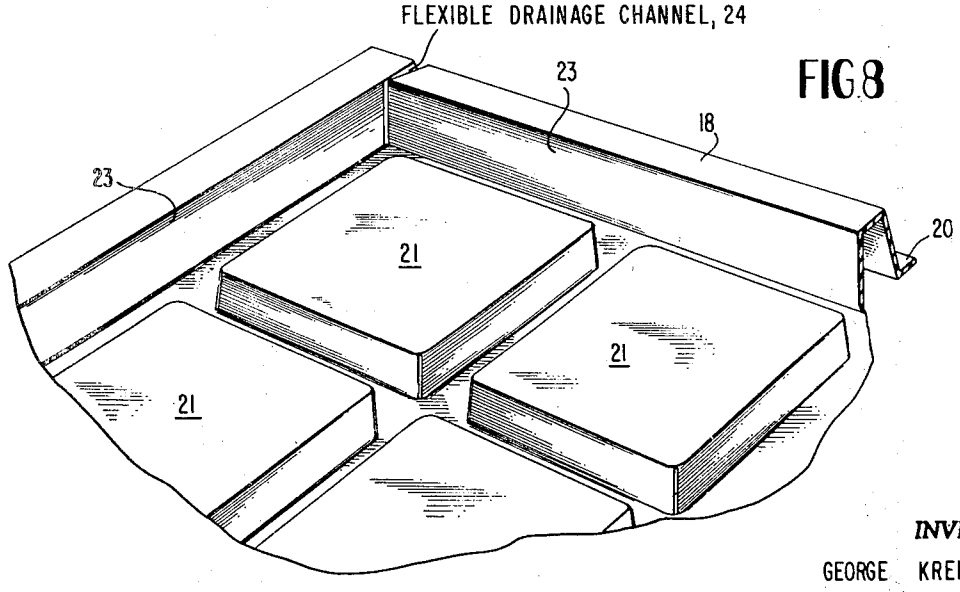


FIG.8



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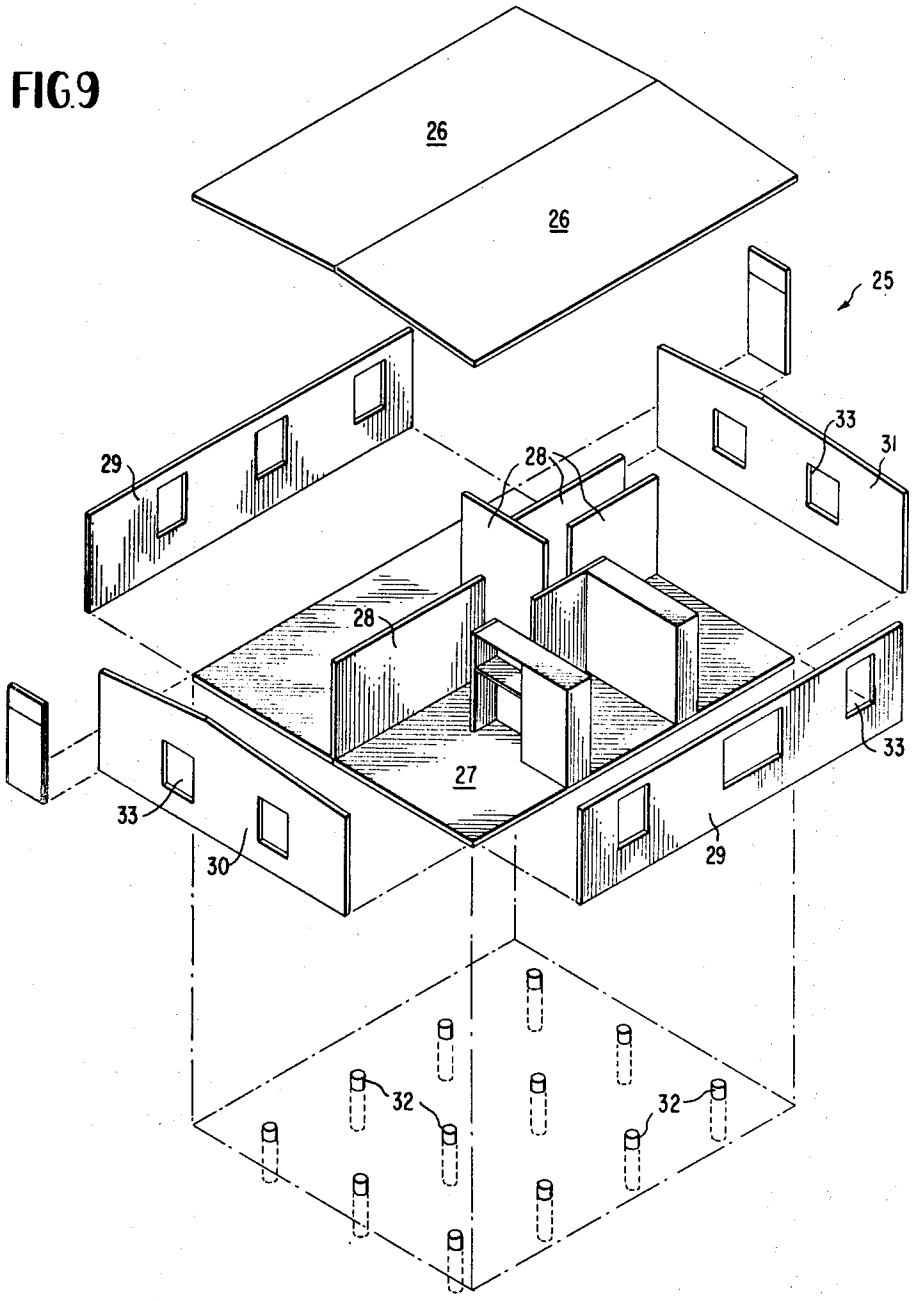
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METHOD FOR MAKING THIN CONCRETE PANELS

Original Filed Oct. 31, 1966 4 Sheets-Sheet 4

FIG.9



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United States Patent Office 3,520,967 Patented July 21, 1970

3,520,967

METHOD FOR MAKING THIN CONCRETE PANELS

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Original application Oct. 31, 1966, Ser. No. 590,580, now Patent No. 3,479,786, dated Nov. 25, 1969. Divided and this application May 27, 1968, Ser. No. 739,588

Int. Cl. B28b 7/06, 7/10, 7/22

U.S. Cl. 264—227 3 Claims

ABSTRACT OF THE DISCLOSURE

A method of constructing large, thin, concrete panels having level edges wherein the panels are formed in a flexible fiberglass resin-impregnated production mold having vertical drain slits and a plurality of raised portions in a planar surface of the mold which creates a waffle pattern in the panels. The mold is adapted to be flexed to a convex configuration to permit the panels to be removed without the need for dismantling the molding means. A prototype is used to form a master pattern and the production mold is made from the prototype.

This invention relates to a novel method and to a new, simplified apparatus for making low cost, thin, engineered concrete panels and, more particularly, to a method of making and utilizing improved Fiberglas molds for the production of large thin concrete panels as elements of low cost house construction.

This application is a division of copending U.S. patent application Ser. No. 590,580, filed Oct. 31, 1966 and now abandoned, and is related to applicant's U.S. Pat. No. 3,479,786, granted Nov. 25, 1969, in that the light weight panels made by the method of the present invention are useful for building houses by the method claimed in this granted patent.

A widely used method of constructing low cost houses in the tropical and semi-tropical climate areas of the world is by the utilization of concrete. This material is simple to form and requires a minimum amount of reinforcing material, yet can provide fireproof and substantially earthquake-proof housing. Concrete is extensively used in underdeveloped countries because of its local availability and and low cost and is a fundamental, durable material for meeting the shelter requirements of the people in these countries.

The concrete panels used to form a house are generally made by one of two well known methods. One method is to construct the pattern molds in situ. Such molds are usually constructed from wood. A separate mold is constructed for each element of the house and is set up in its ultimate position. For example, as shown in Bonet U.S. Pat. No. 2,852,931, a mold for a wall is positioned on the foundation at the exact position where the wall is desired. When the molds are put into position, reinforcing bars are then positioned therein. Concrete is then poured into the mold in what will be its final position and the mold is removed by dismantling after the concrete sets. Obviously, any positioning mistakes are extremely difficult and expensive to rectify.

This first method is uneconomical because the mold must be constructed anew for each house to be built, and quite often the concrete panel formed is damaged in the process of removing the mold therefrom. Concrete must, moreover, be quite heavy in section to permit placement and in order to minimize the damage to the concrete panel during the dismantling of the mold. This thickness is not dictated by economy or ultimate performance of the panel. The materials to build the mold must be transported to the site and a mold for each element of the house must be individually constructed to the exact form, size, shape and position of the final formed concrete panel. Great skill and much supervision is needed, and reuse is poor. The individual mold concept is therefore suitable only for high cost, low production housing construction. Mold systems have been devised to improve reuse, but difficulties in concrete placement remain.

A second known method is precasting, as shown in Midby U.S. Pat. No. 2,883,852. In this method, panels are cast in a central production area. Ordinarily, level concrete beds are cast and metal rails are secured along the periphery of the concrete beds. The metal rails must usually be removed and reset for each casting. Reinforcing rods are placed into the mold and concrete poured therein between the metal rail frame. After the concrete has hardened, the formed panels are removed from the molds and transported to the ultimate site. At the site, individual concrete panels are assembled using various standard joints to form the finished house, as is shown in Wilson U.S. Pat. No. 2,592,634. The cast concrete panels, including the reinforcing bars, are heavy and bulky, and therefore the cost of transportation from the central casting area to the ultimate assembly site is expensive. Moreover, it is difficult to remove the panels from the molds of this type or from the metal molds which are also sometimes used. Consequently, the panels must be uneconomically heavy to withstand strains at removal. Such heavy panels are shown in Henderson U.S. Pat. No. 2,691,291 and Brauer U.S. Pat. No. 2,620,651. Despite attempts made to lighten the weight of the panels, as set forth in Marston U.S. Pat. No. 2,139,623, the panels have not been made light enough for widespread, low cost use. Also, in molds of this type, panels cannot be given much detail or finish, partially because of excessive mold cost and partly because more complicated pieces cannot be stripped successfully.

The removal of the cast concrete panels, after curing, from the prefabricated mold is a laborious job requiring the utilization of pinch bars and other similar tools for prying the molds away from the panel or the panel out of the molds. The removal of the panel from the mold is expensive, not only by reason of time and labor involved, but also because of the resultant damage to the mold and the panel, and particularly to the edges thereof. Frequently, the edges of the panels are damaged so extensively that they cannot be used without extensive reconditioning, if at all.

It has been determined that by greatly reducing the size of the concrete panels cast, they can be removed with a reduction of damage; however, this requires the use of additional molds and multiplies the problems of joining the panels together to form a single integral element of the house.

An alternate method for removing the panels from the molds has been the provision of a plurality of orifices in the base of the mold and the forcing of compressed air through the orifices. This method requires the purchase, set-up and transportation of expensive air compressor equipment, and involves the great likelihood that the orifices in the mold's base will become clogged with concrete or extraneous mattter during shipment or use. This method is obviously uneconomical and not feasible for on-site construction.

Some collapsible and portable molds have been developed from lightweight, disposable material. Their strength is reduced greatly by the wet concrete and the moist condition found in semi-tropical and tropical regions. Additionally, these forms are not reusable and must be discarded after each use, making cost prohibitive in production.

The present invention eliminates the aforesaid problems by providing a Fiberglas master pattern mold from which a plurality of production molds can be constructed. The production molds are provided with a water-absorbing gel coat and drains for removing rain water. Additionally, the production mold is flexible, thereby allowing a diaphragm action to facilitate the stripping of concrete panels from it. Because of the diaphragm action, the production mold can have substantially vertical walls without any draft. The molds of the prior art, such as shown in Rushing U.S. Pat. No. 2,850,785, do not permit this diaphragm action because of their rigid construction. In accordance with the present invention, the shaping of the horizontal load-bearing structures, the precast large, thin concrete panels made in seamless reinforced plastic molds, requires a waffle and pan forming technique, as taught in Budd U.S. Pat. No. 2,892,238. The shaping of the vertical panels desirably employs the arcuate reinforcing ribs of Marston U.S. Pat. No. 2,139,623.

The above features, plus coating with a release agent, enable a thin extended concrete panel to be cast and removed easily without damage to the mold or to the panel. The molds are light in weight, inexpensive to reproduce, reusable with a minimum amount of reconditioning and cleaning. Great detail can be introduced into the pattern and reproduced economically in production molds, and ultimately without cost in the finished panel.

This invention allows and makes feasible the mass production of low-cost, attractive, fire-resistant, durable houses for families with low income. Low income housing is greatly needed in semi-tropical and tropical regions where adequate housing must furnish protection from hurricane winds, torrential rains and destructive insects. In addition, the houses constructed herefrom have many desirable characteristics for low income families, such as minimum maintenance and maximum durability. The houses can be assembled by unskilled labor quickly and easily by a simple welded operation, followed by grouting and/or sealing the joints.

An object of this invention is to provide a method for economically producing large thin concrete panels.

Another object is to provide a master pattern from which a plurality of production molds can be reproduced.

Another object is to provide a master pattern which forms a self-contained shipping container.

Another object is to provide a method for removing concrete panels from a mold without damaging either the mold or the panel.

Another object is to provide a method of assembling precast concrete panels to form a house.

Another object is to provide a method of building low cost houses with unskilled labor.

Another object is to provide means to produce concrete panels having self-contained electrical and mechanical connections.

Another object is to provide a method of making Fiberglas reinforced plastic molds.

Another object is to provide a Fiberglas reinforced mold having a smooth gel coat surface.

Another object is to provide a gel coat capable of absorbing a percentage of excess water in the poured concrete.

Another object is to provide a method for making aesthetically pleasant, highly detailed, smooth finish concrete panels.

Another object is to provide a Fiberglas mold that has a flexible diaphragming action to facilitate stripping of concrete panels.

Another object is to provide a Fiberglas mold having drains to facilitate production of the concrete panel outdoors in wet weather.

Another object is to provide a stress balanced mold structure that is seamless.

These and other objects and novel features of the present invention will be more clearly and fully set forth in the following specification, attached drawings and claims. A preferred embodiment of this invention will now be described with particular reference to the accompanying drawings wherein:

FIG. 1 illustrates a flow diagram of the method;

FIG. 2 is a top view of a master pattern;

FIG. 3 is a side cut away view of the master pattern in shipping condition;

FIG. 4 is an enlarged detail view along 4—4 of FIGS. 3 and 6;

FIG. 5 is a plan view of a production mold;

FIG. 6 is a side cut away view of the production mold;

FIG. 7 is an exaggerated view of the production mold in a flexed diaphragming position;

FIG. 8 is a perspective view of the production mold showing the flex-drain feature; and,

FIG. 9 is an exploded isometric view of a house constructed in accordance with the present invention.

Referring now to the drawings, wherein like reference numbers designate like or corresponding parts throughout the several views, there is shown in FIG. 1 a flow chart illustrating the steps necessary for the mass production of a house in accordance with the present invention.

The first step in the method is the construction of a temporary master mold from which a master pattern will be formed. In order to construct the master pattern, a full scale prototype of the desired production mold is constructed in a manner well known to those skilled in the art. While the prototype can be constructed from any of a number of types of materials, such as clay, wood, plaster, plastic, metal or other rigid or resilient material known and utilized in the art, it is preferred to use plaster of paris applied over a suitable framework. Because the construction of the prototype is a hand operation, the prototype can be made to any form or configuration desired for economic and aesthetic house construction, some common designs being the waffle or rib slab type, both of which effect a substantial saving in material.

After the full scale prototype mold has been constructed, it is coated with a suitable release agent. A thin uniform layer of a gel coat containing chemically inert hydrophilic fibrous filler and styrene polyester resin is applied over the release agent on the prototype. A Fiberglas mat or cloth saturated with conventional catalyzed polyester resin is laid up over the gel coat and residual air bubbles and excess resin are removed from the combination by squeegee or the like to maintain the desired glass fiber content by weight. The number of layers of resin impregnated Fiberglas mat and cloth that are built up will depend upon the size of the mold and rigidity and strength desired.

When cured, the Fiberglas and gel coat combination will form a rigid positive master pattern conforming to the exact external surface of the prototype. The gel coat and Fiberglas laminate is then reinforced with wood stiffeners, a wooden frame around the periphery thereof, and a wooden base. It is finally stripped from the prototype, cleaned and finished.

A completed master pattern **10** is illustrated in FIGS. 2 and 3, which show a typical waffle pattern for the sake of illustration. FIG. 3 shows the master pattern **10** ready to be shipped. A wooden frame **11** is secured along the periphery of the pattern **10** and extends slightly beyond the upper surface and flush with the lowermost surface of the pattern **10**. Extending between and secured to opposite sides of the raised portions **12** are wood stiffeners or diaphragms **13**. The wood diaphragms **13** impart to the pattern **10** sufficient rigidity to retain its shape and dimensional accuracy. The lower edge of the frame **11** is secured to a planar base **14**, which lies in justaposition to the extreme lower surface **15** of the pattern **10**. The base **14** extends the complete length of the pattern **10** and is secured to both the frame **11** and the surface **15**. While

any number of materials can be used for constructing the base **14**, wood is preferred because of its low cost and ease of workability. Interconnecting the upper edges of the frame **11** along its entire length are a plurality of slats **16**. The slats **16** are raised slightly above the raised portions **12** so as not to come into contact therewith and are positioned in a manner to protect the outer surface of the raised portions **12**.

FIG. 4 shows a typical construction of a portion of the master pattern **10** wherein a gel coat **17** provides a smooth seamless surface upon which a production mold **18** will be formed. Underlying the gel coat **17**, and integrally bonded thereto, are a plurality of Fiberglas layers **19** impregnated with a polyester resin. The Fiberglas layers **19** provide a rigid backing for the gel coat **17** while retaining sufficient resiliency to facilitate the removal of the production mold **18**.

The master pattern **10**, as illustrated in FIGS. 2 and 3, is in a shipping condition and the frame **11**, base **14**, and the slats **16** provide a shipping container. Upon receipt at the location where the master pattern **10** will be used, the slats **16** are removed and the frame **11**, diaphragms **13** and the base **14** are left intact to provide a rigid yet resilient master pattern.

Master patterns may advantageously be constructed of elements which may be variously arranged to permit a variety of production molds to be produced from a limited number of master elements.

Referring back to FIG. 1, the master pattern **10** is placed horizontally with the gel coat **17** facing upwardly. A thin, uniform coating of a release agent is applied over the gel coat **17**, and a thin, uniform layer of gel coat **17** containing chemically inert hydrophilic fibrous filler and styrene polyester resin is applied over the release agent on the master pattern **10**. A plurality of glass fiber mats and cloths saturated with conventional catalyzed polyester resin are alternately laid up over the gel coat and residual air bubbles and excess resin are removed from the combination by a squeegee, or the like, to maintain the desired glass fiber content by weight. The number of layers of resin impregnated Fiberglas mat and cloth that are built up will depend upon the size of the mold and the rigidity and strength desired. Diaphragms are placed as required to complete the structure.

When cured, the Fiberglas and gel coat combination will form a rigid production mold **18** conforming to the exact external surface of the master pattern **10**. The master pattern **10** can be used repeatedly for the reproduction of production molds, as desired, in the same manner as hereinbefore described. After a plurality of production molds are reproduced, the master pattern **10** is recrated by securing the slats **16** to the frame **11** and the pattern **10** is shipped to its next destination where additional production molds can be reproduced.

The production mold **18**, as illustrated in FIGS. 5 and 6, is a negative version of the master pattern **10**. Extending outwardly along the entire periphery of the production mold **18** is an integral flange **20** which provides a hold-down support when the production mold **18** is in operation. Extending between and secured to opposite sides of a plurality of raised portions **21** are a plurality of wooden diaphragms **13**. The wood diaphragms **13** impart to the production mold **18** sufficient rigidity to retain its shape and dimensional accuracy when in production, while enabling it to flex to a limited extent to allow the removal of an extended thin-ribbed planar concrete panel **22**, as illustrated in FIG. 7.

Since the production mold **18** is constructed in a substantially identical manner as the master pattern **10**, it is obvious that FIG. 4 also shows a typical construction of a portion of the production mold **18**.

When the production mold **18** is to be used in producing concrete panels, the mold **18** is set horizontally upon a level surface with the gel coat **17** facing upwardly.

It will be noted by reference to FIGS. 3 and 6 that the internal walls **23** of the master pattern **10** and the production mold **18** are substantially vertical with no appreciable draft. In the present production of concrete slabs, the molds used to form the concrete require a high degree of draft or slope in order to enable the panel to be removed. This, of course, causes many problems, particularly in the construction of multi-storied houses where the panels must abut one another to form a strong, rigid, well constructed structure. By providing molds having an ability to flex, as illustrated in FIG. 7, the internal walls **23** can be constructed in a substantially vertical plane in order to form panels having substantially level, straight, parallel edges. As will be described hereinafter, the flexibility of the production mold **18** allows the concrete panels with level edges to be produced without impairing the stripping of the panel from the mold **18**.

Another aspect of the present invention is illustrated in FIG. 8, which shows a production mold **18** with a flex-drain in the corner of a mold. Normally four of those drains occur per panel. In semi-tropical or tropical regions, the amount of rainfall is usually high and showers are frequent. Normally concrete molds have no provision for draining as they are not ordinarily used outdoors. By providing flex-drains in the corners of the mold **18**, water is allowed to drain off while preventing the seepage of concrete through slits **24**. Molds are consequently immediately ready to use when the rain stops The flex-drain has an equally important use in allowing the mold to hinge or flex at the corners of rails to permit the removal of panels with vertical walls.

Referring back to FIG. 1, the production mold **18** is allowed to cure and wood diaphragms **13** are inserted between and secured to opposite sides of the raised portions **21**. The diaphragmed mold is then set upon a level horizontal surface with its gel coat **17** facing upwardly. The flange **20** is secured to the level horizontal surface in any one of a number of economical manners such as wood cleats or concrete rails. The gel coat **17** of the production mold **18** is then coated with a thin, uniform film of release agent. The release agent should be one of the many types of water-insoluble oil materials which tend to float on the water-wet concrete product. I prefer a treatment with Johnson's Traffic Wax weekly, with daily application of an emulsion consisting of ten percent stearic acid in kerosene.

Before the concrete is poured into the production mold **18**, a plurality of reinforcing rods or wire mesh are laid out within the production mold **18**. In addition to the reinforcing material, weld plates, electrical fittings, conduit or cable, and water pipes are inserted in the mold, and then the concrete is poured therein. In order to insert the weld plates, the production mold **18** may be provided with depressions or reliefs along the walls thereof. By providing depressions in the walls of the mold **18**, the weld plates can extend outwardly from the level edges of the concrete panel. The concrete is poured into the mold **18** until it rises slightly above the upper surface of the internal walls **23**. It will be noted that the upper surface of the internal walls **23** is horizontal and parallel to the level surface upon which the production mold **18** is secured.

The concrete is distributed and smoothed out until it is level and coplanar with the upper surface of the internal walls **23**. Ordinarily, a vibrating screen is guided along the upper surface of the external rails and over the concrete until the concrete settles and fills all the spaces within the production mold **18**, thereby eliminating any voids. The low weight and resilience of the mold makes the vibration extremely effective. The smooth surface gel coat facilitates placement.

In addition to imparting a smooth surface to the molded concrete, the gel coat **17** withdraws from the freshly poured concrete a quantity of water up to about 1.5% by weight of the gel coat, thereby facilitating the placing of the concrete and final separation of the concrete from the mold.

After the concrete panel has cured and hardened, a vacuum lifter of the type made and sold by the Vacuum Concrete Corporation of America under the trade name "Octopus Lifter" is brought into contact with the level planar surface of the concrete panel. The "Octopus Lifter" has been specified only for illustrative purposes, and it will be obvious that a number of other vacuum lifters can be utilized. The vacuum lifter grasps the level surface of the panel and securely adheres thereto. As the vacuum lifter is raised upwardly, the concrete panel is stripped from the production mold **18**. The separation of the concrete panel from the production mold **18** is facilitated by the release agent which is applied to the gel coat and the particular properties of the gel coat, and by the ability of the mold **18** to flex upwardly to a convex configuration, thereby causing the walls **23** to be forced outwardly at an obtuse angle to the horizontal surface upon which the mold **18** is secured. The flexing of the poduction mold **18** to a convex configuration, as shown in FIG. 7, is assisted by the flex-drains **24** which enable the mold to be flexed at the corners and yet return to its original dimensional configuration subsequent to the stripping of the concrete panel from the mold **18**.

It is the combination of the nature of the gel coat and the release agent and the ability of the mold to flex upwardly to a convex configuration that enables the thin concrete panels to be removed easily and efficiently from the mold **18** without damaging either the mold **18** or the panel. Additionally, the ability of the mold **18** to flex outwardly enables the mold to be constructed with substantially vertical walls and eliminates the necessity of providing draft for facilitating the removal of the cast concrete panels. By eliminating the necessity for draft on the walls **23**, concrete panels can be cast with smooth level edges which greatly facilitate the setting up of the panels to form a dweller.

As shown in FIG. 9, a typical house **25** to be constructed from the concrete panels **22** consists of a roof **26**, a floor **27**, inner dividing walls **28**, a pair of side walls **29**, a front wall **30** and a rear wall **31**. It will be noted from FIG. 9 that side walls **29** are substantially identical, that front wall **30** and rear wall **31** are also substantially identical, and that all the walls are of one piece construction. The roof **26** and the floor **27** are of substantially identical construction and consist of two separate panels joined together along a longitudinal edge. While the roof **26** and the floor **27** are shown as being constructed from two separate panels, it will be obvious that, because of the present novel method of manufacturing thin, seamless panels **22**, the roof **26** and the floor **27** can be constructed from one integral panel.

In operation, only three master molds **10** are necessary for the complete external construction of the house **25**. One master mold **10** is necessary for the roof **26** and the floor **27**, another master mold **10** is necessary for the side walls **29** and another for the front wall **30** and the rear wall **31**. Each master mold **10** provides a pattern from which a plurality of the production molds **18** can be reproduced as described hereinbefore. In order to provide a solid foundation upon which to build the house **25**, a plurality of piles **32** are placed into the ground. The use of the piles **32** is highly desirable where the ground upon which the house **25** is to be built is incapable of securely supporting the house or where the terrain is irregular. After the piles **32** are set into the ground the floor panels **27** are placed in a horizontal position on top of the piles by a vacuum lifter. The floor panels **27** are then secured to the piles **32** in any well known manner such as welding or adhesive connections.

In constructing the front, rear and side walls those portions of the walls which comprise windows **33** are removed. In order to cast walls with openings to provide windows **33** and doors, the production mold **18** is provided with a plurality of extended raised portions (not shown). The extended raised portions are similar to the

raised portions **21** as illustrated in FIG. 8, but extend upwardly beyond portions **21** to a level flush with the upper surface of the internal walls **23**. Therefore, when concrete is poured into the mold **18** and compacted to a plane flush with the upper surface of the internal walls **23**, the extended raised portions will provide a plurality of openings **33** in the panel **22**.

The front, rear and side walls are placed on the floor panel **27** by the vacuum lifter and the weld plates of adjacent abutting panels are welded together and to the floor panel **27**. After the walls **29**, **30** and **31**, are secured to each other and to the floor **27** the inner dividing walls **28** are positional and secured within the inner portion of the house **25** as defined by the floor **27**, the side walls **29**, the front wall **30** and the rear wall **31**.

After the inner dividing walls **28** are in position, the roof panels **26** are lifted and placed upon the upper edges of the walls **28**, **29**, **30** and **31** by a vacuum lifter. The roof **26** is positioned upon the walls in a substantially horizontal position and secured to the walls. When the roof **26** is cast in two sections, the sections are placed in abutting relationship along their longitudinal edges. The dividing line between the two roof panels **26** is coaxial with the center line of an inner wall **28** and the roof panels **26** are partially supported thereby.

While for the sake of illustration a single story house has been described, it will be obvious that any number of stories can be constructed and the roof of the bottom story will serve as the floor of the upper story. Because of the substantially smooth level edges of the panels **22**, the walls **28**, **29**, **30** and **31** are easily secured to the roof **26** and the floor **27** in a perpendicular manner. The method of securing the walls to the floor, to the roof and to one another can be by welding or cementing or any other manner well known in the art.

After the completed house **25** has been constructed, the connecting joints between the various panels are filled with an insulating material which is capable of allowing expansion and contraction. While a number of commercially available insulating materials can be used, it is preferred but not necessary that a flexible insulating material such as that produced by Expandite Ltd. of England and sold under the trade name of "Thioflex" be used.

It will be obvious to those skilled in the art that while a preferred embodiment has been described in detail, modifications may be made without departing from the spirit and scope of the invention as defined in the claims which follow.

I claim:

1. A method of constructing a large thin concrete panel comprising:

building a prototype mold having a waffle pattern with vertical raised portions for the panel;

coating said prototype mold with a release agent;

forming a resin-impregnated fiberglass master pattern from said prototype;

coating said master pattern with a release agent;

applying a uniform coating of a water-absorbing gel comprising an unsaturated polyester resin;

forming a resin-impregnated, fiberglass production mold from said master pattern;

forming a plurality of substantially vertical slits along an edge of said production mold to permit water to be drained from the mold;

inserting a plurality of diaphragms between the vertical raised portions wherein the edges of the said diaphrams are frictionally held between the said vertical raised portions to stiffen the base of the mold;

coating said production mold with a release agent;

pouring concrete into said production mold to fill said mold;

leveling said concrete with the upper surface being coplanar with the edges of the mold;

curing said concrete; and,

removing the cured concrete panel from the production mold.

2. A method as claimed in claim 1, wherein longitudinal reinforcing members are positioned within said production mold, after said mold is coated with a release agent and before concrete is poured into said mold, to reinforce the concrete panel cast therein.

3. A method as claimed in claim 1, wherein said diaphragms are made of wood.

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U.S. Cl. X.R.

156—245; 249—115, 127; 264—336