March 20, 1973 D. W. TOAN 3,721,056

VERTICAL MODULAR CONSTRUCTION HAVING INSERTABLE UNITS

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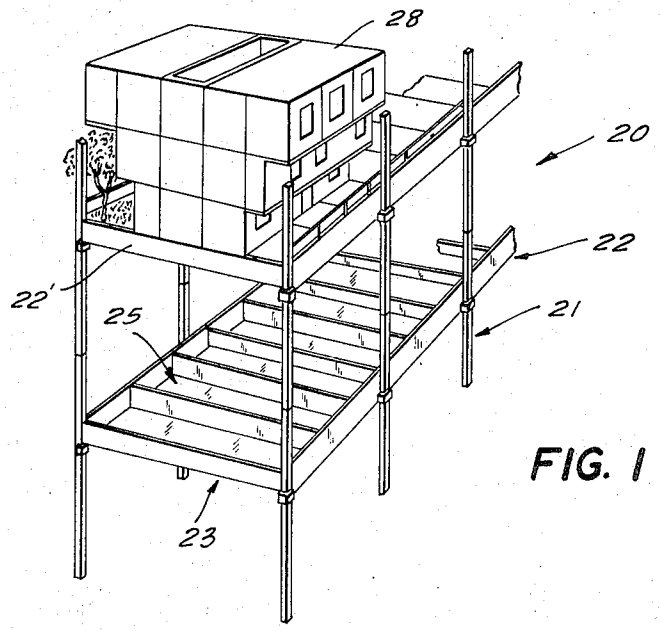


FIG. 1

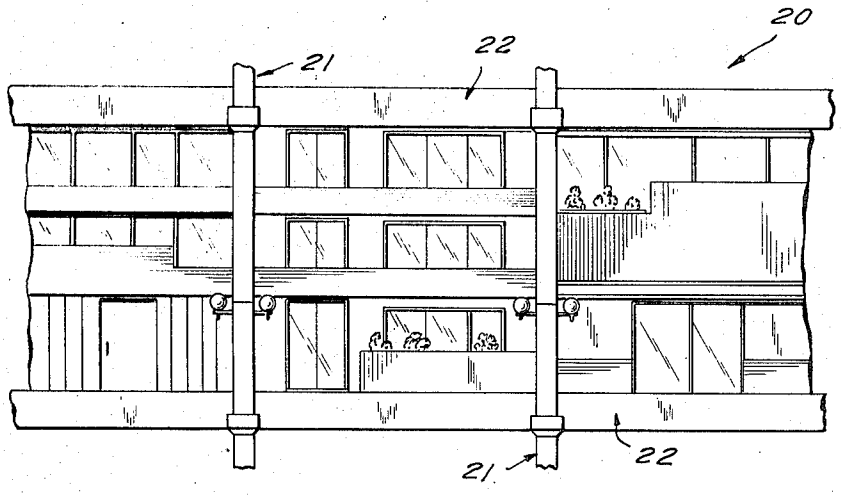


FIG. 2

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VERTICAL MODULAR CONSTRUCTION HAVING INSERTABLE UNITS

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FIG. 3

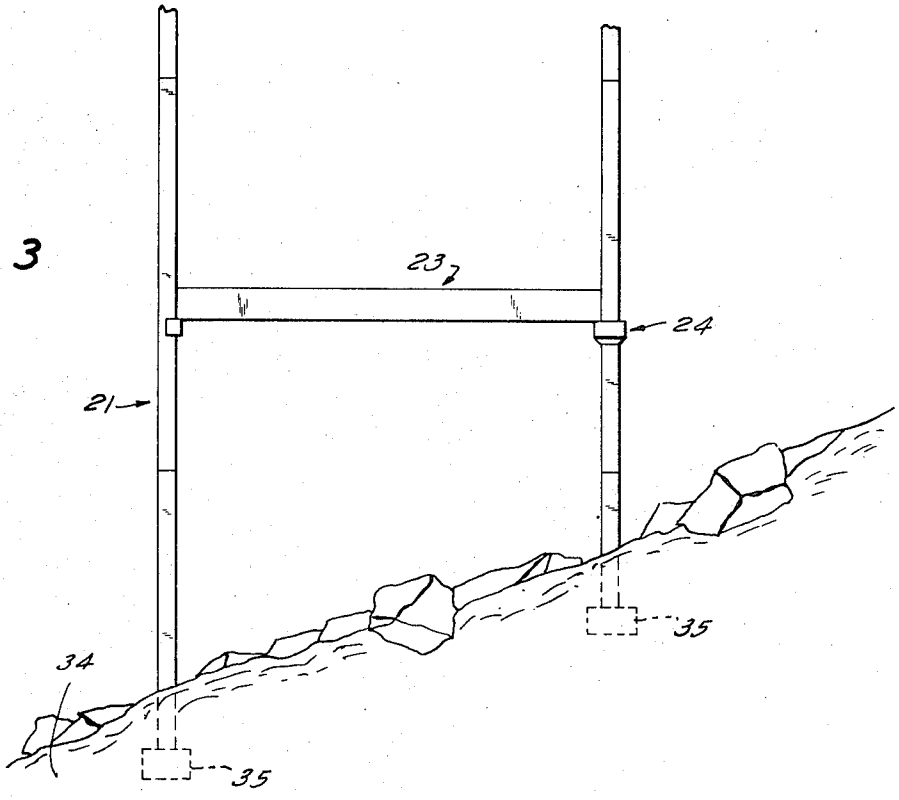
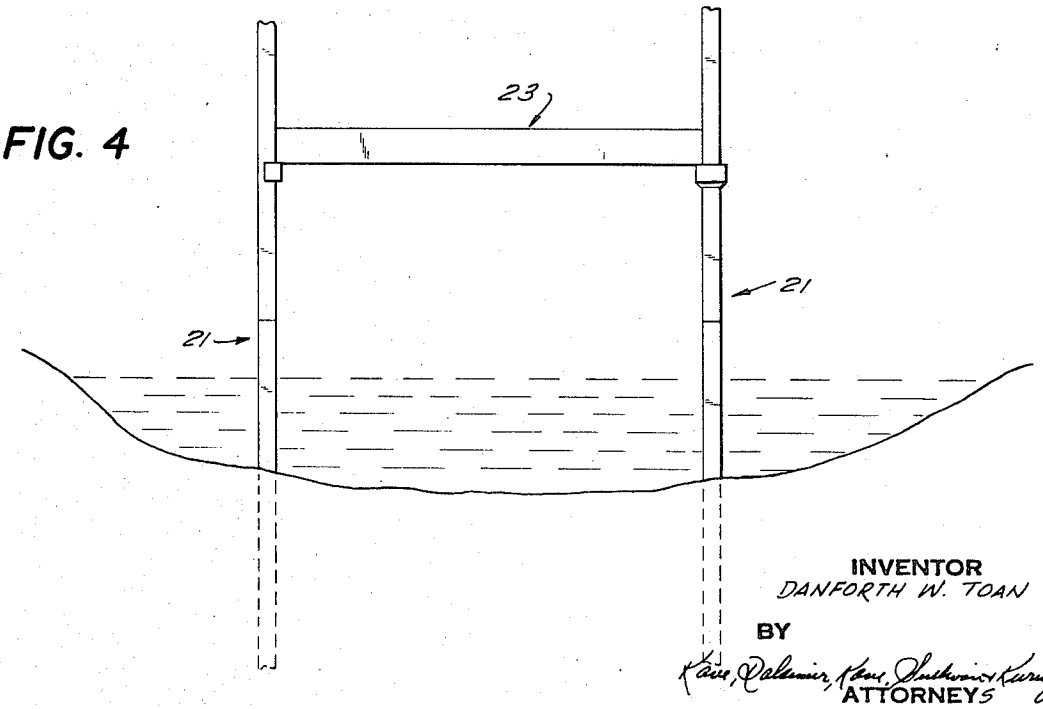


FIG. 4



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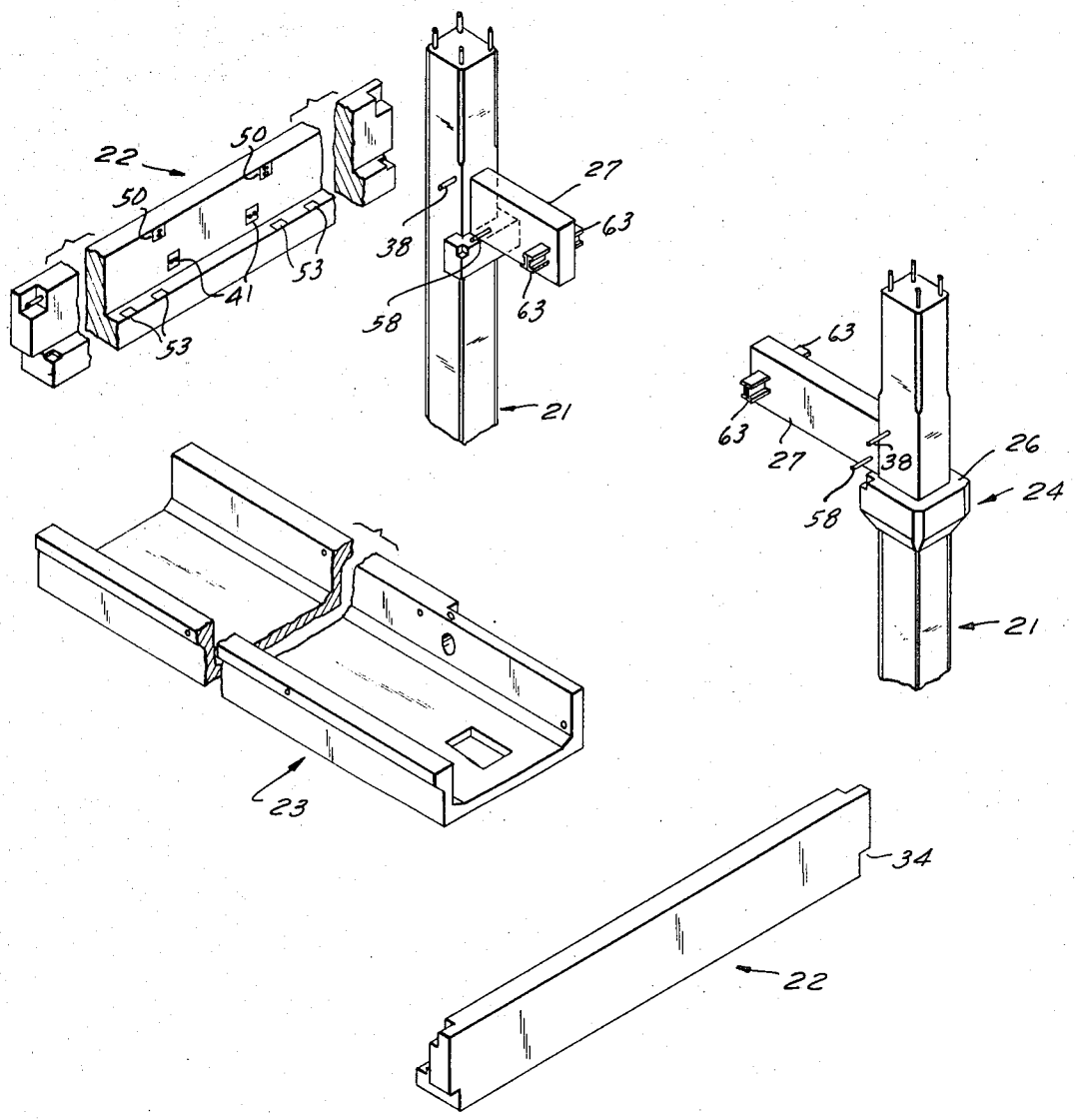


FIG. 5

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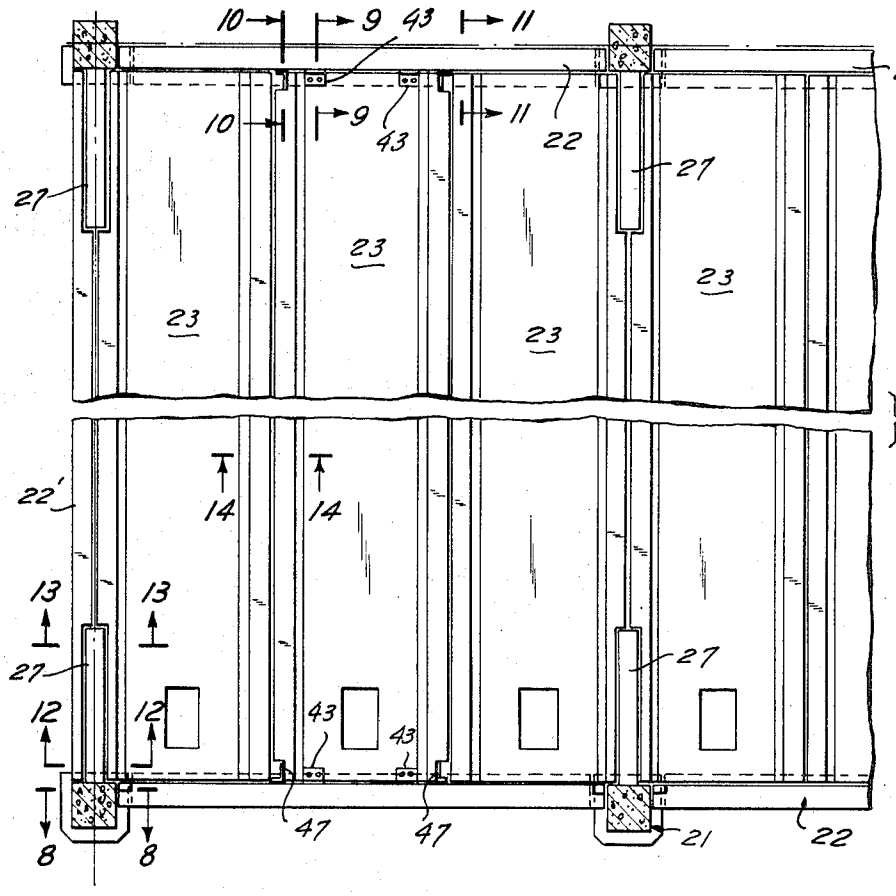


FIG. 6

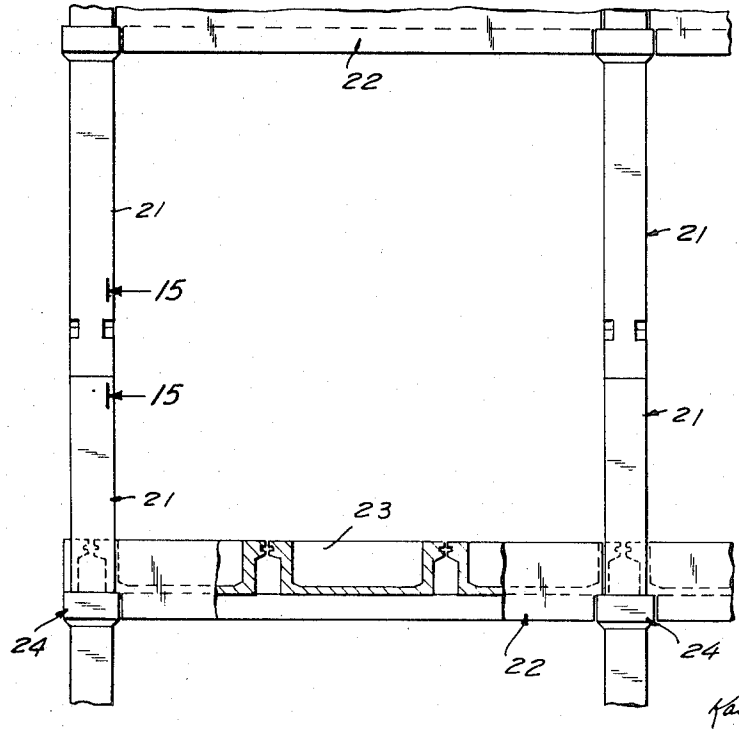


FIG. 7

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VERTICAL MODULAR CONSTRUCTION HAVING INSERTABLE UNITS

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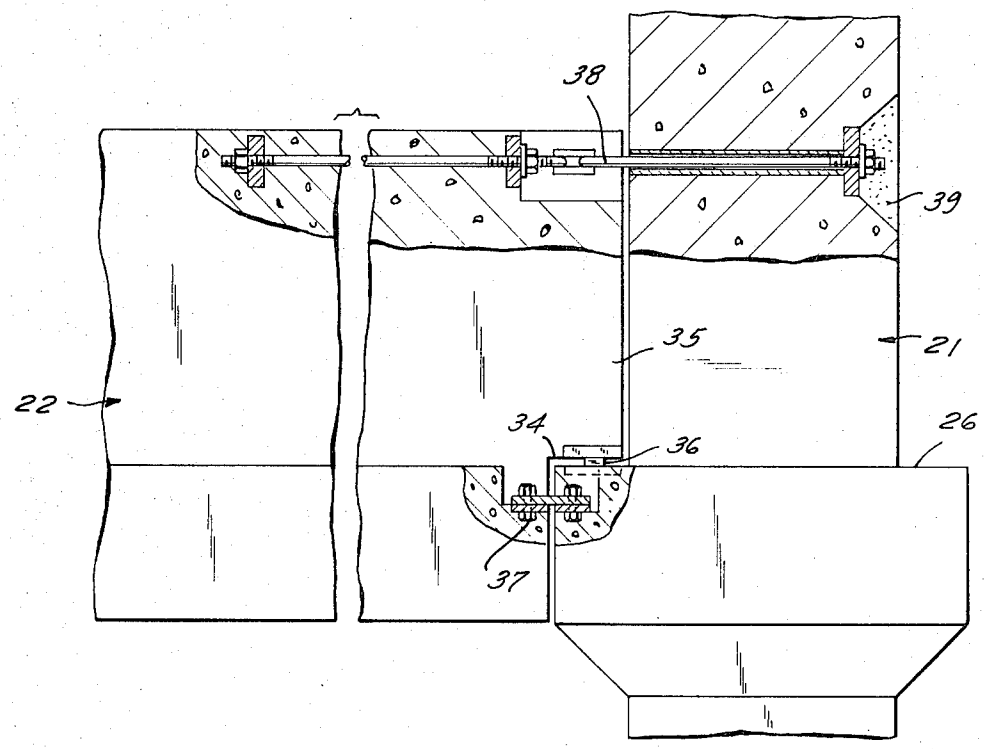


FIG. 8

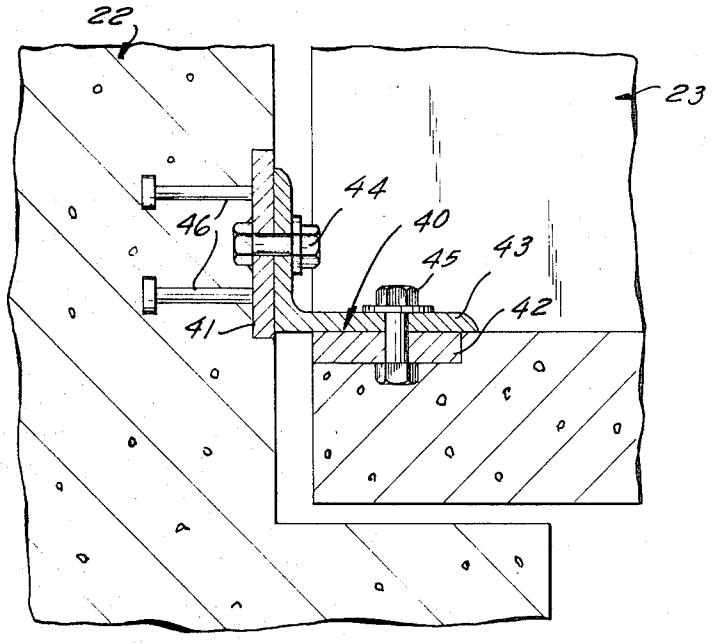


FIG. 9

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VERTICAL MODULAR CONSTRUCTION HAVING INSERTABLE UNITS

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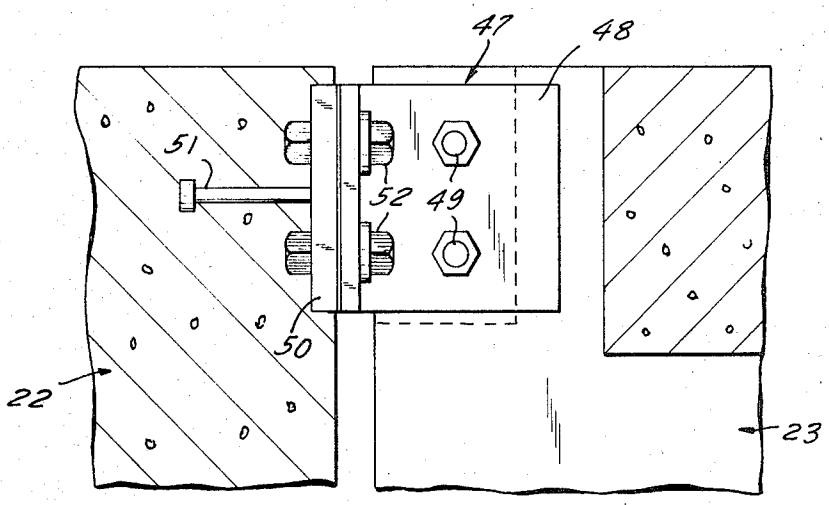


FIG. 10

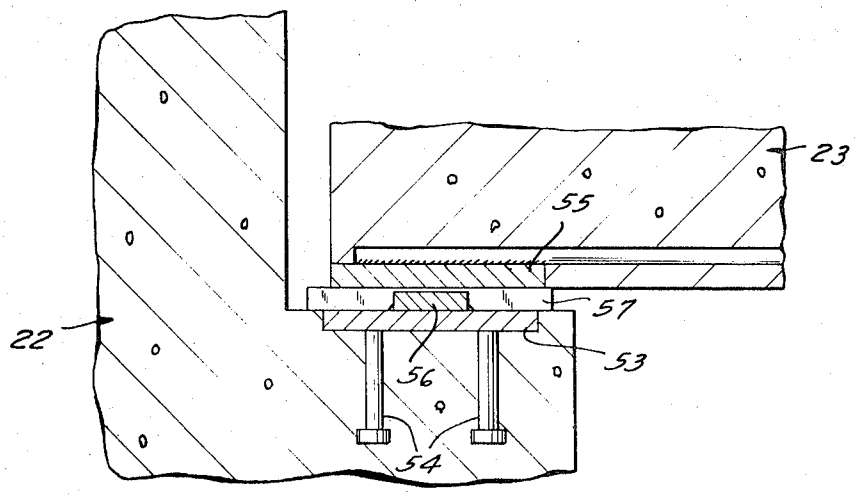


FIG. 11

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VERTICAL MODULAR CONSTRUCTION HAVING INSERTABLE UNITS

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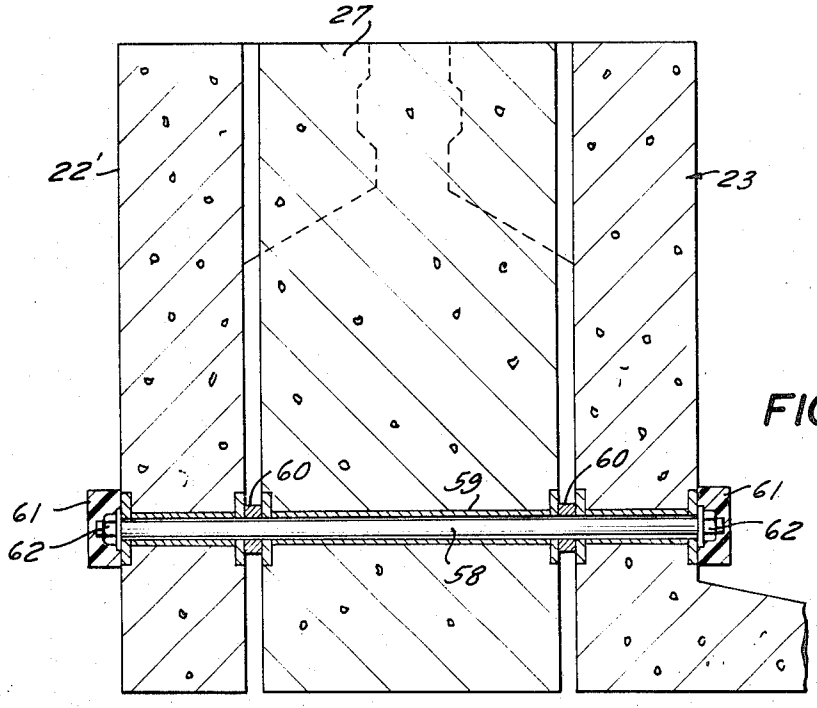


FIG. 12

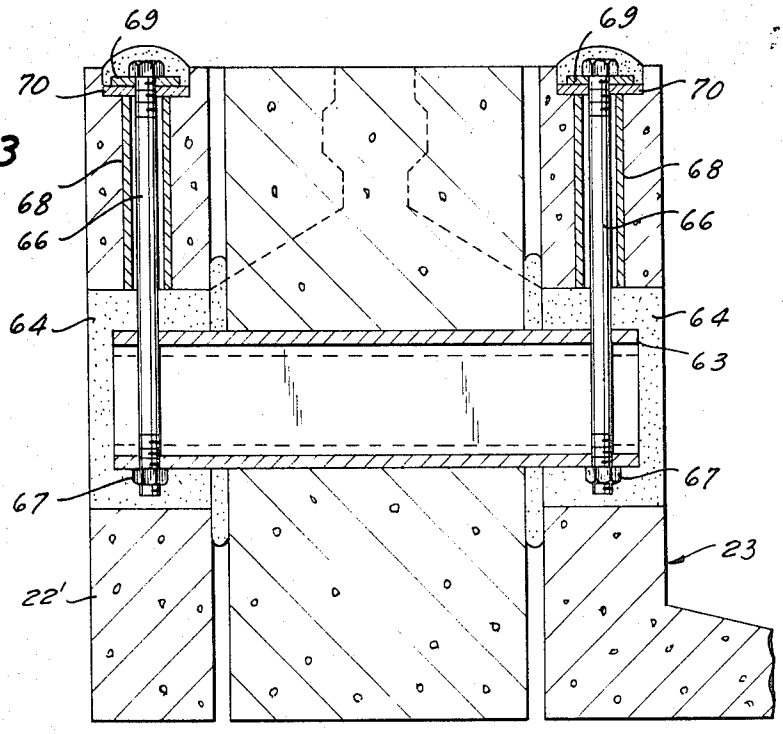


FIG. 13

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VERTICAL MODULAR CONSTRUCTION HAVING INSERTABLE UNITS

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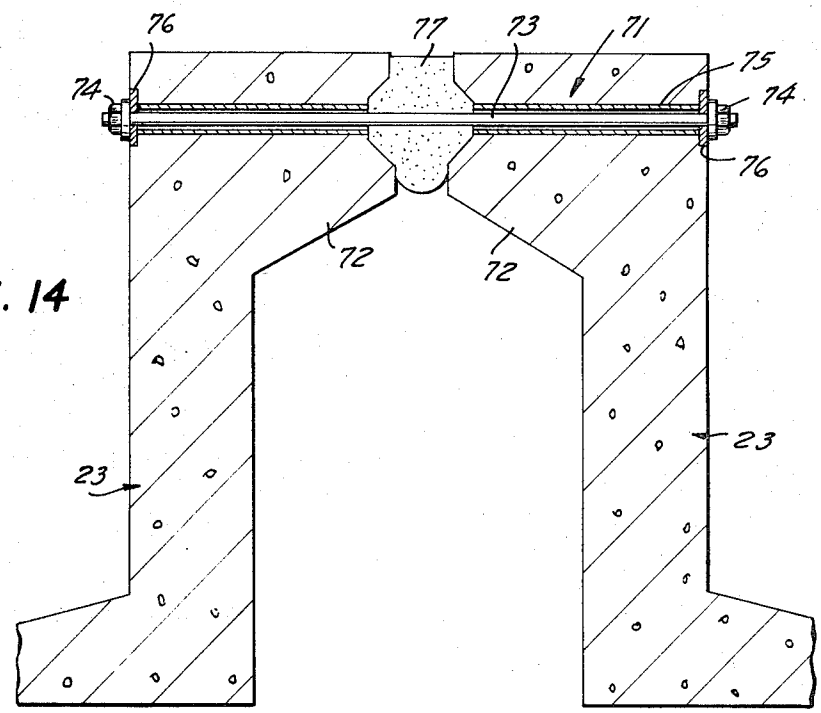


FIG. 14

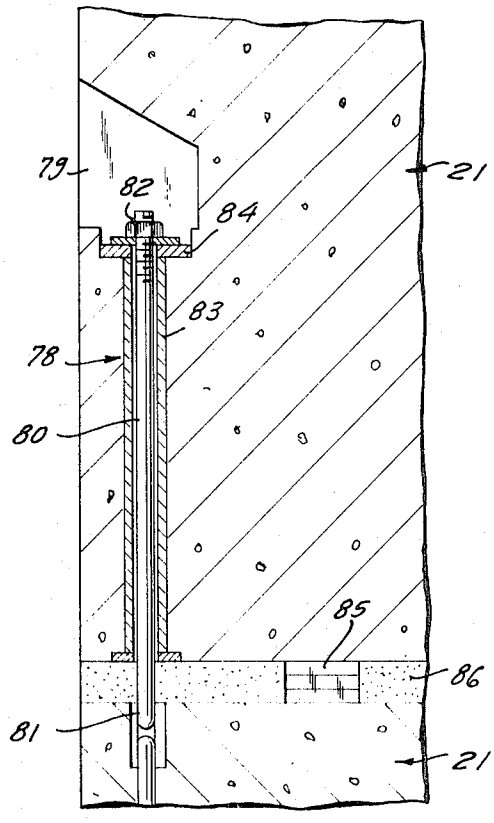


FIG. 15

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VERTICAL MODULAR CONSTRUCTION HAVING INSERTABLE UNITS

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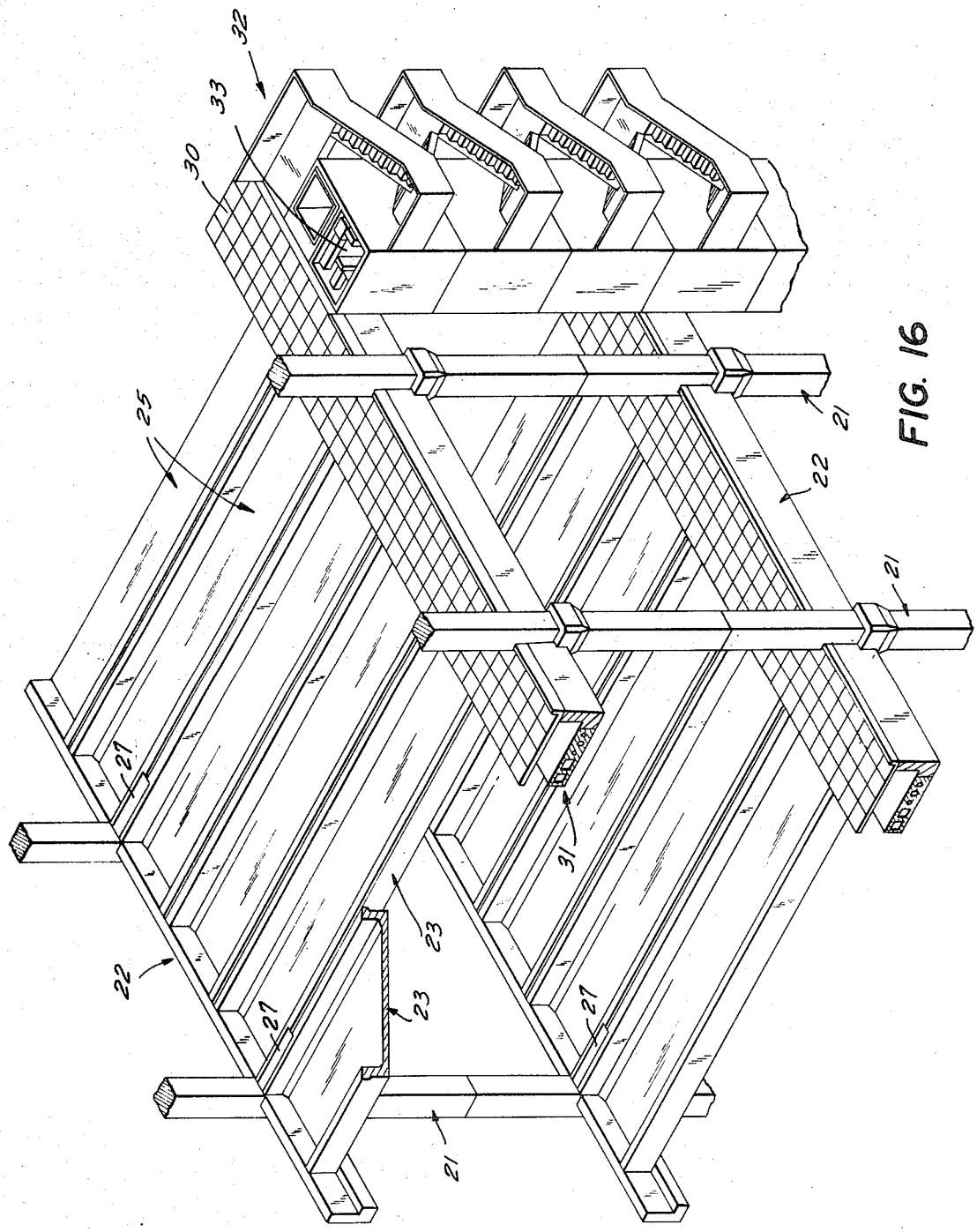


FIG. 16

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VERTICAL MODULAR CONSTRUCTION HAVING INSERTABLE UNITS

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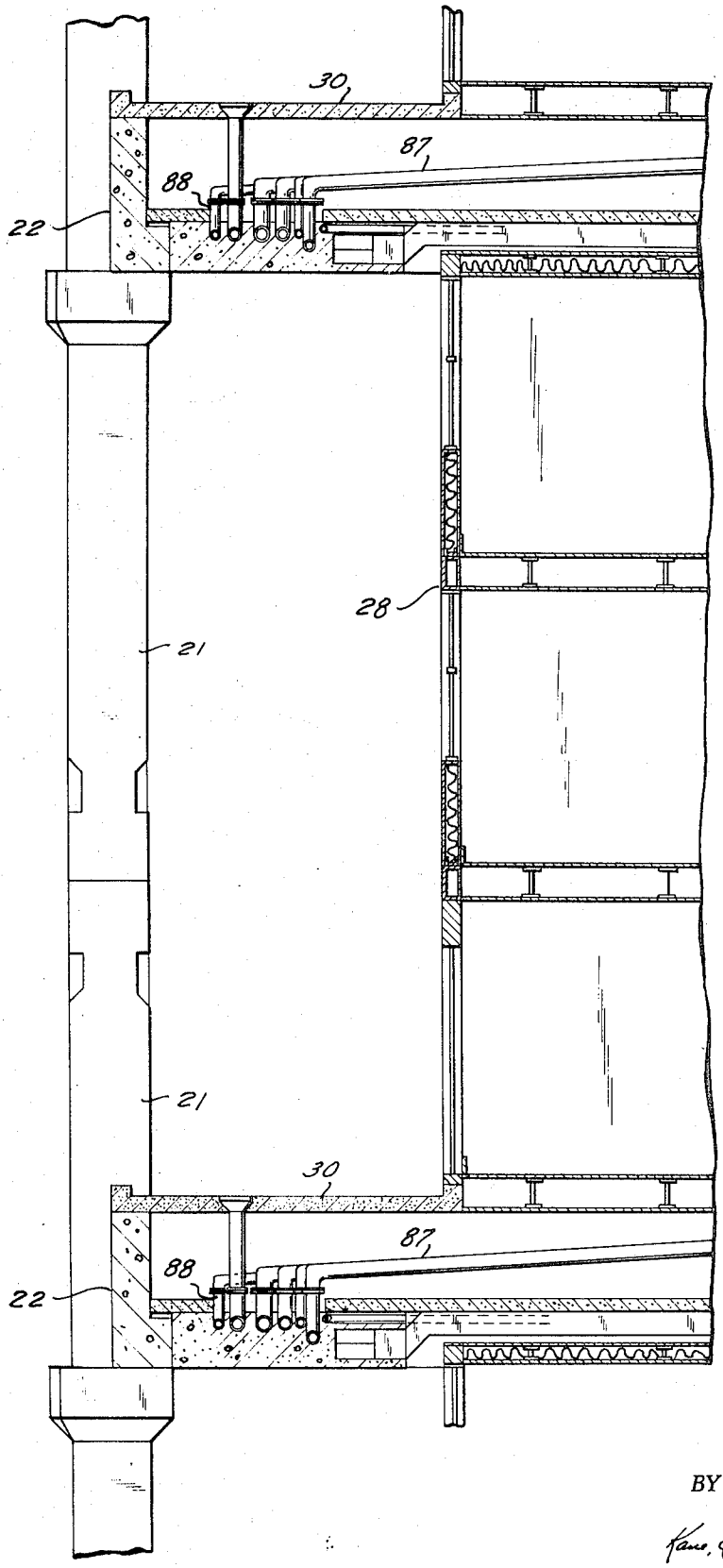


FIG. 17

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United States Patent Office 3,721,056 Patented Mar. 20, 1973

3,721,056

VERTICAL MODULAR CONSTRUCTION HAVING INSERTABLE UNITS

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Filed Sept. 3, 1970, Ser. No. 69,303
Int. Cl. E04h 1/04
U.S. Cl. 52—236 9 Claims

ABSTRACT OF THE DISCLOSURE

A modular frame system capable of being constructed in both a vertical and horizontal direction to a predetermined size and configuration. A plurality of spaced land structures in vertically tiered relationship are provided and each land structure has means thereon to permit the land structure to function the same as the ground surface structure of a building. A plurality of substantially vertical columns extend upwardly from the ground and the columns have beams thereon to support the vertically spaced land structures. The land structure and column support assemblies are adapted to receive at least one insertable core unit between each pair of spaced land structures in a manner that will permit each vertically inserted core unit to be connected to a land structure in the same manner as it would normally be connected to the ground surface.

BACKGROUND OF THE INVENTION

Meeting the nation's housing need is a complicated and enormous task. Many different approaches are being employed to accomplish the job. In recent years, it has become increasingly desirable to reside in some sort of suburban development. In this manner, the residents will gain the benefit of an individuality in housing facilities in comparison to his neighbor as well as being provided with a plot of land of his own. He is free to do what he wishes with this plot of land within certain zoning and other local restrictions.

In any event, it is clear that desirable residential housing draws its qualities in part from the land upon which it is built, and part from the manner in which it is related to the land and, most importantly, from the manner in which both land and house are related to the needs of the people who use them.

Since the amount of land available for individual housing projects is somewhat limited and will apparently become much more limited in the near future, it would be extremely advantageous to most effectively utilize the land available to greatest degree. For example, in building a development, it would be advantageous to not only provide for the creation of individual housing units, but also for the creation of synthetic land. With created land, sites can be provided for a variety of residential, commercial and institutional needs.

A concept of providing land surfaces in vertical arrangement extending upwardly from one base land surface in interspaced relationship with private dwellings positioned in the interstices of the vertical system gives the advantage of a suburban development expanded in a vertical direction rather than being limited to merely a horizontal expansion of the surban development. In fact, a system which can be expanded both vertically and horizontally would also be helpful in taking the greatest advantage of the land space available.

In this manner, the amenities and architectural variety of private dwellings with the land economy of high-rise

construction and the cost advantages of light-weight framing would be combined. A system of this type would hold almost unlimited potential for variations in use, size and design of individual units as well as for occupancy mix and for future expansion. It would equally be suitable for erection on vacant land, on top of presently developed suburban sites or in urban centers. For urban renewal, it offers the possibility of providing new air-right housing for tenants before displacing them and removing existing buildings.

By creating new land or structure equivalent to land surface, the housing erected in it can accommodate to all known ownership or tenancy arrangements and to possible new combinations. For example, building sites and residences may be sold, leased, or sub-leased separately or together. Home purchasers can select their sites and design their residences to suit taste, budget or family needs. Additionally, rent subsidies or supplements, where appropriate, could apply to the site, housing or both.

A system of this type would be specifically developed to be adaptable to a variety of technologies as well as varying rates of technology change.

SUMMARY OF THE INVENTION

The system of this invention satisfies the above discussed criteria in providing a most effective system for constructing vertically spaced artificial land structures above a base land structure with the frame system adapted to receive individual variable core units in the interstices of the lattice-like frame arrangement. The system is adapted to be expanded horizontally as well as vertically to cover the desired land surface area.

Basically, a modular frame system is provided capable of being constructed in both a vertical and a horizontal direction to a predetermined size and configuration. The system includes a plurality of spaced land structures in vertically tiered relationship with each land structure having means thereon so as to permit the land structure to function the same as the ground surface structure of a building. A plurality of substantially vertical columns extend upwardly from the ground and the columns have means thereon to support the vertically spaced land structures. The land structure and column support assemblies are adapted to receive at least one insertable core unit between each pair of spaced land structures in a manner that will permit each vertically inserted core unit to be connected to a land structure in the same manner as it would normally be connected to the ground surface.

The main frame or supported land system as described above includes columns, spandrel beams and deck slabs in interconnected relationship. The overall effect is to create grids enclosing regular open multi-story spaces. For example, the deck or land surfaces can be positioned at intervals of two or three stories and with vertical access and supporting services and utilities in place, the supported land system constitutes developed synthetic land.

Thereafter, for example, two or three story house units can be constructed on the separate tiers of the supported land system. These house units would be assembled on the supported land system from incombustible, pre-fabricated, light-weight metal framing and factory built mechanical and electrical boxes. Individual house units can be enclosed with a wide variety of materials to achieve desirable room arrangements and visual and textural effects, and to suit different occupancy requirements.

There are several other significant features of the relationship between the core units and the grid or frame which are of significance. Initially, the enclosures or core units built into the multilevel spaces of the grid or frame would not occupy all of the deck level. At every third level an elevated pedestrian street would traverse the

front of the house or core units and a system of private courtyards would traverse the rear. The land structures are designed to allow for earth fill, plainting, pedestrian traffic, drainage and access to utility ducts. It is well within the economical capabilities of the system to accommodate vehicular traffic and parking on upper levels as well as heavy community facilities, such as swimming pools.

Additionally, the enclosed spaces need not be limited to residential uses. As will become apparent from the following detailed description, continuous open spaces within a grid or frame would readily lend themselves to incorporation of business, commercial, educational, industrial and public or semi-public uses such as churches and theatres. In very large structures such occupancy mix may be desirable because of zoning, tax, school population or other considerations. Since enclosures are literally built into created spaces, it follows that they can be moved or changed at any future time if changes are made desirable by changing population trends, land utilization, zoning patterns or other social or economic requirements.

From the following drawings, the grid or frame structure may be designed so as to provide for a number of alternative arrangements of light-weight, typically, three-story high, house units. The system enables an unusually wide variety of dwelling arrangements finishes an aesthetic treatments to be possible. Furthermore, the exterior treatment of indivdual housing units is adaptable to a broad range of design interpretations including opportunities for balconies and a wide variety of overlapping or projected bays which add additional interior space and excitement to the exterior appearance. Each project can have a selected family of aesthetically related facade treatments dependent upon regional budgetry and individual selective factors within which a high degree of random and personal selection would still be possible.

The aesthetics of combining many similar units, particularly in housing where personal identification is important, is one of the most difficult problems in architecture. Solutions of this problem have been rare and generally expensive. In this solution, the widely spaced frame structure will provide a strong unifying and modulating framework for the housing units of the in-fill or core units. Through relatively inexpensive variation in column heights, changes of level can easily be established and the entire structure contoured, almost like a natural land form, into a distinctive over-all composition complementing the natural features of landscape, or preserving worthwhile city buildings, as the case may be.

This concept with its streets, lots and backyard offers many advantages. Having direct entry from the street gives a sense of identification to the occupants. The street is self-monitoring giving the neighborhood a natural security. The backyard is earth filled, providing opportunities for modest landscaping and a variety of out-of-door pleasures for children and adults well above the noise, pollution, and danger of the auto level street.

With the above objectives in mind, references is had to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a fragmentary perspective view of a modular frame system embodying the invention with an exemplary core unit positioned therein;

FIG. 2 is a fragmentary side elevation view thereof with several exemplary core units therein;

FIG. 3 is a fragmentary side elevation view thereof showing the system built on a graded land surface;

FIG. 4 is a fragmentary side elevation view thereof showing the system mounted on a second type of graded land surface;

FIG. 5 is an exploded perspective view of the basic components of a modular frame system of the invention with portions of the components having been broken away and removed;

FIG. 6 is a fragmentary top plan view of a modular frame system of the invention;

FIG. 7 is a fragmentary side elevation view thereof;

FIG. 8 is a fragmentary partially sectional elevation view thereof taken along the plane of line **8—8** of FIG. 6;

FIG. 9 is a fragmentary partially sectional side elevation view thereof taken along the plane of line **9—9** of FIG. 6;

FIG. 10 is a fragmentary sectional side elevation view thereof taken along the plane of line **10—10** of FIG. 6;

FIG. 11 is a fragmentary sectional side elevation view taken along the plane of line **11—11** of FIG. 6;

FIG. 12 is a fragmentary side elevation view thereof taken along the plane of line **12—12** of FIG. 6;

FIG. 13 is a fragmentary side elevation view thereof taken along the plane of line **13—13** of FIG. 6;

FIG. 14 is a fragmentary side elevation view thereof taken along the plane of line **14—14** of FIG. 6;

FIG. 15 is a fragmentary sdie elevation view thereof taken along the plane of line **15—15** of FIG. 7;

FIG. 16 is a fragmentary perspective view thereof; and

FIG. 17 is a fragmentary sectional elevation view of a modular frame system embodying the invention with an exemplary core unit positioned therein.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The system **20** as shown in FIGS. 1–5 principally consists of three basic components. These components are columns **21**, spandrel beams **22** and deck elements **23** all interconnected to form the vertical frame structure of the system having interspaced plane-like levels.

As shown, the deck elements or channels **23** are substantially U-shaped elements of predetermined length and are interconnected in side-by-side relationship. The adjacent open ends of the side-by-side channels **23** are mounted on and connected to spandrel beam **22**. A pair of opposing spandrel beams **22** are utilized in the system so as to mount adjacent channels **23** at both open ends. And spandrel beams **22'** are also employed to complete a deck structure.

The spandrel beams or elements **22** are L-shaped in configuration and are of predetermined length depending upon the length of the frame being constructed. Spandrel elements **22** are shaped to receive the deck elements or channels **23** in order to provide adequate seating, allow space for a mechanical supply package, as discussed below, and meet other dimensional requirements. It is preferable for uniformity that all spandrel elements **22** be identical.

Columns **21** are substantially square sections with bearing and connection elements **24** interspaced on its vertical height at the desired location of each artificial land surface or deck **25**. The columns are square sections with bearing and connection elements in the form of shoulder **26** and cantilever extension **27** extending therefrom at points on the vertical height of column **21** where a land surface **25** is to be connected. Mounting means are provided at these points as will be discussed in detail below to facilitate mounting of the land structures including the spandrel members **22** and channels **23** in order to form a land surface **25**.

All of the members including columns **21**, channels **23** and spandrel **22** are constructed of a pre-cast, prestressed concrete material or an acceptable similar material.

It can be readily seen how variations in column height can easily be achieved as well as interspacing between land surfaces. It has been found that a three-level height between land surfaces **25** has been found to work satisfactorily. Naturally, other varied spacings may be employed equally as well to provide interstices between land

surfaces 25 adapted to receive a core unit. It may also be readily seen how by using additional columns in parallel vertical relationship, the system 20 may be expanded horizontally as well as vertically to incorporate a greater number of units over a wider area of actual land surface.

As previously, discussed, each deck or land surface 25 is designed to carry three levels of housing, for example, earth fill and plating on the yard side, and the street load including pedestrian traffic, walkway slabs and mechanical utility elements 31. Elevators, stairs and mechanical shafts 32 utilize the floor deck components as wall elements with special stair and slab elements added as required. All utilities including electrical wiring, plumbing and similar systems may be vertically stacked in shaft 33 in interconnected relationship so that they may be separately connected to each land surface level 25. At each level they may be interconnected with a series of connecting conduits and pipes 31 extending under sidewalk 30 the length of the land surface 25. Thereafter, they may be connected to each individual core in-fill unit of housing 28 from the bottom by passing from conduits 31 through the U-shaped interior of channels 23 and into the individual housing units. In this manner, the frame system 20 is adapted to receive all utility connections and have them in position for connection to each individual housing or core unit 28 when inserted in the interstices between each pair of land surfaces 25.

FIGS. 3 and 4 demonstrate the ease in which the frame structure may be mounted to the regular land surface or terrain 34. No special excavation and foundation work is required for the system. Only isolated point foundations 35 at the base of the columns are needed to carry the column loads. All foundations for any one project are typical and may be selected from a number of basic foundation depending on the particular soil encountered. For example, the base foundation types include spread footings, caissons and pile foundations. The top of foundations 35 can be at existing grade level and connection to the precast columns 21 is made, for example, by means of high strength steel bolts. Naturally, the length of the individual pre-cast columns can be adjusted in the mold. As shown, in FIGS. 3 and 4, the frame system 20 is adaptable to all different types of grading and terrain in order to provide a vertical system of spaced artificial land structures. It should be kept in mind that land structures 25 are of a solid interconnected construction within the framework and as discussed above provide underneath space for utility attachment similar to the manner in which the same attachments may be run under ground to connect to a ground level structure. The system permits retaining of the contours of the natural land and its ecological features where this is either desired or required. Column heights can be varied in length within the standard mold at little cost. Naturally, system 20 is adaptable to a broad range of sizes and almost any kind of urban, suburban, rural or a new town situation. The mix of housing types can be adjusted to the specific size of the site and appropriate ancillary services can be intermixed or dispersed according to the circumstances of the project.

The forms for the three basic components can be designed to produce the numbers of each element required and to store them for curing and stockpiling. As will be discussed below, these elements when interconnected forms frame system 20, may be easily shipped and readily assembled at a desired site location. The system has been designed to insure standardization of components and to aid and facilitate the efficient construction of the completed system.

The vertical core type shaft units 33 which contain the utility, plumbing and similar connections are similar to those commonly used in construction of mobile home and sectional house industries. The vertical connectors are those commonly employed and connection at each land level is achieved in a conventional manner.

System 20 is based on the reasonable thesis that it is possible to erect a fully fireproof medium-rise or high-rise structure with fully code complying means of egress, in which every third floor is fully fire rated while the in-fill floors or core units including the residence areas of a lower rating of construction. With each third level being an artificial land surface level, each core unit of housing 28 is considered as a separate residence and can be fire rated and brought into accordance with other coding restrictions as if it were a ground level residence independent from other vertically positioned residences with respect thereto. Therefore, as stated previously, this system is based on the premise that one can erect a fully fireproof medium-rise or high-rise structure with fully code complying means of egress, in which every third floor is fully fire rated while the in-fill floors are of a lower rating of construction, provided the principal of limiting fire spread between adjacent dwelling units or other areas horizontally or vertically disposed to one another between the fireproof decks 25 be scrupulously preserved. The resultant system is a low cost, high volume, economic housing developing which makes efficient use of available space while maintaining the building code advantages existing with a ground level horizontal residential development.

FIG. 8 illustrates in detail how each spandrel 22 is connected to a column 21. A rectangular recess 34 is provided in the lower end portion of spandrel 22 so that the end portion 35 of spandrel beam 22 rests on bearing surface 26 of column 21. A shim 36 may be positioned between these engaging surfaces for facilitating assembly of the members. The interconnection between spandrel beam 22 and column 21 occurs at two points. Bolt and plate assembly 37 attaches the column to the lower portion of spandrel beam 22 and a long bolt assembly 38 attaches column 21 to the upper portion of spandrel beam 22. It may be noted that the exposed end of nut and bolt assembly 38 is covered by grout 39 after assembly has been accomplished. In this manner, both ends of each spandrel beam 22 may be mounted to a pair of adjacent columns 21.

FIG. 9 discloses one of the connectors between each channel or U-shaped deck unit 23 and the spandrel beam. As previously discussed, the spandrel beam is L-shaped in configuration so that each adjacent U-shaped channel may readily be seated in communication with the two adjacent rectangular walls of the spandrel beam. As shown in FIG. 9, a rectangular bolt and plate assembly 40 is utilized to make the connection with bolt and plate assembly 40 conforming in configuration to the L-shaped surface of spandrel beam 22 adjacent to channel member 23. A pair of base plates 41 and 42 are mounted in accommodating recesses in spandrel 22 and channel 23 respectively to receive L-shaped bracket member 43 in interconnected relationship accomplished by means of bolts 44 and 45 respectively. As shown, anchor members 46 facilitate the retention of plate 41 within spandrel beam 22. The illustration of connection in FIG. 9 represents the manner in which the base portion of channel 23 is mounted to spandrel 22.

FIG. 10 illustrates the manner in which each of the U-shaped extending vertical arms of channel 23 is mounted to spandrel 22. Bolt and plate assembly 47 is utilized to establish each of these connections required by frame system 20. A right-angle plate 48 has its longest side bolted to the vertical extending side of channel 23 by means of bolts 49 and has its shorter perpendicular side bolted to plate 50 mounted in a recess in the upper portion of spandrel beam 22. An anchor member 51 is employed to maintain plate 50 in position. The actual assembly between spandrel and channel is accomplished by means of bolts 52. So, in summary, each channel is connected to a spandrel at both ends of the channel and the connection is made between the base of the channel and

the spandrel beam and each vertical arm of the U-shaped channel and the spandrel beam to facilitate the formation of a solid artificial land surface **25**.

FIG. 11 discloses the manner in which channel **23** is seated on spandrel **22** by means of a polyurethane pad **24** inserted between the undersurface of channel **23** and its resting surface on L-shaped spandrel **22**. An anchored plate **53** in an accommodating recess in spandrel beam **22** and anchored in position by means of anchor members **54** forms a base for the polyurethane pad which engages on its upper surface with a corresponding plate **55** opposite the plate **53**. Plate **55** is in an accommodating recess on the undersurface of channel **23**. An opening is provided in polyurethane pad **57** to receive a locking bar **56** extending upwardly from plate **53** in spandrel **22** to assure that pad **57** remains in proper position in engagement with both channel **23** and spandrel **22**. In this manner, the end of each channel **23** is positively seated on the appropriate surface of L-shaped spandrel beam **22**.

Cantilever member **27** extending inwardly from each column **21** is mounted on each of its sides to an adjacent channel member **23** or end spandrel beam **22'**, if appropriate. FIGS. 12 and 13 shows an exemplary connection between a column cantilever **27** extending inwardly from an end column so that it is connected on its inward side to a channel member **23** and its outward side to an end spandrel member **22'**. The connection is achieved at two points along the length of the cantilever member with each connection being shown respectively in FIGS. 12 and 13. FIG. 12 shows the connection between the three adjacent members at a point on the length of the cantilever member **27** close to column **21**. The connection is made by means of a long bolt and nut assembly **58** extending through aligned openings in all three members. Appropriate sleeves **59** are provided on the circumference of the openings in the three members and plates are provided in accommodating recesses on the adjoining surfaces of each of the three members to facilitate passage of the bolt therethrough. It will be noted that spacers **60** are provided between each successive pair of connected members to maintain proper alignment. Similarly, end covers **61** are employed to cover the nuts **62** which are applied to each end of the bolt to achieve the interconnection between members.

In FIG. 13, the connection between the three same members, that is end spandrel **22'**, cantilever **27** and channel **23** is shown at a point remote from column **21** in respect to cantilever **27**. The connection is made in a somewhat different manner in that a transverse projecting member **63** extends from both sides of cantilever **27** into accommodating recesses **64** and **65** in channel **23** and end spandrel **22'** respectively. Transverse member **63** has passages therethrough adjacent its remotes ends to receive a pair of bolts **66** extending down through aligned openings in channel **23** and spandrel **22'** respectively. Vertical bolts **66** are fastened to transverse member **63** by means of end nut **67** to thereby provide an interlocking relationship between the three members, end spandrel **22'**, cantilever **27** and channel **23**. Once again, the passageways in spandrel **22'** and channel **23** are accommodated with metallic linings or sleeves **68** to retain the proper configuration and alignment of the openings through which bolt **66** must pass. Also, interengaging plates **69** and **70** are present in both channel **23** and end spandrel **22'** to provide a positive retention surface for the top end of bolts **66** and particularly the head portion thereof. Once this connection has been accomplished, as shown in FIG. 13, grout may be utilized to fill in the recesses in end spandrel **22'** and channel **23** which are utilized to receive the bolt and nut locking assemblies along with the transverse member **63** from cantilever **27**. Therefore, by means of the interconnections as shown in FIGS. 12 and 13, column **21** is intrconnected with channels **23** and end spandrels **22'**.

Each pair of adjacent channels **23** on supported artificial land structure **25** are connected at a point adjacent to the upper end of each adjacent member by means of nut and bolt assembly **71** as shown in FIG. 14. Each channel **23** has a lateral projection extending from the upper end of each arm and these lateral projections are in close proximity to the nearest lateral projection of the next channel **23**. A passage extends through channel **23** and through lateral projection **72** in alignment with a corresponding passage of the next adjacent channel so that a long bolt **73** may pass through both channels and with fastener **74** position on each end of bolt **73** the two adjacent channels are interconnected. As many of these channel-to-channel connections by means of assemblies **71** can be utilized along the length of channels **23** as is desired. Once again, a metal sleeve **75** is employed in the passageways to protect against deterioration of the prestressed concrete beams by isolating the beams from contact with bolt **73**. For similar reasons end plates **76** are positioned on either end of the assembly so that when fasteners **74** are engaged to interconnect adjacent channels **23** in positive tight engagement, no damage will occur to concrete beams **23**. The metal sleeves and plates employed with the previous nut and bolt assemblies function in a similar manner. As may be noted from FIG. 4, the central opening between lateral projections **72** is filled with grout to cover the central portion of bolt **73** and to facilitate the formation of a continuous surface engagement between adjacent channels **23** of artificial land structure **25**.

In fastening two columns in vertical relationship, FIG. 15 illustrates the type of nut and bolt connection employed to achieve this interengagement. Naturally, the number of assemblies employed for each column-to-column engagement, is a matter of choice. One sample is illustrated in FIG. 15. A detent is provided in each column **21** for access to the bolt and nut assembly **78**. As may be noted, the lower end of bolt **80** of assembly **78** has a hooked portion which is in a receptacle **81** within the column. Similarly, the bolt extending upwardly from the lower column engages with the receptacle to form the locking arrangement between columns **21** arranged in a vertical fashion. Naturally, as explained above the number of columns of this type in vertical attachment is a matter of choice depending upon the desired height of the building. Openings are provided in the columns and are positioned so that when the columns are brought into mating relationship, the passageway will become aligned to permit passage of bolt **80** of nut and bolt assembly **78** through both adjoining columns. Thereafter fasteners **82** may be applied to bolt **80** to lock both columns together. Once again a metal sleeve **83** is provided in the passageway surrounding the bolt to protect the concrete column **21** from damage which might come with engagement with the bolt during assembly or over a prolonged period of time. Similarly, plates **84** are provided adjacent to the fastener so that when the bolts are fastened the fastener will not directly contact the concrete but will contact metal plates **84** and avert damage to the prestressed concrete column **21**. The interspaces between adjacent columns are maintained in alignment and are held at a uniform dimension across the cross section of the columns by means of shims **85** initially positioned between the members. The remainder of the space between columns after fastening of the assembly is filled with grout **86** to provide the uniform and smooth appearance for the entire vertical height of the assembled columns **21**.

In FIG. 17, it is readily illustrated how the mechanical elements pass through the conduits **31** beneath the street or sidewalk portion **30** from initial vertical shaft **33** and are thereafter connected with a three-story vertical structure. The connecting elements **87** pass from the street connections through the hollow interior portion of U-shaped channels **23** and are thereafter connected as desired to the three-story structure. The particular core unit of housing, in this instance, a three-story unit, **28** is mounted in

conventional fashion between each of two vertically spaced land level structures 25. Conduits 87 extending through the open space between the sides of a lateral channel 23 facilitate connection to each three-story core unit 28 either from the top or the bottom. Conventional adapter connectors 88 are utilized to facilitate connection of the mechanical conduits under the sidewalk portion 30 of frame structure land surface 25 to the individual core units 28. In this manner, infill core units 28 may be inserted into the interstices of the frame system 20 after it has been constructed to a predetermined configuration vertically and horizontally. There is no limit to the differences in configuration that may be employed for each individual in-fill or core unit 28 so that a completely non-uniform suburban type development may be constructed on the frame system 20 in a vertical as well as horizontal direction. This is facilitated by the fact that each land surface 25 is equivalent to a ground surface as a foundation functional unit for a residential housing unit. In this manner, mixed classes of construction may be vertically provided to gain the advantages of the space saving factors involved as well as the economic and low cost construction features discussed above while not materially detracting from the fire preventional as well as other safety values gained from building individual houses on a plot of ordinary land.

Thus, the above discussed objectives are effectively attained.

I claim:

1. A modular precast concrete frame system capable of being constructed in both a vertical and horizontal direction from a ground surface to a predetermined size and configuration without vertical shear walls comprising: a plurality of spaced fire resistive land structures in vertically tiered relationship and each land structure having means thereon so as to permit said land structure to function the same as the ground surface of a building, a plurality of substantially vertical columns extending upwardly from the ground and said columns having means thereon to support said vertically spaced land structures including a support member extending horizontally inwardly of the frame from each of a predetermined number of the columns and being connected to a land structure to provide transverse support for the system against wind forces and eliminate the necessity of vertical shear walls in the system, said land structure and column support assemblies being adapted to receive at least one insertable core unit between each pair of spaced land structures with one of the spaced land structures positioned so as to protect substantially the entire undersurface of a core unit thereby permitting each vertically inserted core unit to be connected to to a land structure in the same manner as it would normally be connected to the ground surface; each of said land structures including a plurality of U-shaped channels arranged in side-by-side interconnected relationship, the open side of the U-shaped channels facing upwardly thereby providing for a substantially camber-free surface on which to mount the core units, a pair of L-shaped side spandrel beams mounted on said columns and having the open end portion of said U-shaped channels mounted thereto, and said columns, U-shaped channels spandrel beams, and support member being interconnected so as to form a modular frame system of one land structure connected to said plurality of vertical columns.

2. The invention in accordance with claim 1 wherein a predetermined number of vertically spaced land structures with each land structure including channel members and spandrels for connection to said columns are provided to provide a multi-level modular frame system, and the land structure being spaced apart at least two conventional floor levels.

3. The invention in accordance with claim 1 wherein each of said columns is substantially rectangular in configuration, a plurality of vertically spaced shoulders extend from the perimeter of said column with each of said shoulder providing support for one of said land structures, said support member including a cantilever member extending from one side of said column adjacent to the upper surface of said shoulder and connected to said land structure supported by said shoulder by interconnection with at least one side wall of an adjacent U-shaped channel to thereby provide additional support for said land structure.

4. The invention in accordance with claim 3 wherein the shoulder on said column supports the end portion of each of the adjacent spandrel beams, and bottom connector means and top connector means are provided to fasten the spandrel beam to the column at both the top portion and the bottom portion of the spandrel beam.

5. The invention in accordance with claim 1 wherein each L-shaped spandrel member has a vertical inner surface and a horizontal inner surface which is adapted to receive the end portion of said U-shaped channel members, a top connector means for connection of the top portion of each U-shaped channel means to said spandrel member and a bottom connection assembly for connection of the bottom of said U-shaped channel member to said spandrel to facilitate the construction of a strong land structure.

6. The invention in accordance with claim 5 wherein a polyurethane pad is positioned between the undersurface of each channel member and the upper horizontal resting surface of said L-shaped spandrel to facilitate the construction of a desired land structure.

7. The invention in accordance with claim 3 wherein a proximate connector assembly is provided to faciiltate connection of said cantilever member of said column to adjacent members of said land structure, and a distal connector assembly is provided to connect the portion of said cantilever member distal from said column to each adjacent portion of said land structure thereby facilitating the connection of said land structure to said columns.

8. The invention in accordance with claim 1 wherein at least one channel connector assembly is provided for each two adjacent U-shaped channels to facilitate the connection between said channels thereby assisting and providing a desired strength land structure.

9. The invention in accordance with claim 1 wherein column connector assembly means are provided for fastening each two vertically aligned adjacent column members thereby facilitating the construction of substantially strong vertical columns of desired height.

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