United States Patent [19]

Kelbish

[11] **3,835,601**

[45] **Sept. 17, 1974**

[54] **MODULAR CONSTRUCTION SYSTEM**

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[22] Filed: **Jan. 10, 1973**

[21] Appl. No.: **322,505**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 176,549, Aug. 31, 1971, Pat. No. 3,716,954.

[52] **U.S. Cl.** **52/79,** 52/236

[51] **Int. Cl.** **E04g 1/04**

[58] **Field of Search** 52/79, 236

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Primary Examiner—Frank L. Abbott
Assistant Examiner—Leslie A. Braun

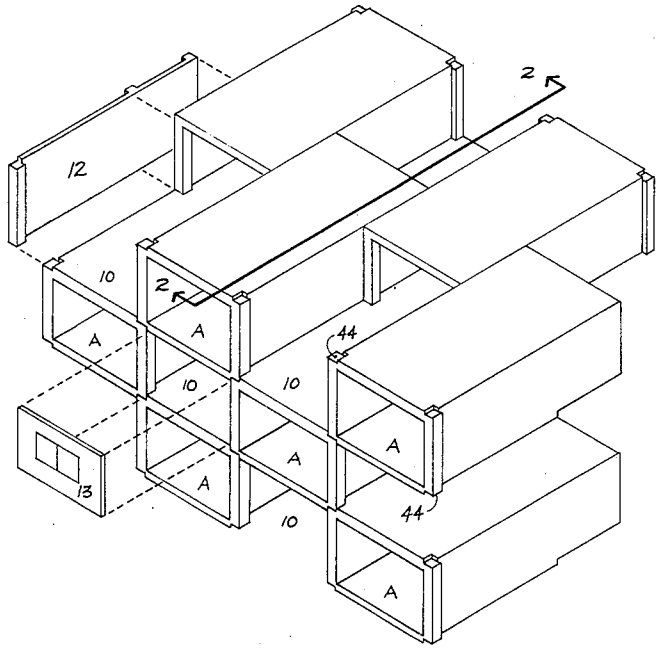
[57] **ABSTRACT**

A modular construction system which utilizes a plurality of preformed box-shaped modular units, which include a factory installation of all kitchens, bathrooms, closets, interior partitions, stairs needed for the proper functioning of the enclosed spaces.

These modular units are stacked in a predetermined manner to form a variety of efficient, easily planned multi-level residential buildings which maximize the advantages of both overlapped and staggered modular assembly.

In some embodiments the preformed box-shaped units have support columns cast with the side walls and in other embodiments the units include load-bearing side walls in the areas of the unit overlap. In some embodiments the overlapped and staggered areas of the building are jointly formed by the individual modules and in other embodiments the areas are separately formed by the individual modules.

17 Claims, 20 Drawing Figures



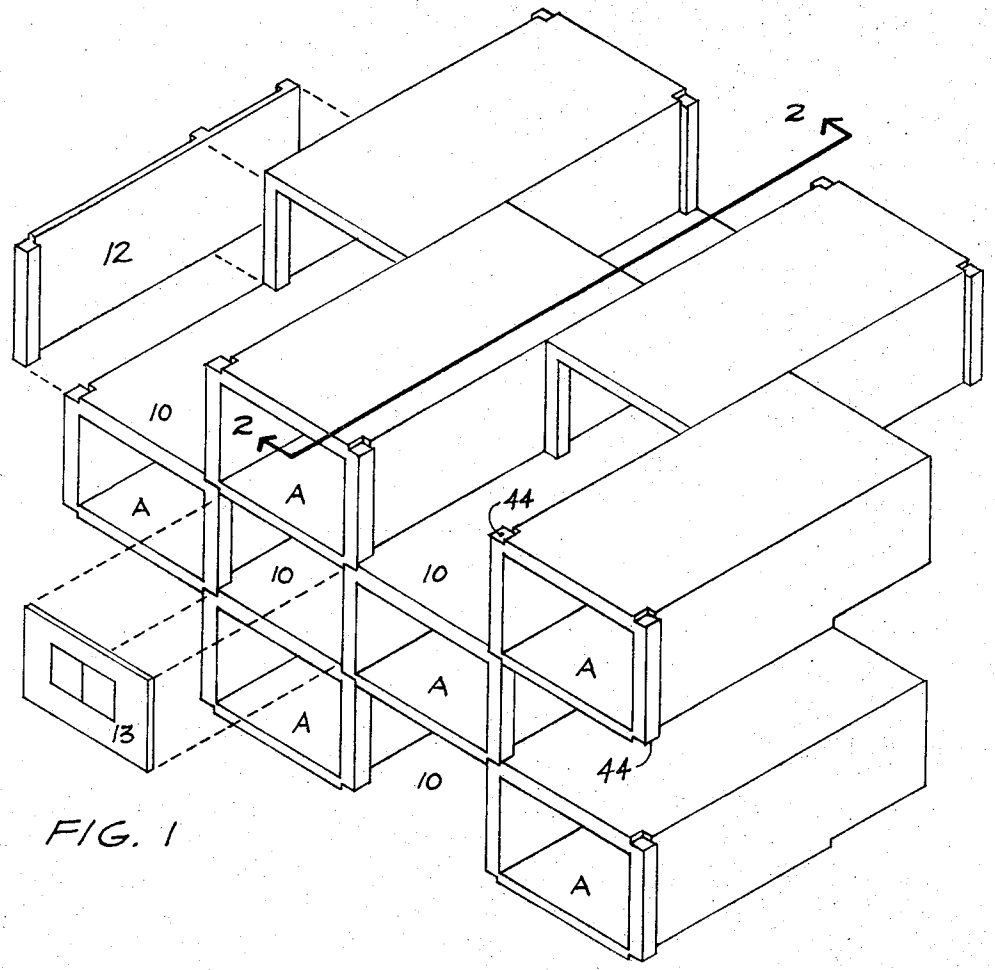


FIG. 1

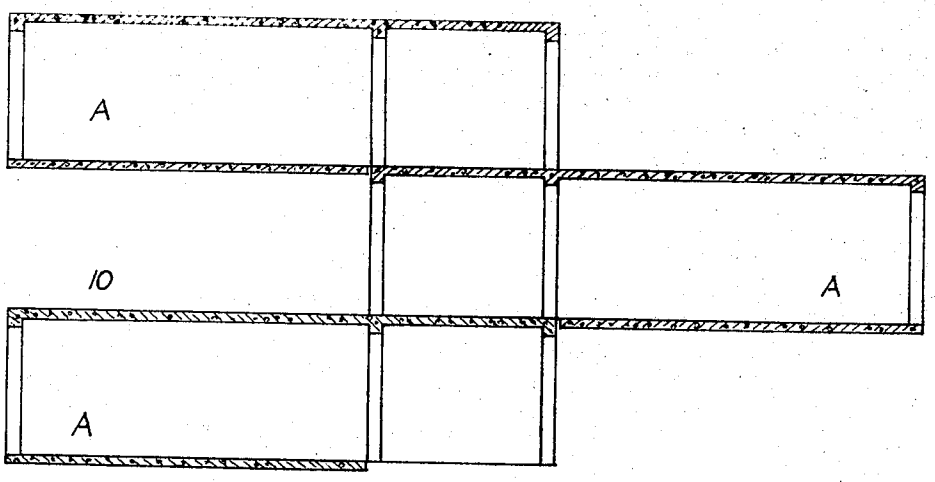


FIG. 2

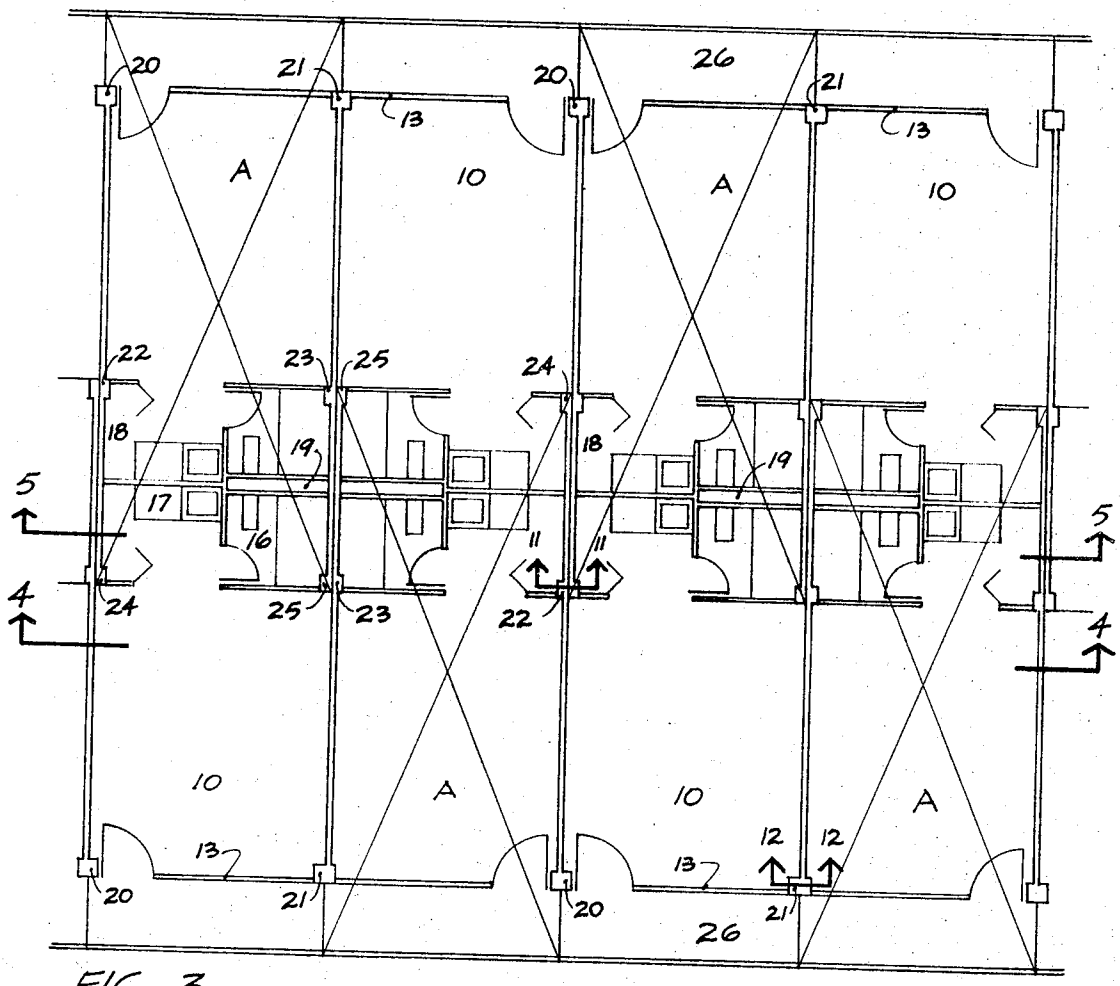


FIG. 3

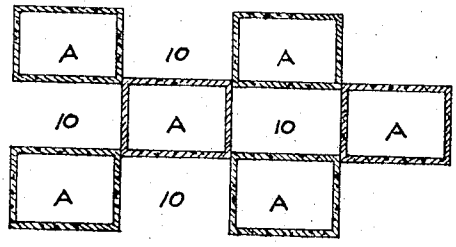


FIG. 4

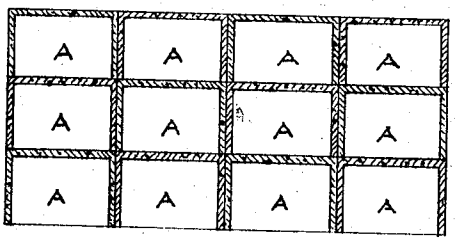


FIG. 5

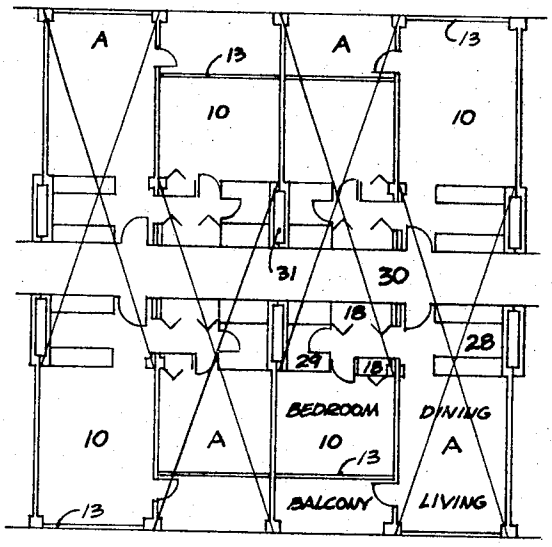


FIG. 6

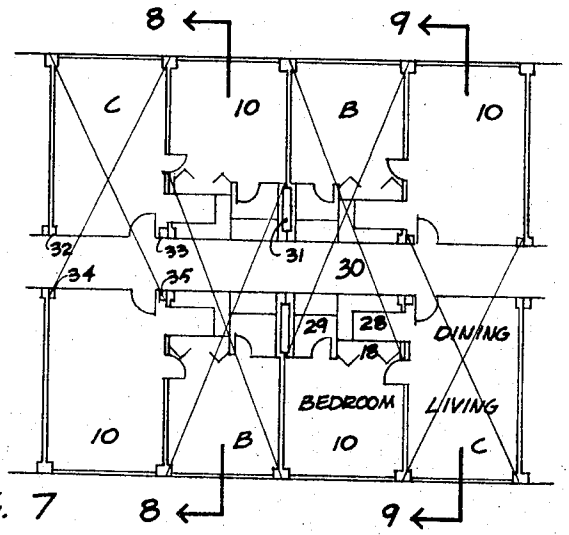


FIG. 7

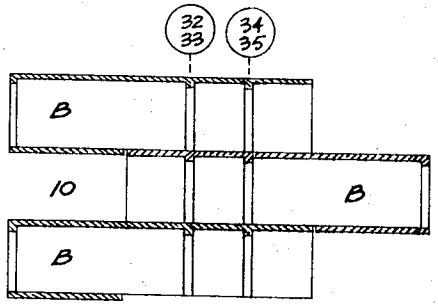


FIG. 8

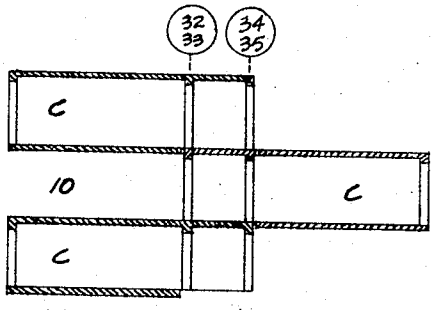


FIG. 9

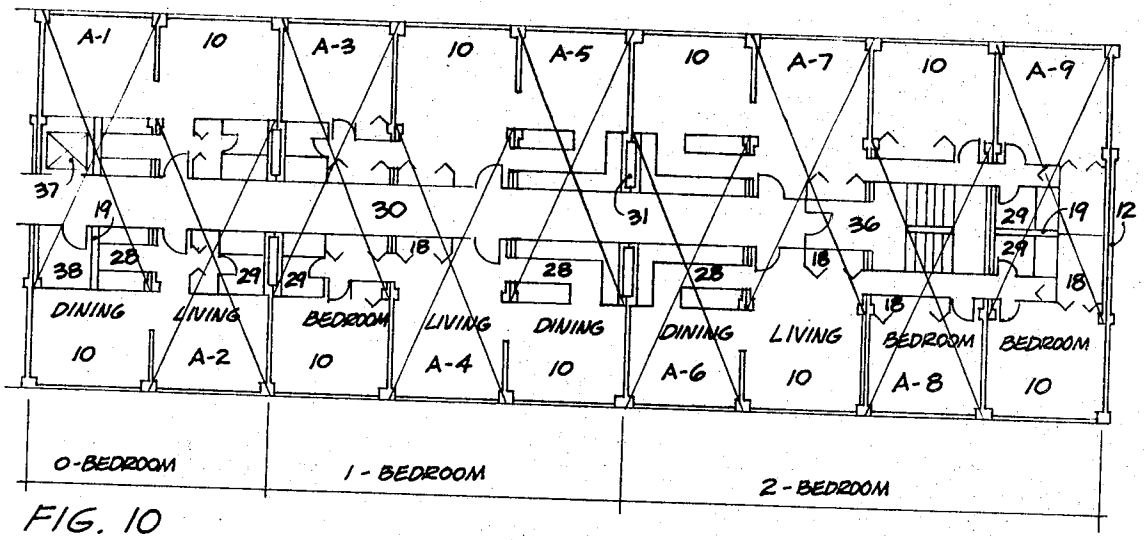


FIG. 10

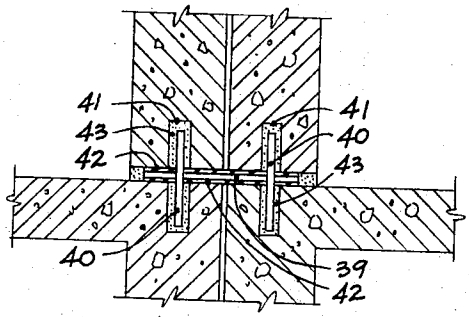


FIG. 11

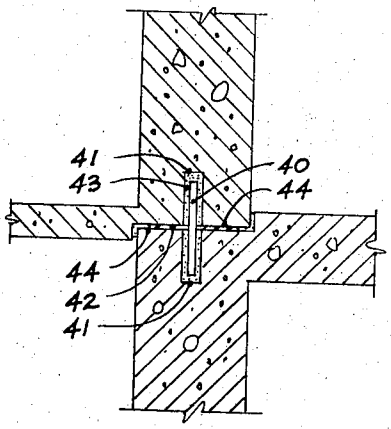


FIG. 12

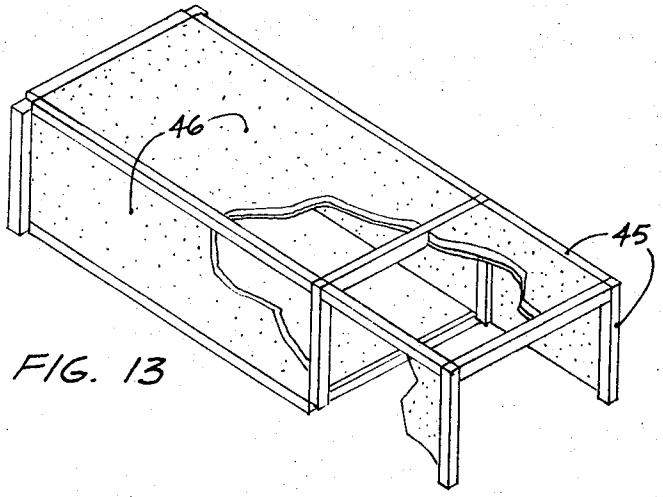


FIG. 13

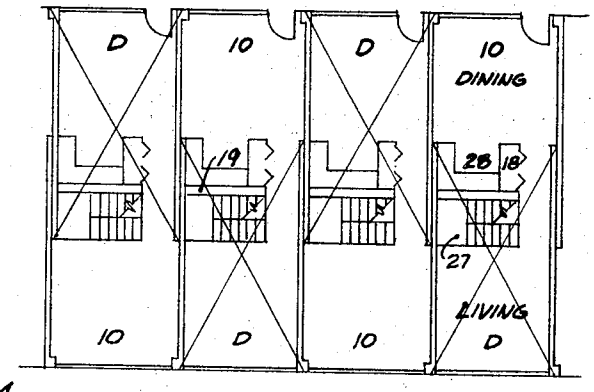


FIG. 14

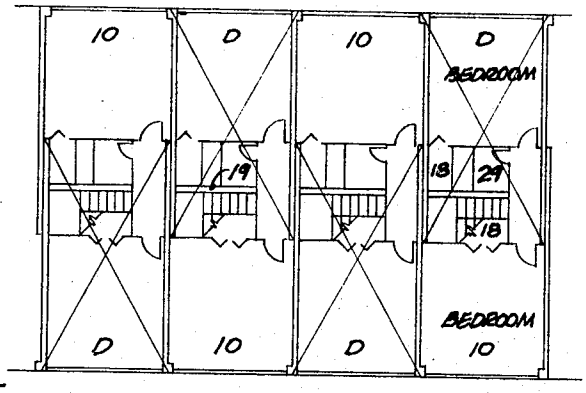


FIG. 15

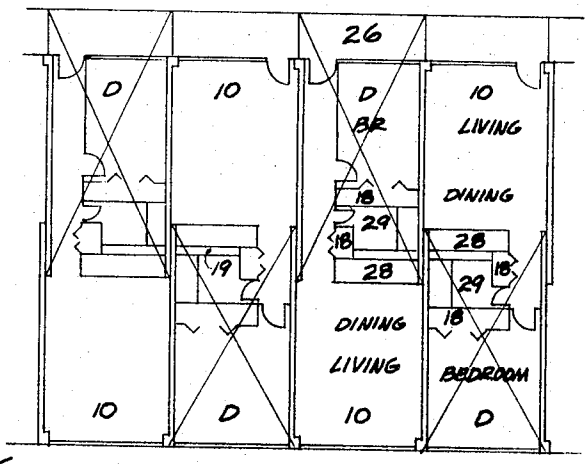


FIG. 16

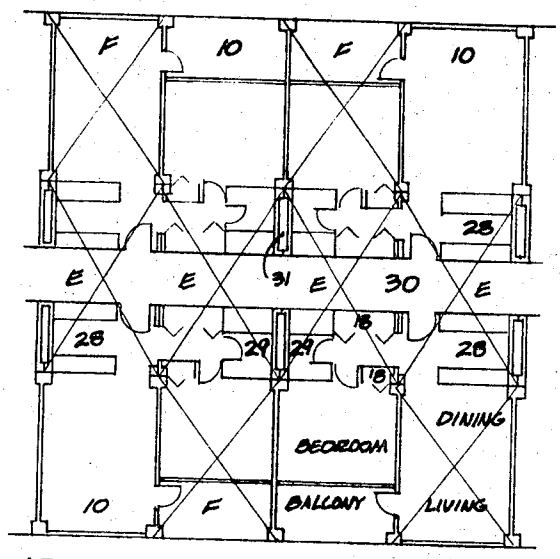


FIG. 17

FIG. 19

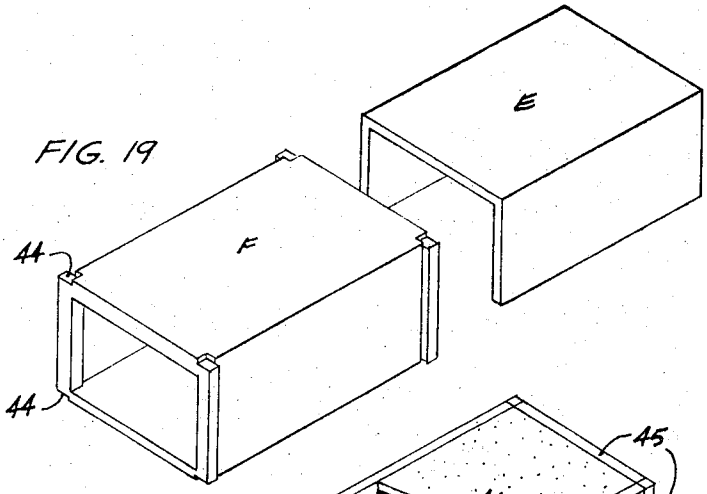
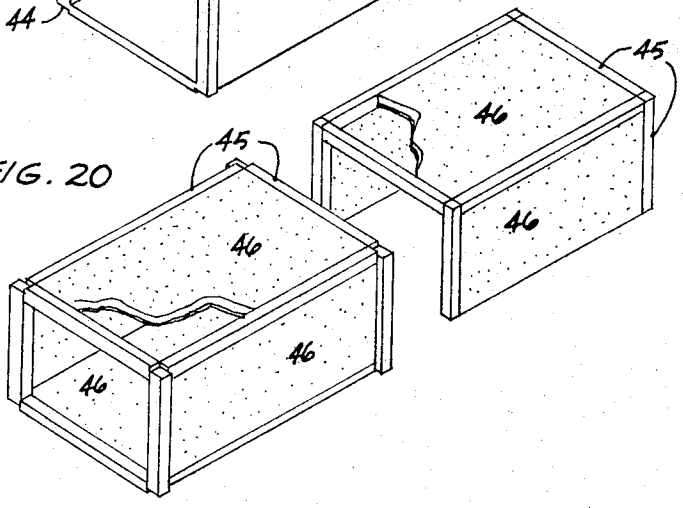


FIG. 20



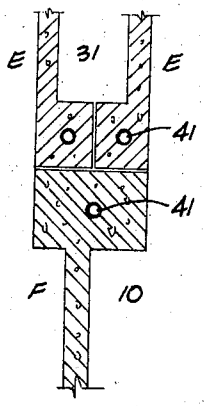


FIG. 18

MODULAR CONSTRUCTION SYSTEM

RELATED U.S. APPLICATION DATA:

Continuation-in-part of Ser. No. 176,549 Aug. 31, 1971 now U.S. Pat. No. 3,716,954.

BACKGROUND OF THE INVENTION:

This invention relates to multi-level residential buildings of modular design and more particularly to buildings formed of factory produced boxshaped modular units which are stacked in a predetermined manner in order to maximize the advantages of both overlapped and staggered modular assembly.

A primary object of the present invention to provide a novel, economical, and improved construction system comprised of a plurality of factory produced box-shaped modules which are appropriate to residential buildings.

Another object is to provide a modular system of stacked box-shaped modules which substantially reduces the duplication of floors and walls.

Another object is to provide a modular system which allows the length of its modules to be less than the width of the building they form and therefore permits these modules to be more easily fabricated, transported and stacked.

A further object is to provide a modular system that reduces costly field work by allowing all bathroom and kitchen utilities, stairs, closets, interior partitions to be installed and finished in the constructed modules at the factory.

A further object is to provide a modular system which can adjust to a wide variety of building types in which the modules alone form the support structure during erection and in the final building.

Other objects, advantages, and applications of the present invention will be made apparent by the following detailed description of the invention.

SUMMARY OF THE INVENTION:

Briefly, the foregoing objects are accomplished by employing a plurality of column supported box-shaped modular units which are preformed in two stages with side walls, columns, roof slab being cast first as a partial unit and then cast to a floor slab to form a single unitary and structural modular unit.

These modular units include a factory installation of all kitchen and bathroom utilities, closets, interior partitions and stairs needed for the proper functioning of the enclosed public and private spaces.

The units are always less than the width of the building they form and when shipped from factory to building site are acceptable for over-the-high-way transportation with lengths less than the 40 foot maximum for conventional trucking.

In forming a building structure these modular units are placed on a constructed foundation in a "partial by-pass" relationship to adjacent and similar units on the same level, and are stacked in a "partial overlap" and "partial staggered" relationship to similar units on the adjacent lower and upper levels. The "partial by-pass" and "partial overlap" would occur in an interior area or zone of the building structure where kitchens, bathrooms, closets, interior corridors and stairs are located. This allows mechanical shafts to be freely located with substantial cost savings since apartments can be flexibly planned with kitchen and bathroom utilities grouped on both sides of a common vertically matched mechanical shaft.

The "partial staggered" areas would occur in the outward or perimeter side areas of the building structure where the open habitable spaces are located and therefore obtain the advantages of spaces created in which the walls, floors and ceilings are formed from adjacent modular units.

In the present invention the above mentioned cast floor slab would be limited to the "partial staggered" unit area with the floor in the "partial overlap" areas being formed from the roof slab of the adjacent lower level modular units. The cast roof slab and side walls in the "partial overlap" areas would provide the enclosure and support surfaces for the factory installed kitchen and bathroom utilities, and partition walls.

These modular units are structurally related to each other by support columns which are cast with the side walls of the unit. In the area of the "partial overlap" units, a plurality of vertically aligned interior columns permit the stacking of one modular unit directly over a lower and adjacent unit. In the area of the "partial staggered" units, two vertically aligned offset exterior perimeter columns of the upper level unit stack directly over the corner offset exterior perimeter columns of the adjacent units on the lower level.

All columns are vertically aligned from one level to another by means of bearing plates with alignment prongs. These prongs are inserted into preformed sleeves which are cast into the upper and lower bearing surfaces of the support columns.

The interior columns of adjacent modules are horizontally aligned and tied to each other by the same bearing plates which are double-width to interlock the adjacent pair of interior columns and act as shear plates for the "partial by-pass" and "partial overlap" area of the building structure.

In high-rise structures, the vertically aligned exterior perimeter columns would be post-tensioned from the uppermost unit level to the foundation structure by either bolting each perimeter column to its lower level perimeter column or by continuous tension rods placed in sleeves cast within each perimeter column.

In addition, the system permits the floors of the formed building structure to be level and contiguous by means of recessed perimeter column bearing seats in the area of the "partial staggered" units.

The present invention also illustrates the option of providing loadbearing side walls for each module in the areas of partial unit overlap which would be appropriate to low-rise construction. In addition, the present invention illustrates the option of reducing the overall length and therefor the lifting weight of the modular units by providing separate preformed modules for the overlapped and staggered building areas.

BRIEF DESCRIPTION OF THE DRAWINGS:

FIG. **1** is a perspective diagrammatic view of the preformed 'A' modular units and sub-components of the modular building system in accordance with the present invention.

FIG. **2** is a transverse diagrammatic sectional view along line **2—2** in FIG. **1** showing the relationship of three vertically stacked preformed 'A' modular units.

FIG. 3 is a part plan of a motel or domitory type building with exterior corridors utilizing 'A' modular units.

FIG. 4 is a diagrammatic sectional view along line 4—4 in FIG. 3 showing the vertical relationship of the 'A' modular units.

FIG. 5 is a diagrammatic sectional view along line 5—5 in FIG. 3 showing the vertical relationship of the 'A' modular units.

FIG. 6 is a part plan of a residential type building with a double loaded interior corridor utilizing 'A' modular units.

FIG. 7 is a part plan of a residential type building with a double loaded interior corridor utilizing 'B' and 'C' modular units.

FIG. 8 is a transverse diagrammatic sectional view along line 8—8 in FIG. 7 showing the relationship of three vertically stacked preformed 'B' modular units.

FIG. 9 is a transverse diagrammatic secional view along line 9—9 in FIG. 7 showing the relationship of three vertically stacked preformed 'C' modular units.

FIG. 10 is a plan of one half of a residential type building with a double loaded interior corridor utilizing 'A' modular units.

FIG. 11 is a vertical section detail view along line 11—11 in FIG. 3 showing the vertical alignment of the interior columns of four modular units in the area of the partial by-pass and partial overlap.

FIG. 12 is a vertical section detail view along line 12—12 in FIG. 3 showing the vertical alignment of the offset exterior perimeter columns of two modules in the area of the partially staggered units.

FIG. 13 is a perspective diagrammatic view of a prefabricated modular unit in accordance with the present invention.

FIG. 14 is a part plan of the lower level of a townhouse type building utilizing 'D' modular units.

FIG. 15 is a part plan of the upper level of the townhouse type building in FIG. 14 utilizing 'D' modular units.

FIG. 16 is a part plan of a residential type building with an exterior corridor utilizing 'D' modular units.

FIG. 17 is a part plan of a residential type building with a double loaded interior corridor utilizing 'E' and 'F' modular units.

FIG. 18 is a plan section view showing the horizontal alignment of the corner columns of two 'E' modular units with the corner column of an 'F' modular unit.

FIG. 19 is a perspective diagrammatic view of the preformed 'E' and 'F' modular units in accordance with the present invention.

FIG. 20 is a perspective diagrammatic view of prefabricated modular units in accordance with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS:

Referring now to the drawings wherein similar characters of reference represent corresponding parts in each of the several views and cross diagonal lines are used in the drawn plan and part plan views to differentiate the horizontally interconnected modular units:

Referring to FIG. 1, a perspective diagrammatic view is shown of the preferred relationship of the preformed 'A' modular units to each other when they are stacked to form a building structure. In this relationship the 'A' modules moving in either direction partially by-pass other 'A' modules on the same level moving in the opposite direction. Further, the 'A' modules of upper levels are placed in a partially overlapped and partially staggered relationship to 'A' modules on the lower and adjacent level. In the areas where these modules are partially staggered, spaces 10 are created in which the walls, floors and ceilings are formed from adjacent 'A' modules.

FIG. 1 also shows the field installed side 12 and end wall 13 subcomponents which are required to enclose the perimeter of the building structure at the points of the created spaces 10. The end wall enclosure panel required to enclose the habitable space of the 'A' modular unit is not shown here and would be factory installed in the constructed module. The side wall subcomponents 12 are located at the ends of the building structure and are positioned with the 'A' modules of the same level to allow the placement of the first and last 'A' modular units of the upper and adjacent level. At the uppermost module level roof panels are used to provide the ceiling enclosure for the created spaces 10.

Referring to FIG. 2, a transverse diagrammatic sectional view is shown indicating the vertical alignment of the preformed 'A' modular units when they are stacked to form a building structure as in FIG. 1. In this vertical alignment the 'A' modules partially overlap each other at the central part of the formed building.

Referring now to FIG. 3, a part plan of a motel or dormitory type building is shown indicating the horizontal alignment of the preformed 'A' modular units and the functional use of the building they form. Shown, also, is the plan location of the support columns which are cast with the side walls of the modular unit and transmit the full weight of the module to the columns of the adjacent 'A' modules on the level below.

The partial by-pass of the 'A' modules on the same level is shown and the location of the vertically aligned interior columns 22, 23, 24, 25 which frame and define the area of the partial unit overlap. Shown, also, in FIG. 3 are the vertically aligned offset exterior perimeter columns 20, 21 in the partially staggered unit areas. These offset perimeter columns 20, 21 are cast so that their center-line is slightly to the outside of the outside face of the side walls of the modular unit. This permits the floor corner of the upper level unit to slightly by-pass the roof corner of the lower and adjacent units in the partially staggered unit area. (See FIG. 4). The said perimeter columns 20, 21 are stacked directly over and are vertically aligned with the adjacent and lower corner columns of the units below. These perimeter columns 20, 21 have recessed column bearing seats 44 of a combined depth approximately equal to the thickness of the floor slab and allow the units to have a level and contiguous floor alignment with the floor of the areas created 10 by the staggered units. (See FIG. 12.)

FIG. 3 shows the functional grouping of the factory installed bathroom utilities 16, 17, in-unit mechanical shafts 19, closets 18 and interior partitions needed for the proper functioning of the apartments they comprise in the area of the partial unit overlap.

This allows the efficient planning of plumbing utilities with a shared freely located in-unit mechanical shaft 19 and the factory installation of substantially all interior work needed for the apartment spaces.

In this particular design the access to the apartment would be from an outside corridor **26,** which is cast as a cantilever slab with the floor and roof of the modular units, and would connect with an exterior placed stair and/or elevator facility.

Referring to FIG. **4** and FIG. **5.** Both embodiments are diagrammatical sectional views taken along lines **4—4** and **5—5** in FIG. **3.** FIG. **4** shows the vertical relationship of the preformed 'A' modular units in the area of the partially staggered modules. FIG. **5** shows the vertical relationship of the preformed 'A' modular units in the area of the partially by-passed and partially overlapped modules.

Referring now to FIG. **6,** a part plan of a one-bedroom type apartment building is shown using the similar horizontally aligned 'A' modules. This plan indicates the method of incorporating the interior public double loaded corridor **30** within the areas of the partial unit overlap.

In this particular design, kitchens **28** and bathrooms **29** are grouped in the same unit overlap area and share common vertically aligned mechanical shafts **31** which are located between the modular units. In the erection sequence those plumbing utilites which are in separate units would be connected to each other in the field through access panels in the side walls once the units are positioned.

Since the public corridor **30** is included in the cast module, all of the corridor partitions, fixtures, doors, finishes and lighting can be factory installed along with all interior work needed for the proper functioning of the adjacent one-bedroom apartments.

The circulation along the public corridor **30** and within the apartment would be provided by openings in the side walls of the cast modules which are achieved by blocking out that portion of the mold prior to casting. Structural framing around such openings could be achieved in any number of ways and apparent to those skilled in the art.

Shown, also, in FIGS. **3** and **6** are the field installed end wall subcomponents **13** which enclose the perimeter of the building at the points of the created spaces **10.**

Referring now to FIG. **7,** a part plan of another one-bedroom double loaded corridor type apartment building is shown, comprised of types 'B' and 'C' preformed modular units, and indicating the horizontal alignment of these modules and the functional use of the building they form. FIG. **7** also shows a variation on the location of the vertically aligned interior columns **32, 33, 34, 35** which frame and define only the area of an interior public corridor **30.** Module 'C' would overlap the lower and similar modular unit only at the area where the interior public corridor **30** is located. Module 'B' is similar to module 'A' in its overlap of the lower and adjacent unit, but its vertically aligned interior columns **32, 33, 34, 35** move closer together and frame and define only the area where the interior public corridor **30** is located. This is done, since this particular design does not require any utilities, partitions or closets in module 'C' beyond the public corridor enclosure. Also, the horizontal column alignment and interlock connection of the bearing places (see FIG. **11**) is needed for the structural continuity of the internal partial by-pass areas of the building structure.

Referring now to FIG. **8** and FIG. **9.** Both embodiments are transverse diagrammatical sectional views taken along lines **8—8** and **9—9** in FIG. **7.** Module 'B' is shown in FIG. **8** and indicates the degree of the partially overlapped unit area and the center-line location of the interior columns **34, 35,** and **32, 33.** Module 'C' is shown in FIG. **9** and indicates the degree of the partially overlapped unit area and the center-line location of the interior columns **34, 35** and **32, 33.**

Referring now to FIG. **10,** a plan is shown which represents one half of an apartment building composed of 0 bedroom, 1 bedroom, and 2 bedroom apartments. FIG. **10** illustrates the method of planning a typical apartment building of 'A' modules which incorporates interior public areas for corridor **30,** stairs **36,** elevators **37,** and other spaces needed for the proper functioning of the building structure. Module A-**1** incorporates the elevator **37** and incinerator and flue areas **38,** while module A-**8** incorporates the public fire stair **36.** The ceiling openings in the cast module needed for these facilities would be achieved by blocking out that portion of the mold prior to casting. Module A-**9** indicates the method of utilizing the space that would have been given to the public corridor **30,** but now is used for bathroom utilities **29** sharing a common in-unit mechanical shaft **19.** The side wall sub-component **12** is shown in this plan and indicates its function in enclosing the end building created space **10** and the support position it takes to allow the placement of the partially staggered 'A' module on the upper level.

Referring now to FIG. **11,** a vertical section detail view along line **11—11** in FIG. **3** is shown and indicates the vertical column alignment of the four modular units in the area of the partial by-pass and partial overlap. The double-width steel bearing plates **39** with alignment prongs **40** and the preformed sleeves **41** are shown and these indicate the method by which the modular units are adapted for interconnected assembly and vertically aligned to each other. Shown, also, are the neoprene pads **42** and grout filler **43** which is poured in by means of grout holes not shown.

Referring now to FIG. **12,** a vertical section detail view along line **12—12** in FIG. **3** is shown, and it indicates the vertical column alignment of the two modular units in the area of the partially staggered units. In addition to the alignment method shown in FIG. **11,** this detail illustrates the recessed column bearing seats **44** which allow a level and contiguous floor alignment between the modular unit and the floor of the created space **10.**

Referring now to FIG. **13,** a perspective diagrammatic view of a prefabricated modular unit is shown and indicates one possibility of constructing a modular unit in accordance with the present invention from a framework of horizontal and vertical structural members **45** with enclosure and infill panels **46.**

Referring now to FIG. **14** and FIG. **15.** FIG. **14** is a part plan of the lower or entrance level of a townhouse type building using type 'D' preformed modular units. Module 'D' illustrates the option of using structural load-bearing side walls in the area of the partial unit overlap which would provide support for the upper level modules. FIG. **15** indicates the part plan of the upper or bedroom level. Shown here is the method of incorporating the factory installed stairs **27,** kitchens **28,** bathrooms **29,** closets **18** and in-unit mechanical shafts **19** in the partial overlap areas.

Referring now to FIG. **16,** a part plan of a resort type apartment building with an exterior corridor **26** is

shown using type 'D' preformed modular units. FIG. **16** illustrates the option of reducing the area of the partial overlap. In this particular plan only the factory installed apartment kitchens **28** and the in-unit mechanical shafts **19** are located in the partial overlap areas, with the adjacent factory installed bathrooms **29,** partitions and closets **18** being located in the preformed type 'D' modular units. Construction of the exterior corridor **26** would be similar to the method described for the building shown in FIG. **3.**

Referring now to FIG. **17,** a part plan of a one-bedroom type apartment building is shown comprised of types 'E' and 'F' preformed modular units. This plan is similar to the plan shown in FIG. **6** and illustrates the option of reducing the overall length and therefor the lifting weight of the modular units by providing separate units in the partially overlapped and partially staggered areas.

Type 'E' units are used for the overlap areas where the apartment kitchens **28,** bathrooms **29,** closets **18,** and the public corridor **30** spaces are located. Each type 'E' unit is preformed as an inverted U-shaped with side walls, corner columns, roofslab cast as a single unitary and structural modular unit.

Type 'F' units are used for the staggered areas where the apartment living rooms, dining areas and bedroom spaces are located and are each preformed in two stages with side walls, offset corner columns, roof slab cast first as a partial unit. Each partial unit is then cast to a floor slab to form a single unitary and structural box-shaped modular unit.

Referring now to FIG. **18,** a plan section is shown of the typical intersection of the two corner columns of the adjacent 'E' modular units with the offset corner column of the adjacent 'F' modular unit. The alignment and connection between modules would be similar to the method described in FIG. **11.**

Referring now to FIG. **19,** perspective diagrammatic views are shown of the individual preformed 'E' and 'F' modular units in accordance with the present invention. Shown here are the offset corner columns with recessed column bearing seats **44** used in the type 'F' units. The type 'E' unit is shown here with the option of load-bearing side walls for applications to low-rise construction.

Referring now to FIG. **20,** perspective diagrammatic views of two prefabricated modular units are shown and indicate one possibility of constructing these modular units in accordance with the present invention from a framework of horizontal and vertical structural members **45** with enclosure and infill panels **46.**

While the preferred embodiments of the present invention have been described, it is to be understood that various modifications may be made thereto without departing from the spirit and scope of the present invention. For example, while the invention is shown and described herein with reference to residential type buildings, it will be understood that it may be used for the construction of any type of multi-level building.

Accordingly, it is to be understood that the present invention has been described by way of illustration and not limitation.

Having thus described my invention, I claim:

1. A modular construction system for multi-level residential buildings including:

a. a plurality of box-shaped modular units, each of which is preformed in two stages with side walls, and roof slab being cast first as an inverted U-shaped partial unit and then cast to a floor slab to form a single unitary and structural modular unit;

b. each of said units have a plurality of interior columns and two exterior perimeter columns cast with the said walls to provide support means for the said unit;

c. said units being positioned to form a building structure in a partial by-pass relationship to similar and adjacent units on the same level, and stacked in a partial overlap and partial staggered relationship to similar units on the adjacent lower and upper levels;

d. said cast floor slab being limited to the partial staggered unit areas with the floor in the partial overlap unit areas being formed from the roof slab of the adjacent lower level units;

e. said units being vertically stacked over each other and supported by means of vertically and horizontally aligned said interior columns which frame and define the area of the partial unit overlap, and by vertically aligned said exterior perimeter columns in the partially staggered unit areas which are offset and extend beyond the outside face of the said side walls;

f. said units being interconnected to the adjacent units on the same level by connecting means at their horizontally adjacent said interior columns, and said units being vertically aligned to the adjacent units on the upper and lower levels by alignment means at their vertically adjacent said interior and perimeter columns;

g. said units having a level and contiguous floor alignment with the floor of the spaces created by the staggered units by means of recessed column bearing seats for each said perimeter column of a combined depth approximately equal to the thickness of the floor slab.

2. A modular building structure in accordance with the system described in claim **1** wherein the areas of the said partial unit overlap comprise apartment kitchens, bathrooms, closets, storage and circulation spaces and include a factory installation to the said side walls and roof slab of substantially all partitions, fixtures, utilities and finishes needed for the proper functioning of said apartment spaces.

3. A modular building structure in accordance with claim **2** wherein the areas of the said partial unit overlap comprise mechanical shaft space and include a factory installation to the said side walls and roof slab of substantially all enclosure walls and mechanical equipment needed for the proper functioning of the adjacent said kitchens and bathrooms.

4. A modular building structure in accordance with claim **2** wherein the areas of the said partial unit overlap comprise space designated for an interior public corridor, stairs and elevators in a double loaded corridor type building, and include a factory installation to the said side walls and roof slab of substantially all stairs, fixtures, partitions, and finishes needed for the proper functioning of said public spaces.

5. A modular building structure in accordance with the system described in claim **1** wherein the said vertically aligned interior columns frame and define only the area of an interior public corridor of a double loaded corridor type building; said modular units being

of two types in which one unit type overlaps the similar lower and adjacent unit only at the area where the interior public corridor space is located and includes a factory installation to the said side walls and roof slab of substantially all fixtures, partitions, and finishes needed for the proper functioning of that part of the said public space, and the second unit type overlaps the similar lower and adjacent unit at the areas in which the interior public corridor space is located and the areas comprised of the apartment kitchens, bathrooms, closets, storage and circulation spaces, and includes a factory installation to the said side walls and roof slab of substantially all partitions, fixtures, utilities, and finishes needed for the proper functioning of said apartment and public spaces.

6. A modular building structure in accordance with the system described in claim **1** wherein the said plurality of box-shaped units of a similar shape are prefabricated of a framework of structural members with enclosure and infill panels of a variety of materials acceptable to fireproof multi-level building construction.

7. A modular construction system for multi-level residential buildings including:

a. a plurality of box-shaped modular units, each of which is preformed in two stages with side walls and roof slab being cast first as an inverted U-shaped partial unit and then cast to a floor slab to form a single unitary and structural modular unit;

b. each of said units have two exterior perimeter columns cast with the said side walls to provide a partial support means for the said unit;

c. said units being positioned to form a building structure in a partial by-pass relationship to similar and adjacent units on the same level, and stacked in a partial overlap and partial staggered relationship to similar units on the adjacent lower and upper levels;

d. said cast floor slab being limited to the partial staggered unit areas with the floor in the partial overlap unit areas being formed from the roof slab of the adjacent lower level units;

e. said units being vertically stacked over each other and supported by means of load-bearing side walls which frame and define the area of the partial unit overlap, and by vertically aligned said exterior perimeter columns in the partially staggered unit areas are offset and extend beyond the outside face of the said side walls;

f. said units being interconnected to the adjacent units on the same level by connecting means at their horizontally adjacent said side walls, and said units being vertically aligned to the adjacent units on the upper and lower levels by alignment means at their vertically adjacent said side walls and perimeter columns;

g. said units having a level and contiguous floor alignment with the floor of the spaces created by the staggered units by means of recessed column bearing seats for each said perimeter column of a combined depth approximately equal to the thickness of the floor slab.

8. A modular building structure in accordance with the system described in claim **7** wherein the areas of the said partial unit overlap comprise apartment kitchens, bathrooms, mechanical shafts, closets, storage and circulation spaces and include a factory installation to the said side walls and roof slab of substantially all partitions, fixtures, utilities, mechanical equipment and finishes needed for the proper functioning of said apartment spaces.

9. A modular building structure in accordance with the system described in claim **7** wherein the areas of the said partial unit overlap comprise apartment kitchens and mechanical shafts spaces with apartment bathrooms, closets, storage and circulation spaces being located in the factory constructed said modular units, and all of said spaces include a factory installation to the said side walls and roof slab of substantially all partitions, fixtures, utilities, mechanical equipment and finishes needed for the proper functioning of said apartment spaces.

10. A modular building structure in accordance with the system described in claim **7** wherein the areas of the said partial unit overlap comprise mechanical shaft spaces with apartment kitchens, bathrooms, closets, storage and circulation spaces being located in the factory constructed said modular units, and all of said spaces include a factory installation to the said side walls and roof slab of substantially all partitions, fixtures, utilities, mechanical equipment and finishes needed for the proper functioning of said apartment spaces.

11. A modular construction system for multi-level residential buildings including:

a. a plurality of inverted U-shaped modular units, each of which has side walls, corner support columns and roof slab preformed as a single unitary and structural modular unit;

b. a plurality of box-shaped modular units, each of which is preformed in two stages with side walls, corner support columns and roof slab being cast first as an inverted U-shaped partial unit and then cast to a floor slab to form a single unitary and structural modular unit;

c. said inverted U-shaped units being positioned and stacked to form a building structure adjacent to and over other similar units and supported by means of vertically and horizontally aligned said corner columns, with the said roof slab forming the floor area for the adjacent upper level similar units to form the central building core area;

d. said box-shaped units being positioned and stacked on both sides of the said building core area in a staggered relationship to similar units on the adjacent lower and upper levels and supported by means of vertically aligned said corner columns which are offset and extend beyond the outside face of the said side walls;

e. said inverted U-shaped and said box-shaped units being interconnected to the adjacent units on the same level by connecting means at their horizontally adjacent said corner columns and vertically aligned to the adjacent units on the upper and lower levels by alignment means at their vertically adjacent said corner columns;

f. said box-shaped units having a level and contiguous floor alignment with the floor of the spaces created by the staggered units and the floor of the central building core by means of recessed column bearing seats for each said corner column of a combined depth approximately equal to the thickness of the floor slab.

12. A modular building structure in accordance with the system described in claim 11 wherein the areas of the said central building core area formed by the stacked inverted U-shaped modular units comprise apartment kitchens, bathrooms, closets, storage and circulation spaces and include a factory installation to the said side walls and roof slab of the said inverted U-shaped modular units of substantially all partitions, fixtures, utilities and finishes needed for the proper functioning of said apartment spaces.

13. A modular building structure in accordance with claim 12 wherein the areas of the said central building core comprise mechanical shaft spaces and include a factory installation to the said side walls and roof slab of substantially all enclosure walls and mechanical equipment needed for the proper functioning of the adjacent said kitchens and bathrooms.

14. A modular building structure in accordance with claim 12 wherein the areas of the said central building core comprise space designated for an interior public corridor, stairs and elevators in a double loaded corridor type building and include a factory installation to the said side walls and roof slab of substantially all stairs, fixtures, partitions and finishes needed for the proper functioning of said public spaces.

15. A modular building structure in accordance with the system described in claim 11 wherein the said plurality of inverted U-shaped and box-shaped modular units are prefabricated of a framework of structural members with enclosure and infill panels of a variety of materials acceptable to fireproof multi-level building construction.

16. A modular construction system for multi-level residential buildings including:

a. a plurality of inverted U-shaped modular units, each of which has load-bearing side walls, roof slab, preformed as a single unitary and structural modular unit;

b. a plurality of box-shaped modular units, each of which is preformed in two stages with side walls, corner support columns, roof slab being cast first as an inverted U-shaped partial unit and then cast to a floor slab to form a single unitary and structural modular unit;

c. said inverted U-shaped units being positioned and stacked to form a building structure adjacent to and over other similar units and supported by means of the said side walls with the said roof slab forming the floor area for the adjacent upper level similar units to form the central core area;

d. said box-shaped units being positioned and stacked on both sides of the said building core area in a staggered relationship to similar units on the adjacent lower and upper levels and supported by means of vertically aligned said corner columns which are offset and extend beyond the outside face of the said side walls;

e. said inverted U-shaped and said box shaped units being interconnected to the adjacent units on the same level by connecting means at their horizontally adjacent said side walls and corner columns and vertically aligned to the adjacent units on the upper and lower levels by alignment means at their vertically adjacent said side walls and corner columns;

f. said box-shaped units having a level and contiguous floor alignment with the floor of the spaces created by the staggered units and the floor of the said central building core by means of recessed column bearing seats for each said corner column of a combined depth approximately equal to the thickness of the floor slab.

17. A modular building structure in accordance with the system described in claim 16 wherein the areas of the said central building core area formed by the stacked inverted U-shaped modular units comprise apartment kitchens, bathrooms, closets, storage, mechanical shaft and circulation spaces and include a factory installation to the said side walls and roof slab of the said inverted U-shaped modular units of substantially all partitions, fixtures, utilities, mechanical equipment and finishes needed for the proper functioning of said apartment spaces.

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