United States Patent [19]

Livingston

[11] 3,902,287

[45] Sept. 2, 1975

[54] DWELLING CONSTRUCTION SYSTEM

[75] Inventor: **Johnston R. Livingston**, Denver, Colo.

[73] Assignee: **Marcor Housing Systems, Incorporated**, Denver, Colo.

[22] Filed: **May 18, 1973**

[21] Appl. No.: **361,805**

Related U.S. Application Data

[60] Division of Ser. No. 230,803, March 1, 1972, Pat. No. 3,800,493, which is a continuation-in-part of Ser. No. 166,545, July 27, 1971, abandoned.

[52] **U.S. Cl.** **52/73**; 52/79

[51] **Int. Cl.**[2] **E04B 5/00**; E04H 1/00

[58] **Field of Search** 52/79, 236, 34, 35, 261, 52/260, 73

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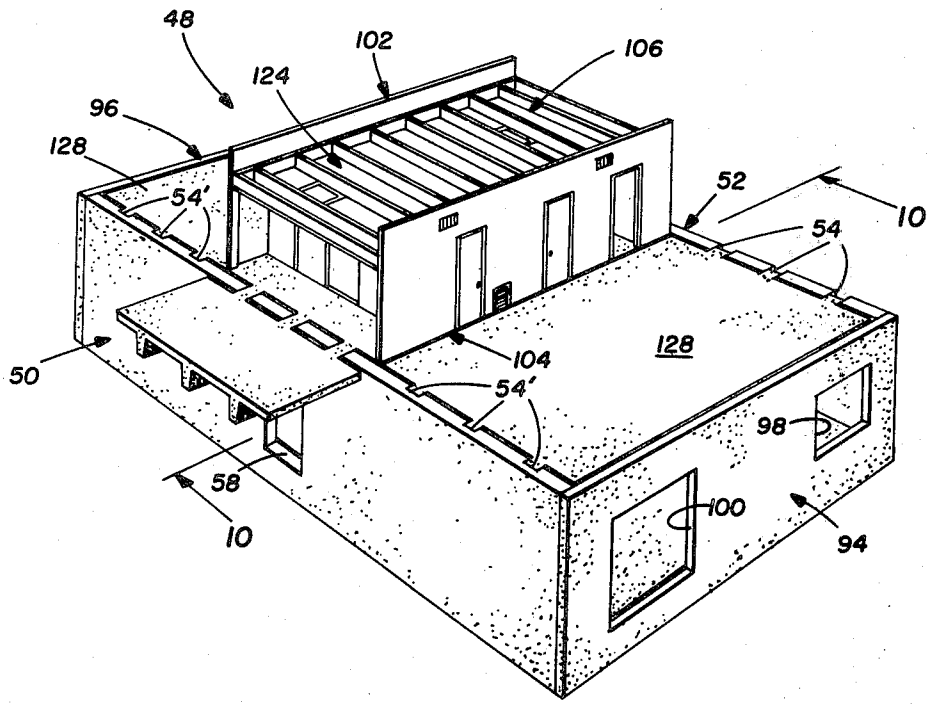
Primary Examiner—John E. Murtagh

Attorney, Agent, or Firm—Hubbard, Thurman, Turner & Tucker

[57] **ABSTRACT**

In a dwelling construction system, a multi-story, multi-family building comprises prestressed concrete pallets which are supported between load bearing walls to form the floors and the ceilings of individual dwellings. Each dwelling includes a service core comprising an enclosure formed on one of the pallets and complete mechanicals for the dwelling. The service cores are fabricated by mass production techniques and are subsequently transported to the building site for installation. In some instances the service core comprises a complete dwelling, in which case the enclosure of the service core may form the exterior walls and the roof of the dwelling.

16 Claims, 28 Drawing Figures



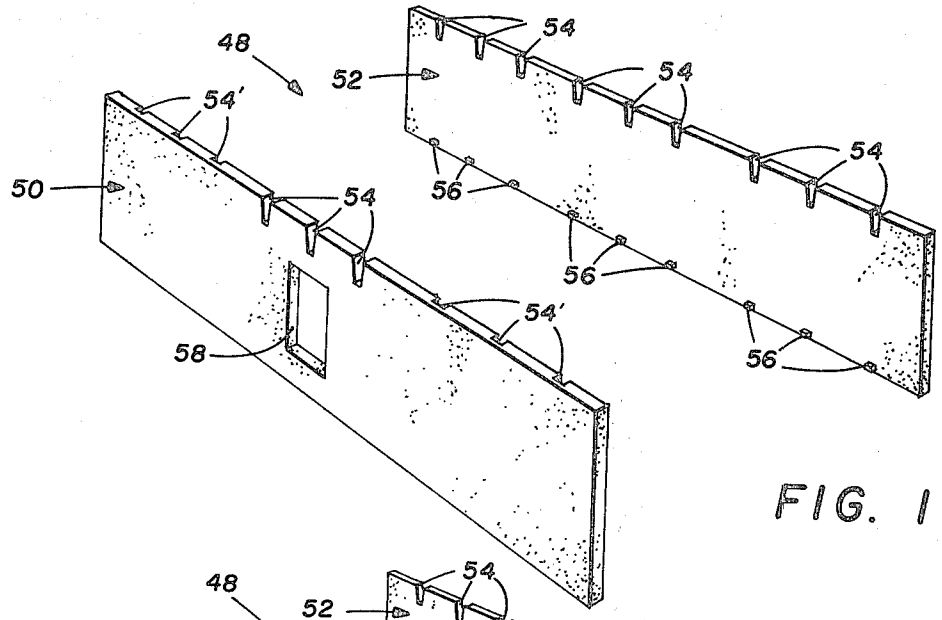


FIG. 1

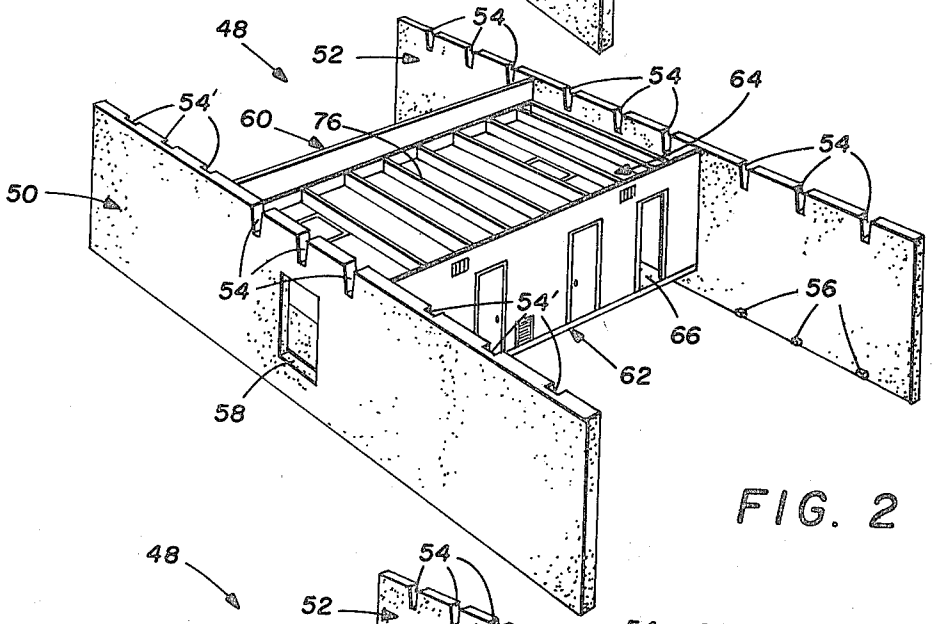


FIG. 2

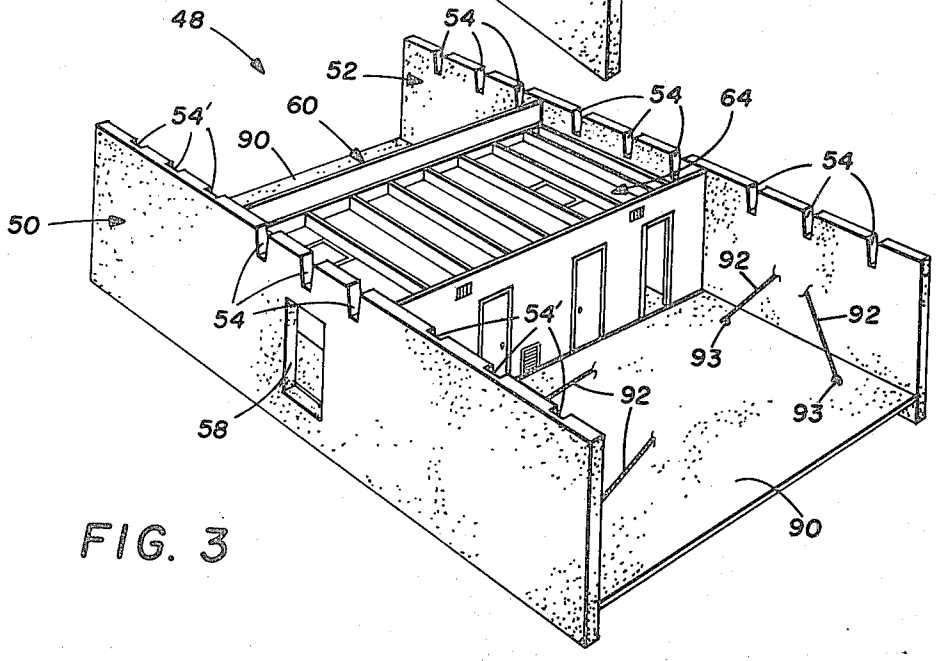


FIG. 3

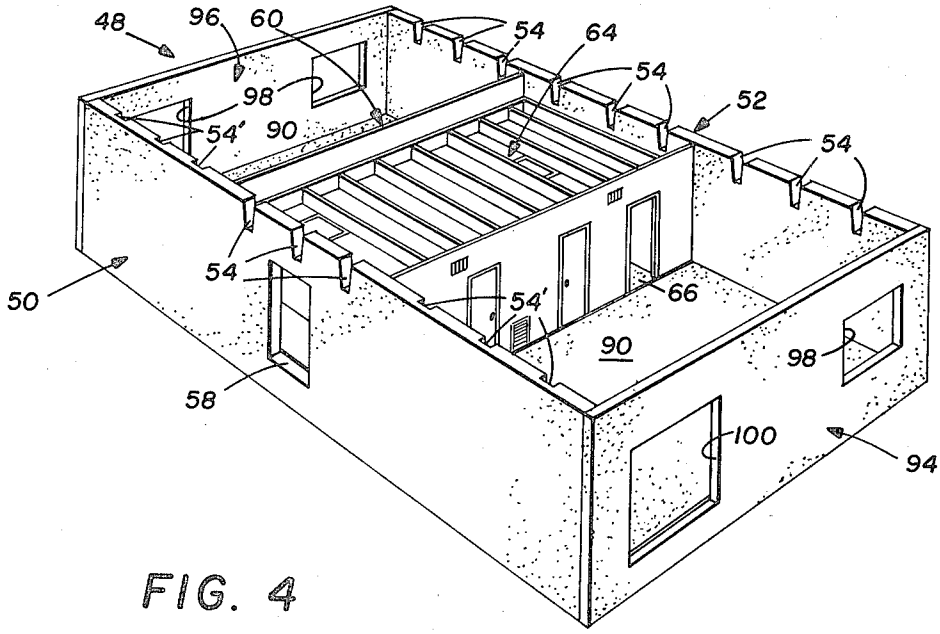

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FIG. 4

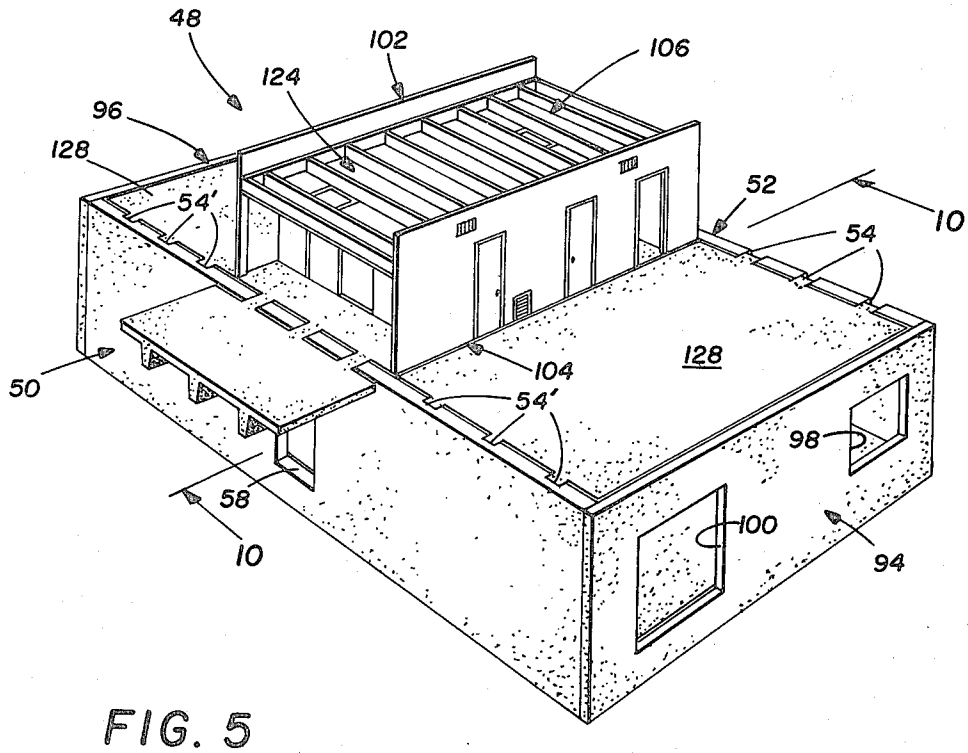

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FIG. 5

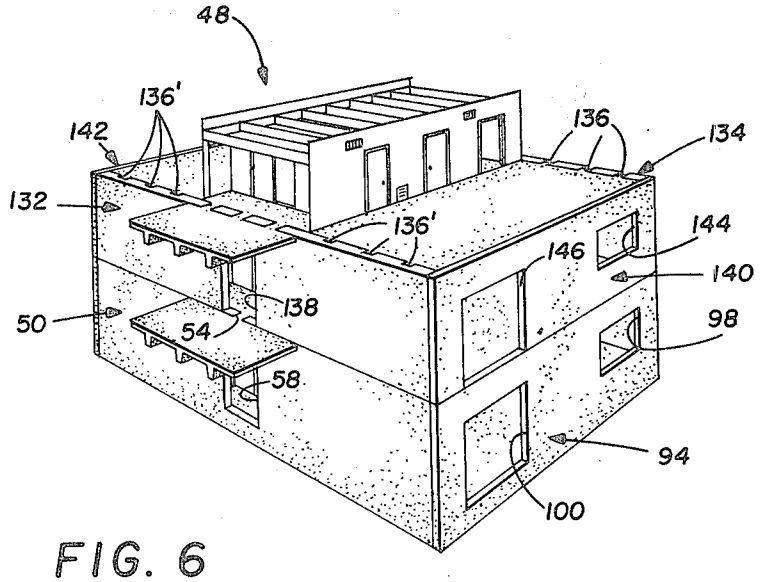

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FIG. 6

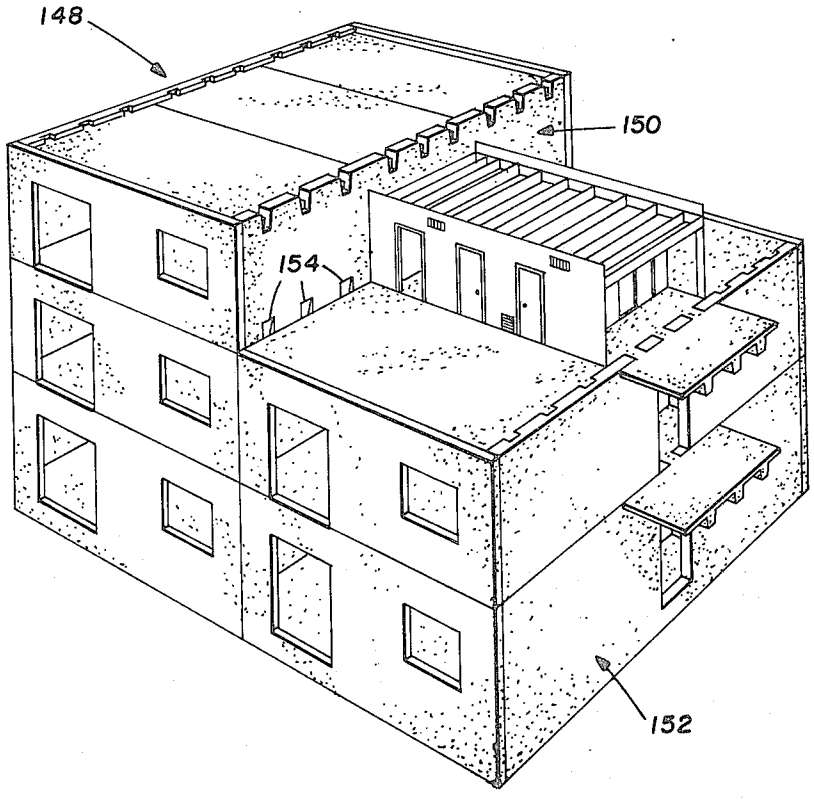

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FIG. 7

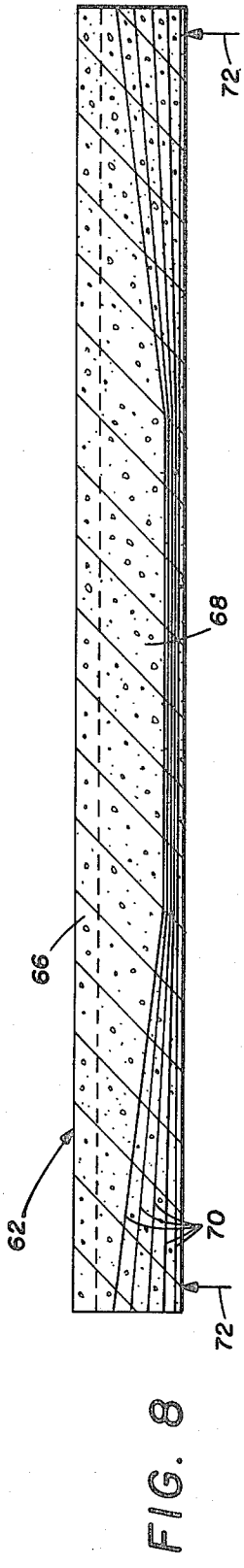


FIG. 8

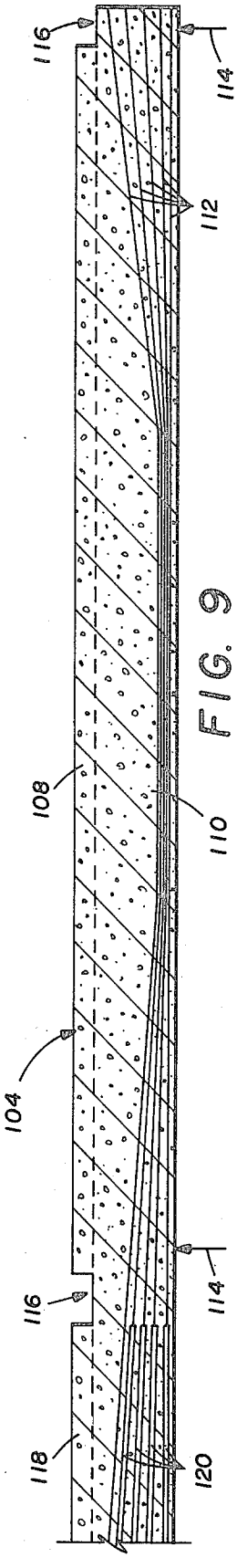


FIG. 9

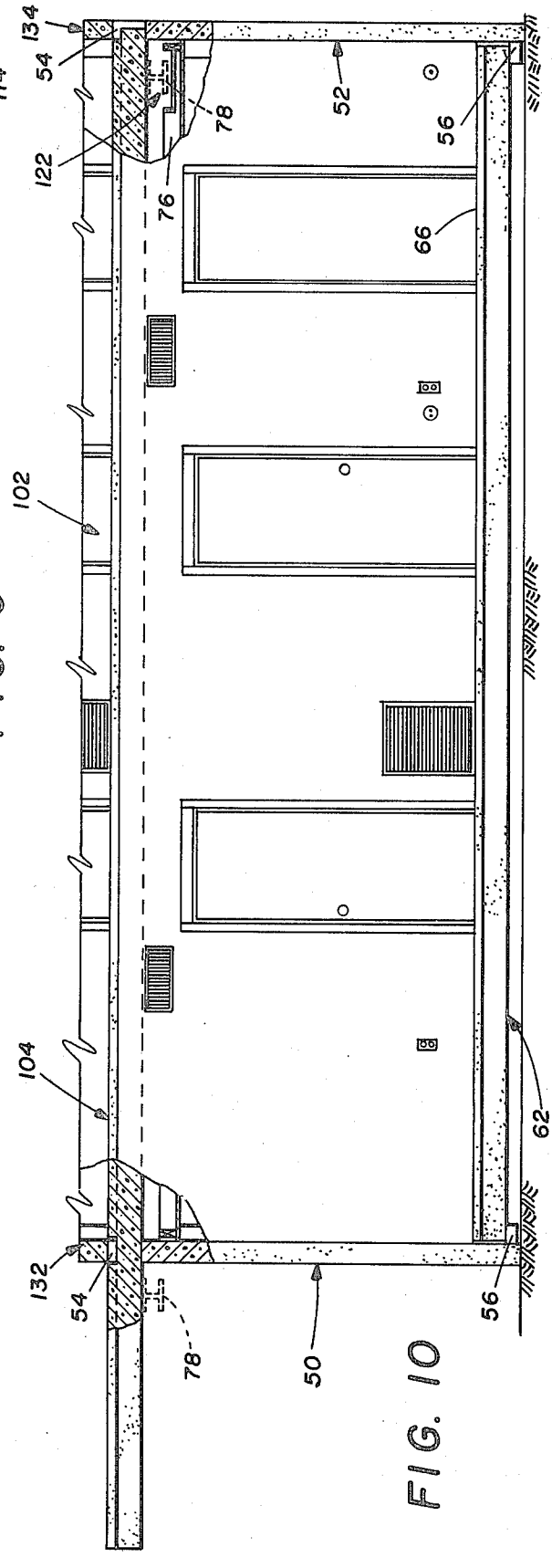
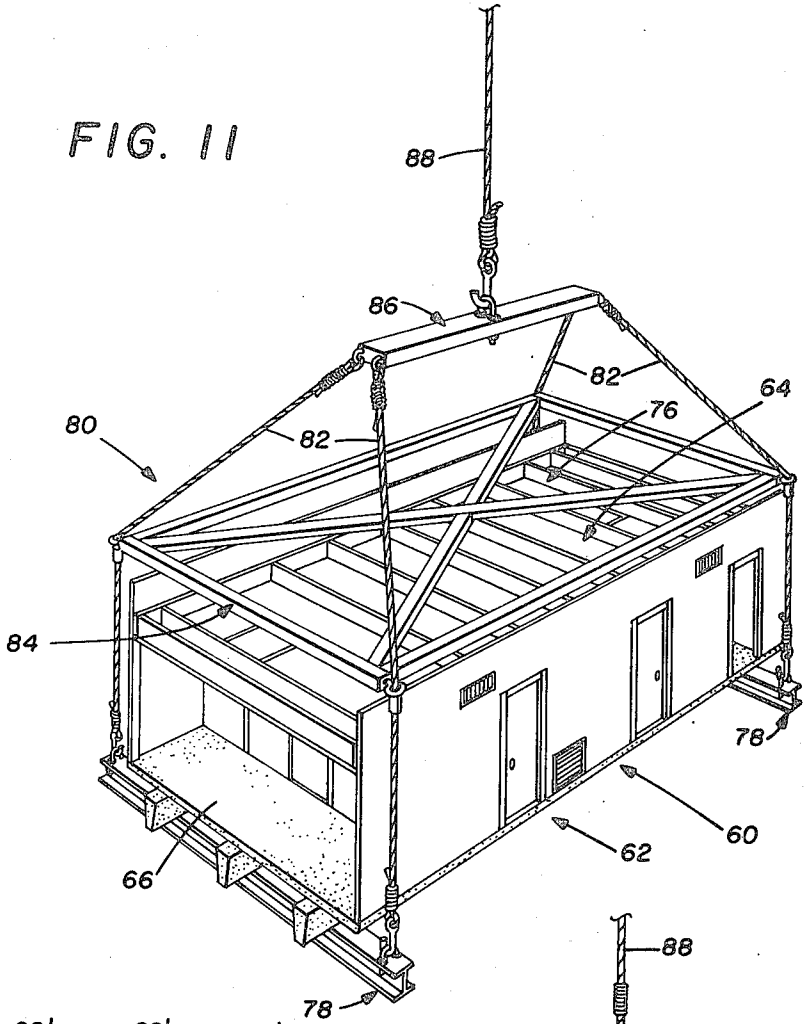


FIG. 10

FIG. 11



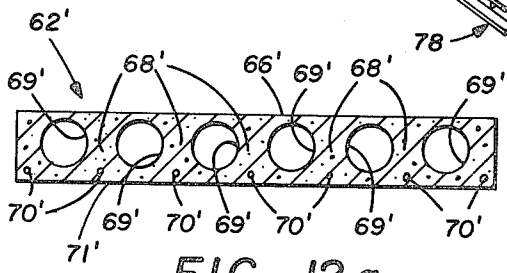


FIG. 12a

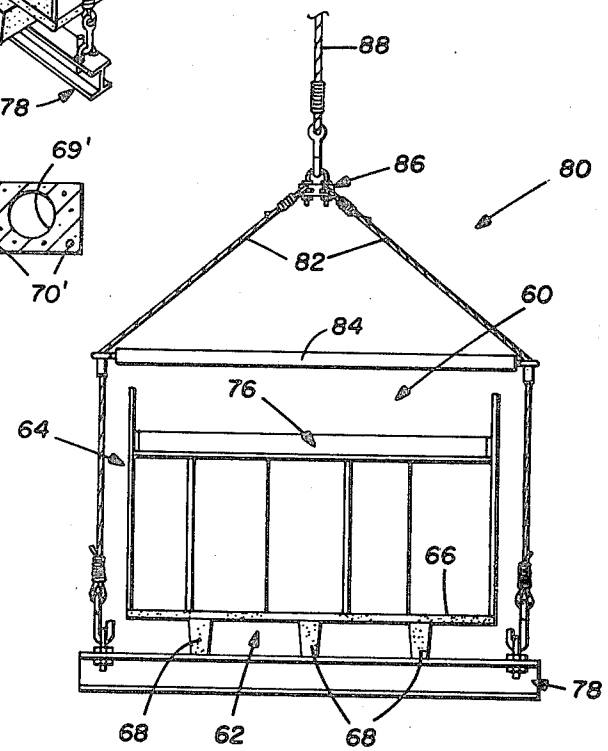


FIG. 12

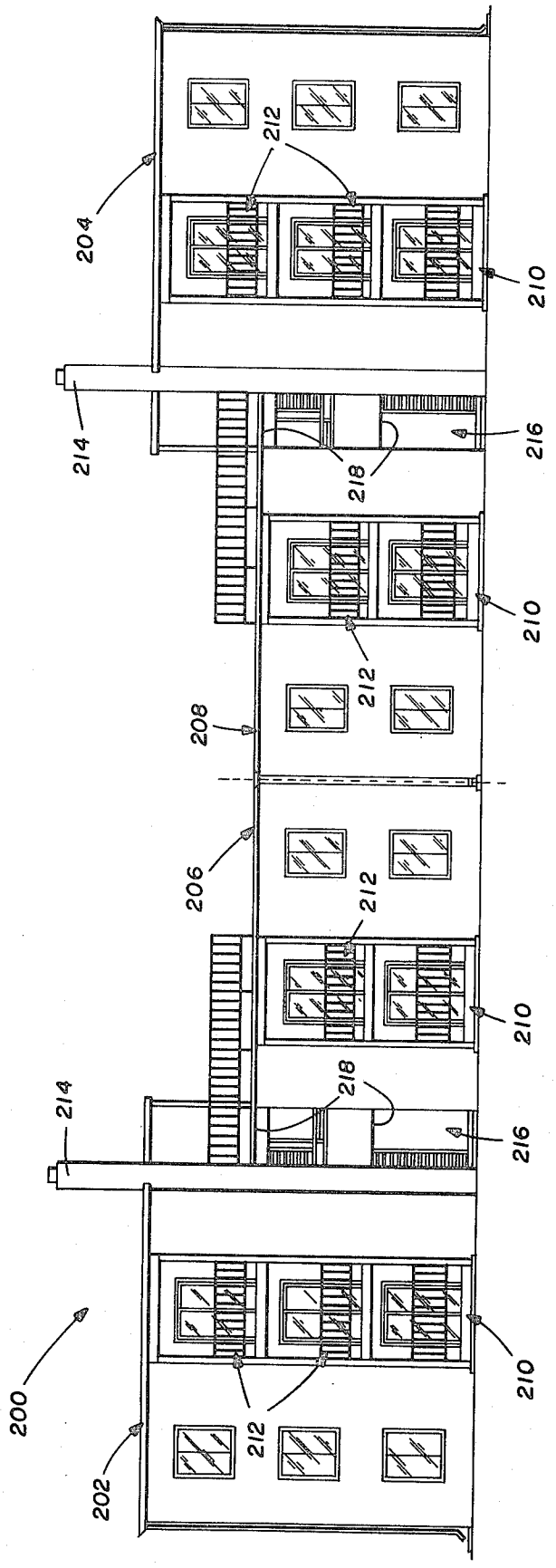


FIG. 13

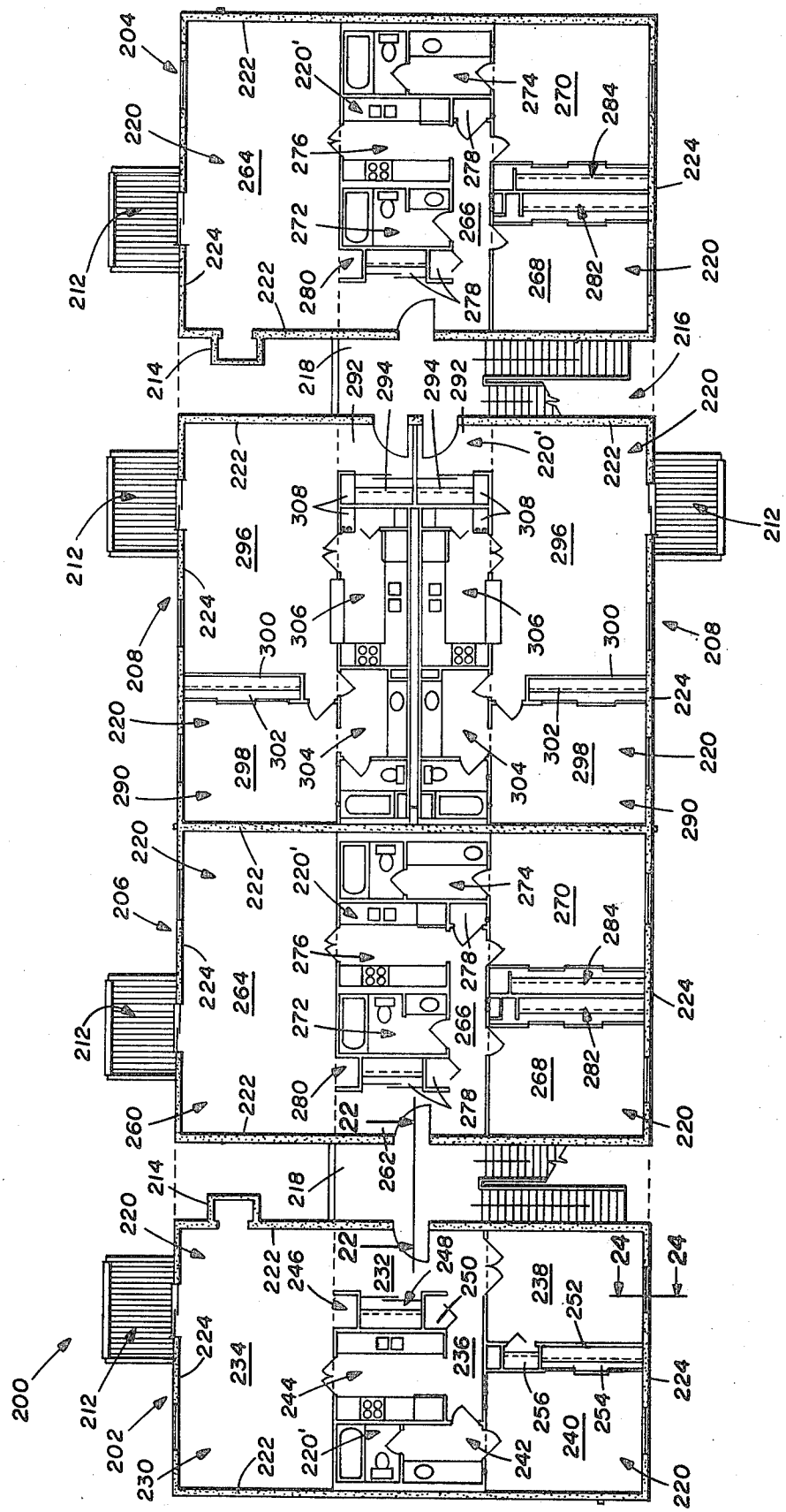

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FIG. 14

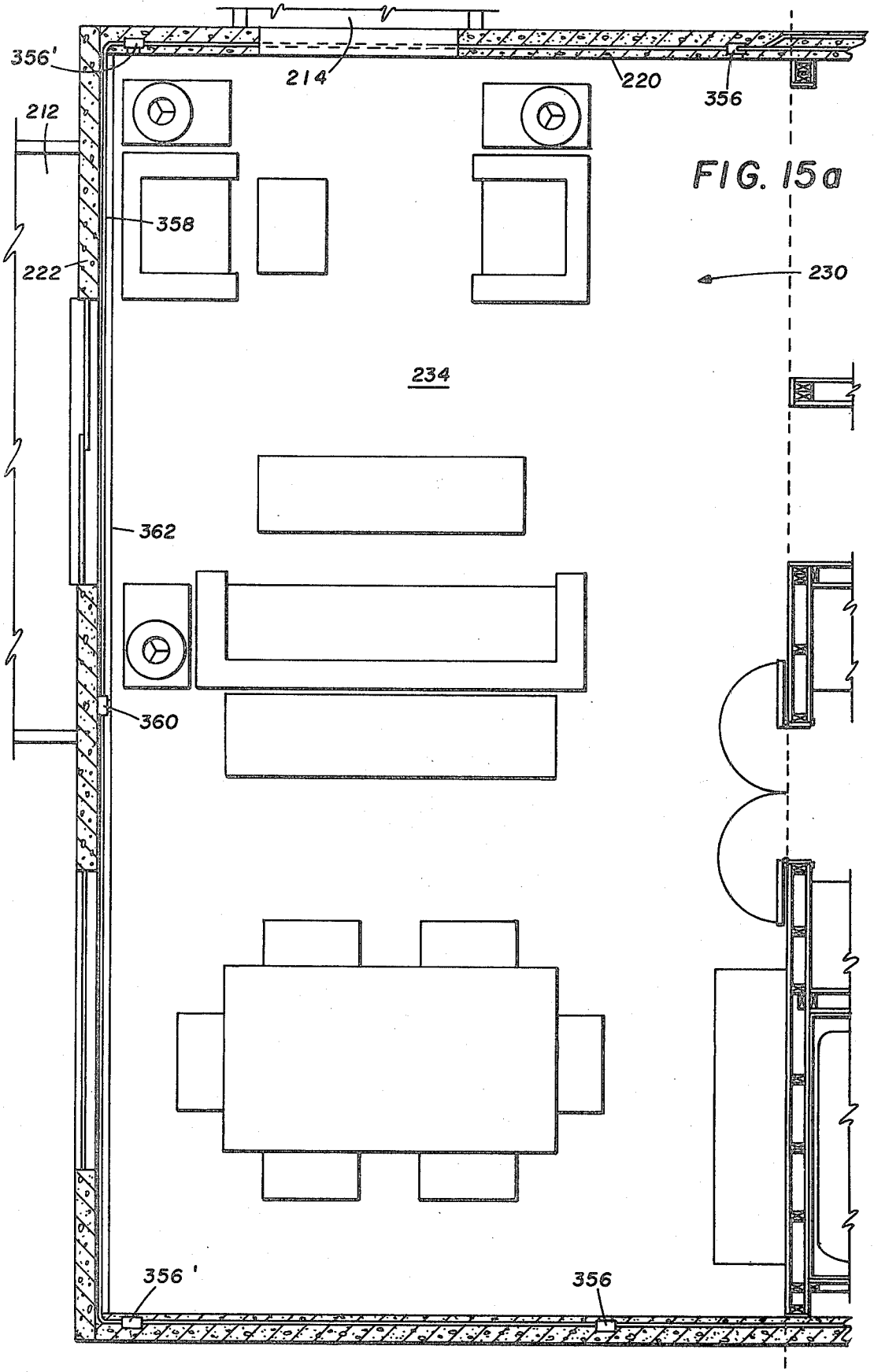


FIG. 15a

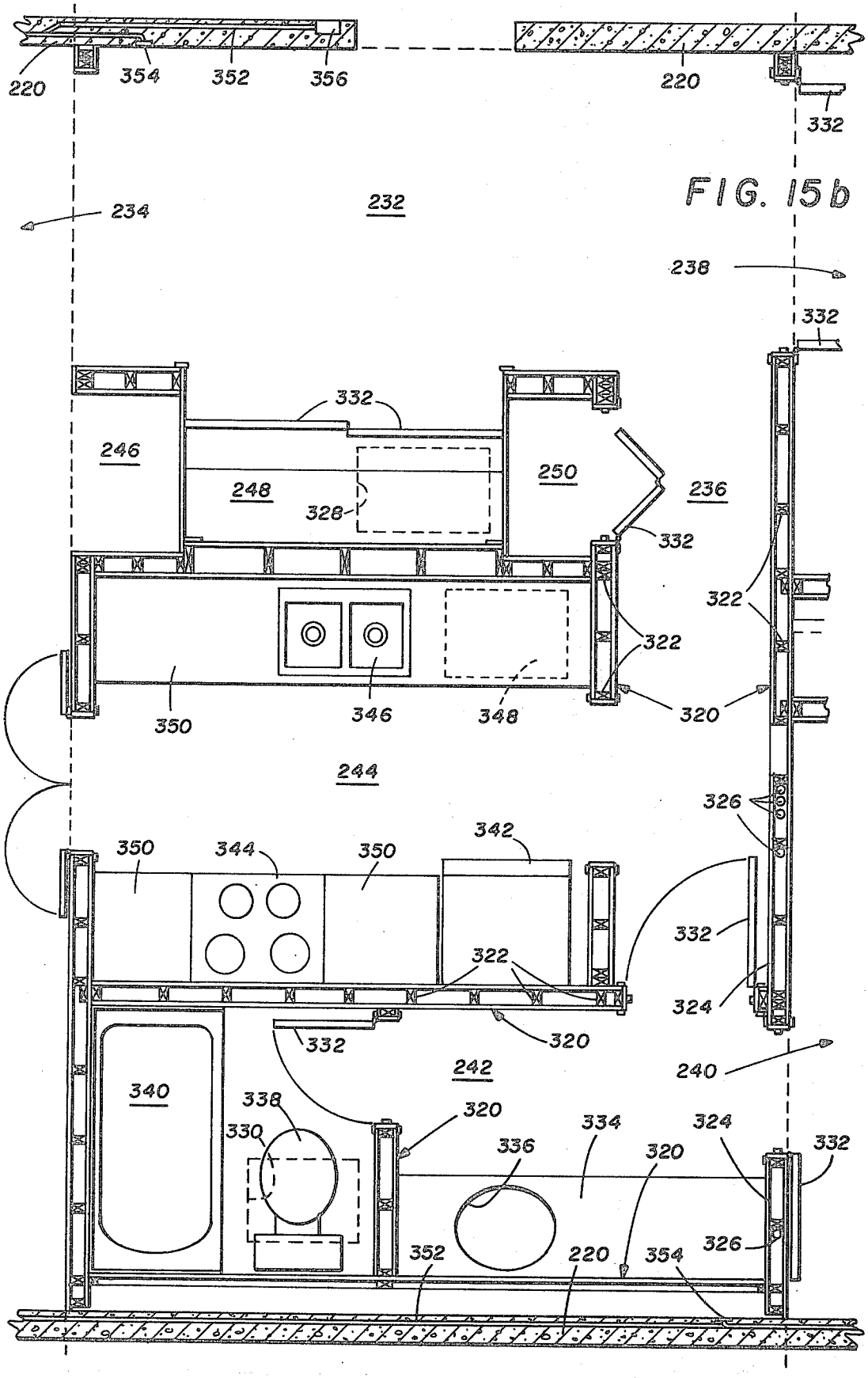

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FIG. 15b

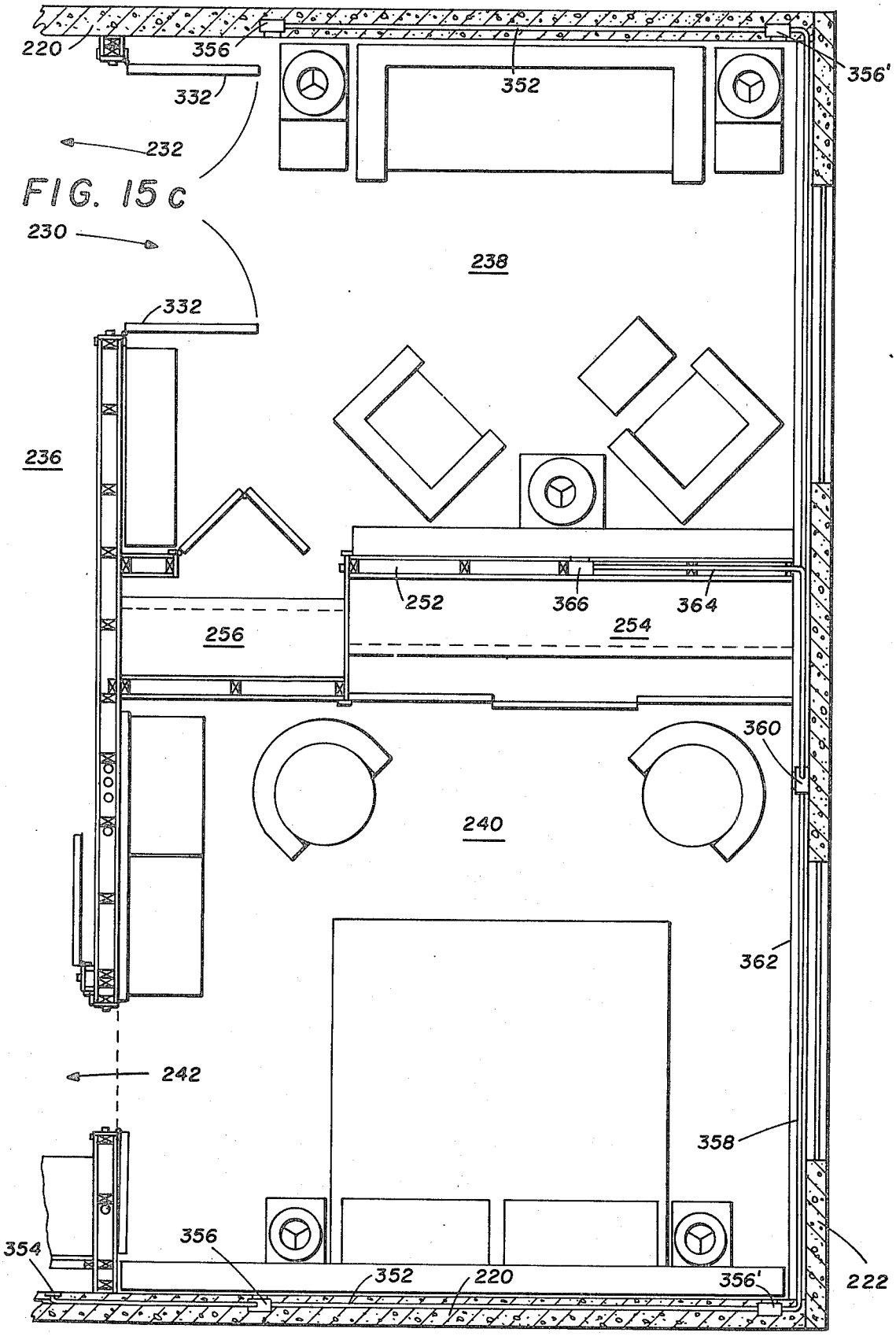
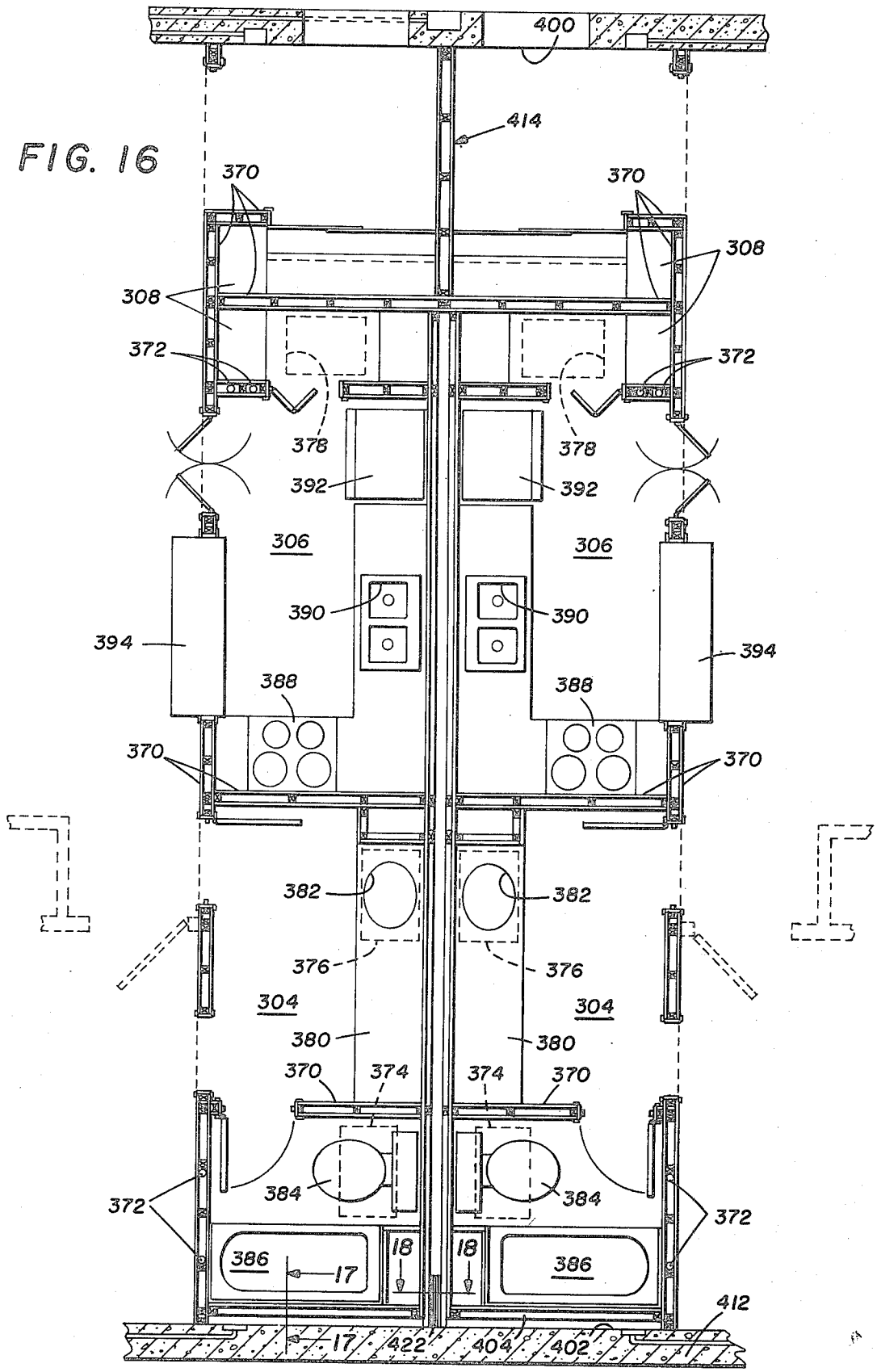

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FIG. 15c

FIG. 16


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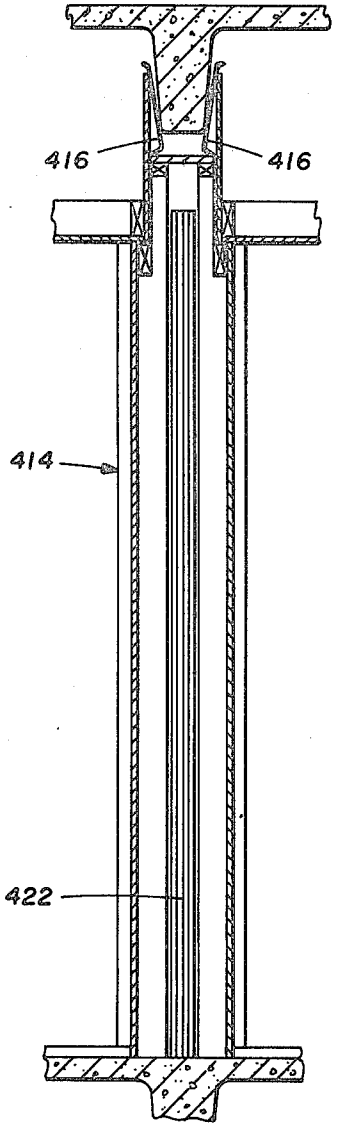


FIG. 18

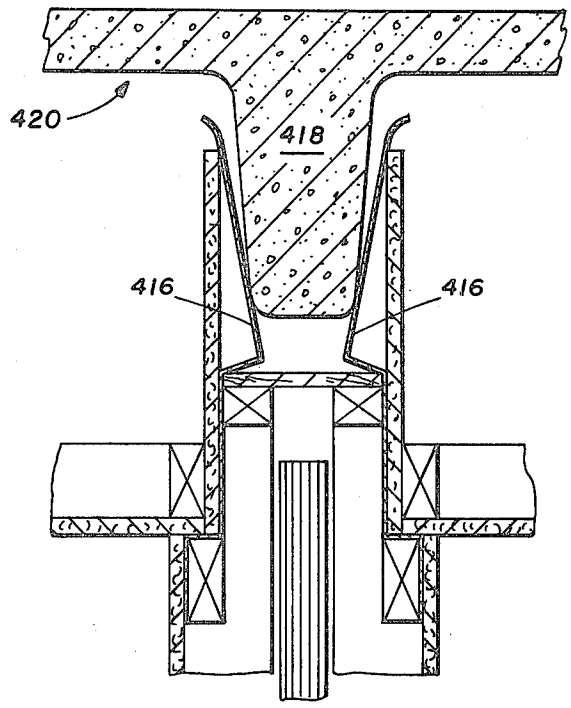


FIG. 19

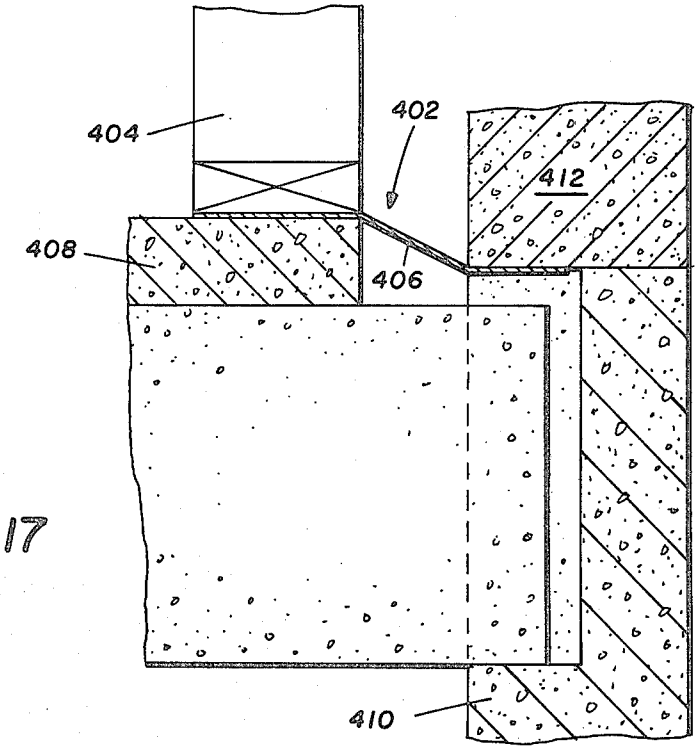


FIG. 17

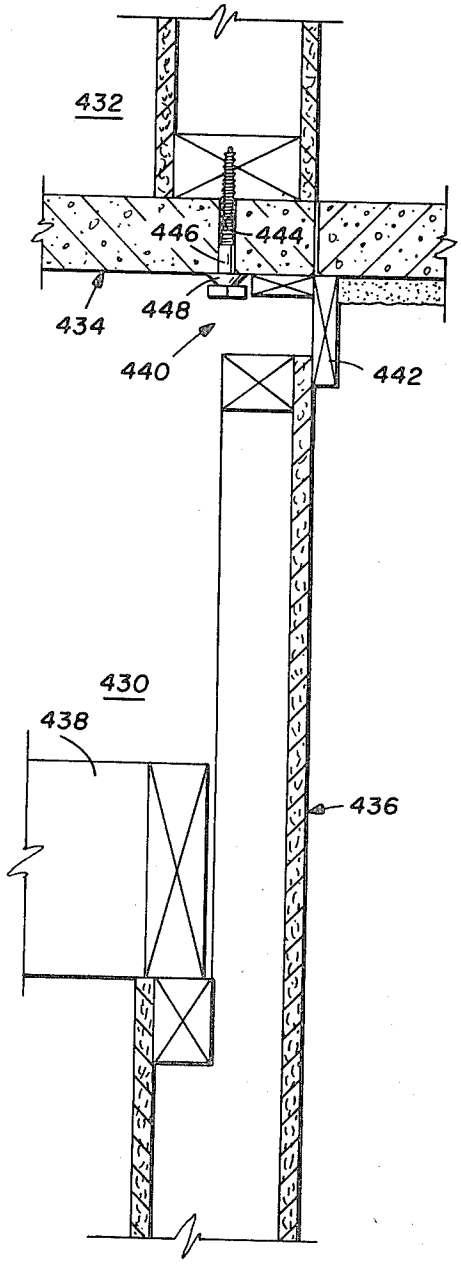


FIG. 20

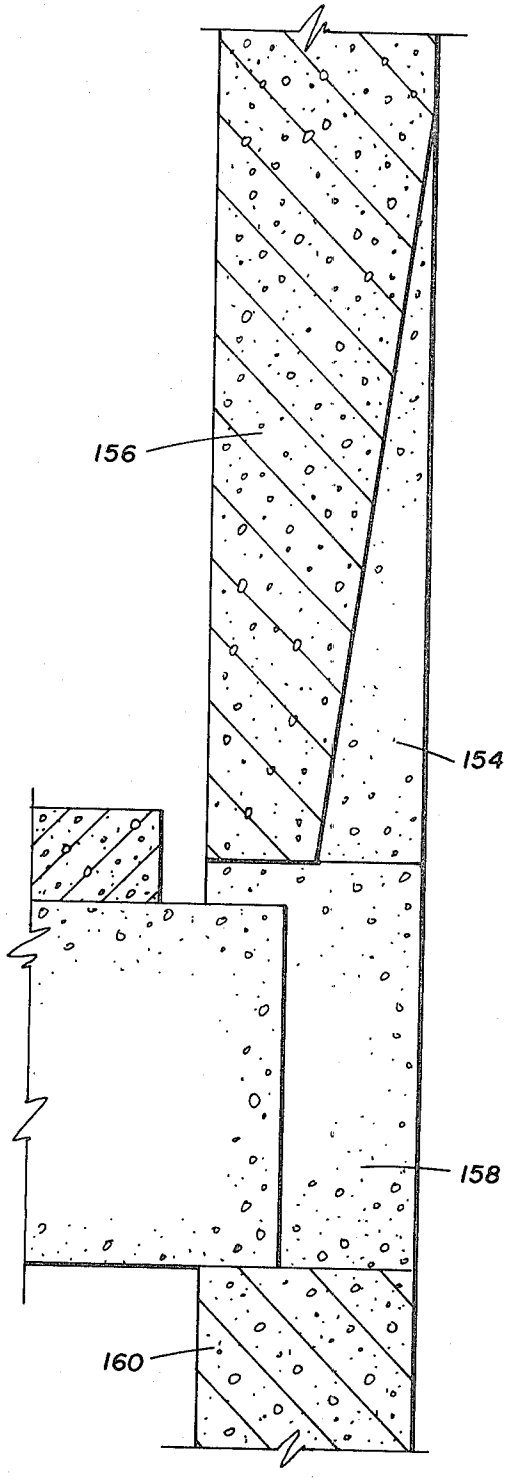


FIG. 21

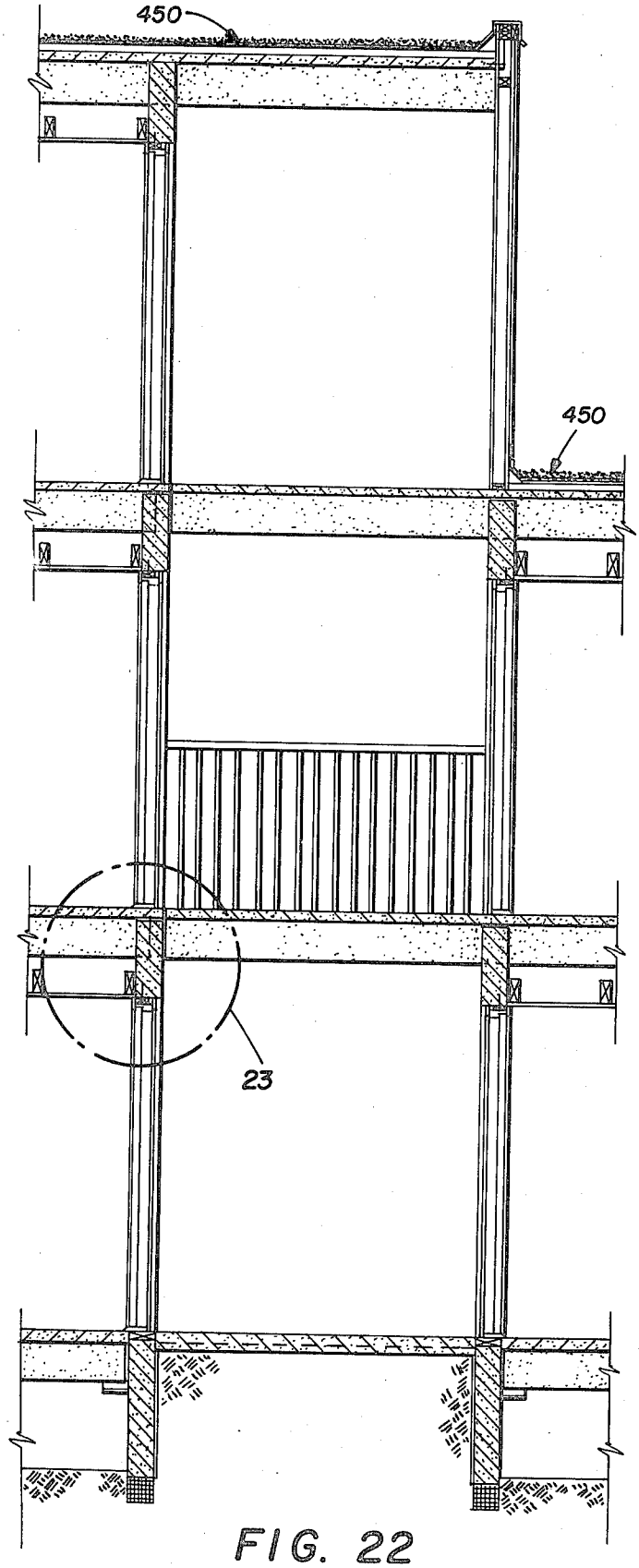


FIG. 22

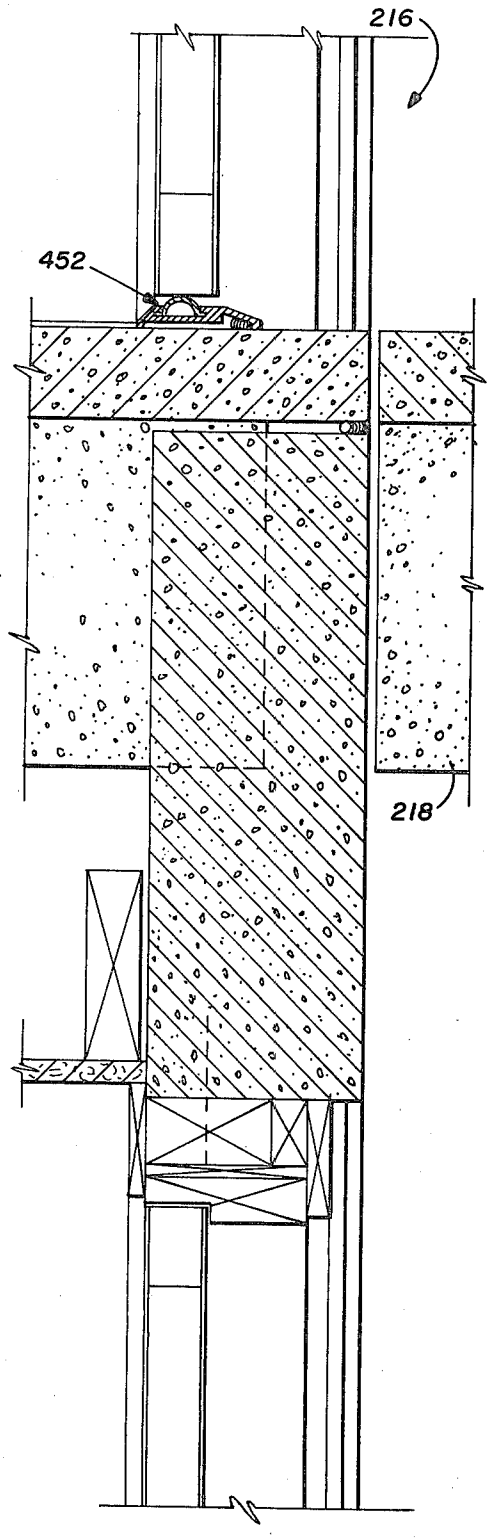


FIG. 23

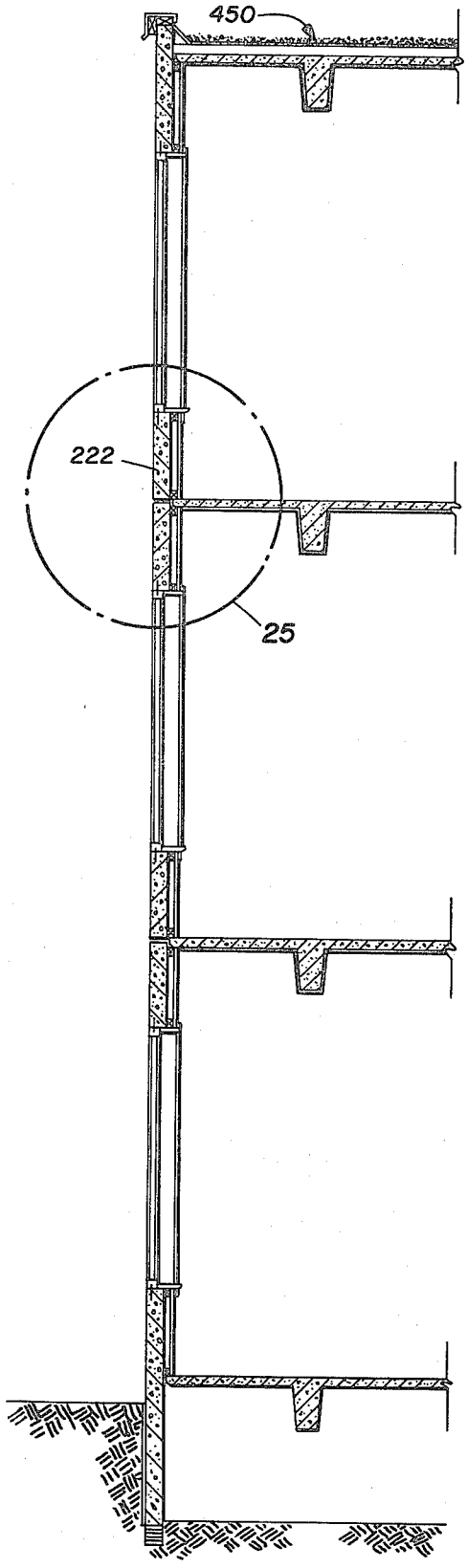


FIG. 24

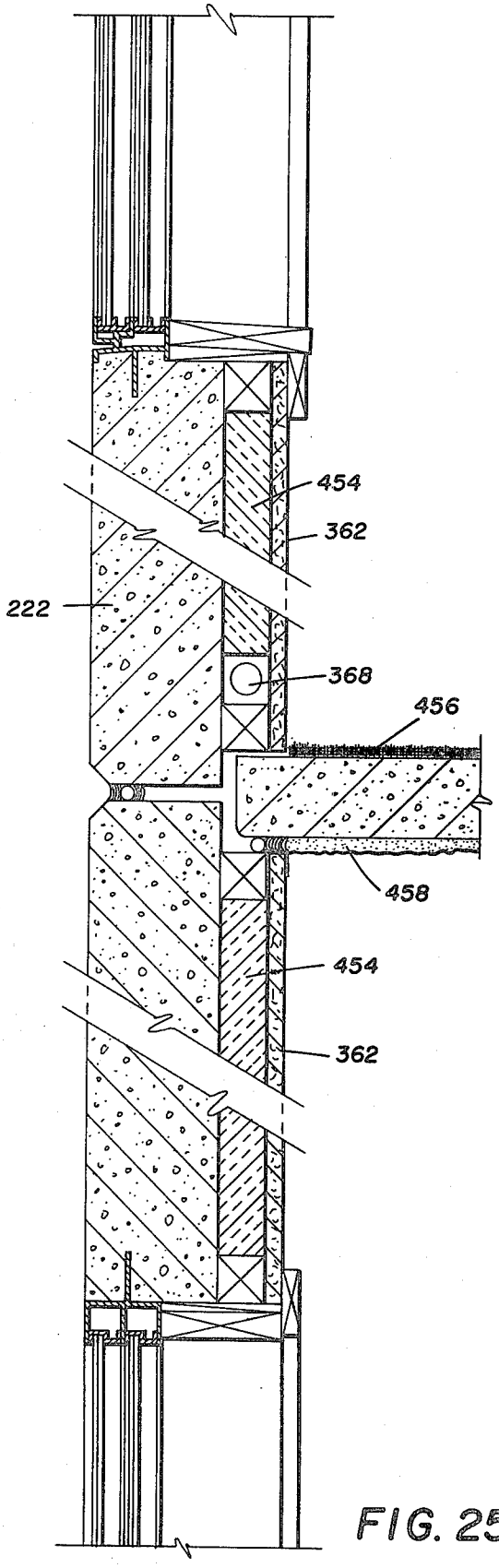


FIG. 25

DWELLING CONSTRUCTION SYSTEM

RELATED APPLICATION

This is a division of application Ser. No. **230,803, filed Mar. 1, 1972,** now U.S. Pat. No. **3,800,493.** Application Ser. No. **230,803** is a continuation-in-part of co-pending application Ser. No. **166,545,** Filed July **27, 1971,** now abandoned.

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to dwelling construction systems, and more particularly relates to a system for fabricating a wide range of dwelling types using production line techniques.

Very substantial sums of money have been expended over the last decade or two to develop building systems which use production line techniques in the construction of both single family and milti-family dwellings. The basic considerations fueling this activity are rapidly increasing labor costs of tradesmen, and the hope that use of production line manufacturing procedures would reduce or eliminate the need for the highly skilled labor of tradesmen as well as provide other cost savings.

This type of construction is particularly promising in the case of dwellings to be erected at remote or relatively inaccessible building sites where labor and materials are not readily accessible.

To date the most successful adaptation of production line techniques to dwelling construction has been in the mobile home industry. As is well known, the fabrication of a trailer house, including the installation of "mechanicals" such as kitchen, bathroom, and temperature control facilities, is typically carried out to completion at a factory. By this means the labor required to install such a dwelling at a particular site is reduced to an absolute minimum.

A different but related method of adapting mass production to dwelling construction comprises sectionalized houses. Typically half or quarter house sections are fabricated at a factory using conventional building materials and techniques and are transported to a construction site by truck. At the site the sections are positioned adjacent one another and are joined to form a completed house.

Multi-family dwelling units have also been constructed using production line techniques. By way of example, one construction system that has been used heretofore involves the fabrication of box-like modules each including a floor, walls and a ceiling which are interconnected to form a structurally integral and transportable unit. The finishing of the modules, including the installation of mechanicals, is completed at a factory. Thereafter the modules are transported to a construction site and are stacked in various configurations to form dwelling units. In this case, the interrelationship of the floor, walls and ceilings of each module cooperates to provide the structural integrity and load bearing capacity necessary to permit the modules to be transported and handled. This type of system has the inherent disadvantage of greatly limiting flexibility of design, and also results in duplicate wall structures.

Although the modular building systems heretofore used have provided some cost reduction, the systems are inherently inflexible and greatly limit the architectural design and livability of the structures. In general,

the greater the modularization of the system to achieve reduced costs, the more inflexible the system is to design change, the smaller the rooms, and the more unlivable the dwelling.

Another trend in the construction industry involves the use of prestressed concrete structural components. Thus, structures such as bridges, parking garages, warehouses and the like are presently being fabricated from various prestressed components including load bearing and non-load bearing walls, columns, beams, and floor and roof decks. Heretofore prestressed members have been used solely as structural elements. This practice necessitates the use of labor at the construction site to perform such tasks as erecting interior partitions, installing mechanicals, etc.

The present invention comprises a novel dwelling construction system which incorporates many of the advantages that are characteristic of prior art modular construction systems while eliminating substantially all of the disadvantages that have long been associated with such systems. In accordance with the broader aspects of the invention, a service core is substantially completely fabricated on an assembly line using mass production techniques. The service core is formed on a prestressed concrete pallet which is also fabricated at a plant site using automated equipment for greatest economy. The service core includes a mechanical enclosure which may be fabricated from conventional drywall building materials of the type used in building houses, and similar buildings. The mechanical enclosure may include complete mechanicals for at least one dwelling, i.e., complete kitchen facilities, complete bathroom facilities, complete temperature control equipment, and electrical systems including telephone and television wiring.

Upon completion, each service core is transported to a dwelling site. The concrete pallet provides the only structural integrity required, thus giving total flexibility in the design of the enclosures. In some instances the service core may comprise an entire dwelling. More often, however, each service core is employed in conjunction with additional prestressed concrete pallets to form a relatively large dwelling. In the latter case the pallets extend between and are supported by prestressed concrete load bearing walls to provide a clear span of substantial length. Additional combinations of service cores and pallets may also be supported on the load bearing walls to form garden apartments, high rise apartments, and the like.

In accordance with more specific aspects of the invention, the prestressed concrete pallets used in the service cores and used in conjunction with the service cores to construct dwellings each comprise a relatively thin deck, a plurality of integrally formed beams depending from the deck, and pretensioned members extending through the beams to prestress and maintain the concrete of the beams in compression such that the beams are adapted to span a substantial distance between two spaced load bearing points and still support large static and live loads on the deck. The deck may terminate at the load bearing points, in which case the deck is entirely enclosed by the load bearing walls. On the other hand, the beams may be cantilevered substantially beyond either of the load bearing points to support a deck portion located outside the load bearing walls to provide a balcony, an entry corridor, etc.

In the use of the present invention to construct a multi-family dwelling such as a garden apartment, a pair of load bearing wall panels are initially erected at points spaced in accordance with the positioning of the support points of the beams of the concrete pallets. After the load bearing wall panels are in place, a service core and then one or more additional pallets are set in place on the load bearing wall panels to form the floor of a first story dwelling. In the case of the first floor dwelling, the beams of the pallets may rest on members projecting inwardly from the load bearing wall panels. Non-load bearing shear wall panels interconnect the load bearing wall panels and serve the dual functions of enclosing the dwelling and maintaining the load bearing wall panels erect.

A service core and then additional pallets which form the ceiling of the first floor dwelling and the floor for a second story dwelling are set in place on the top edges of the load bearing walls of the first floor unit. The beams of the pallets of the second dwelling are preferably received in notches formed in the upper ends of load bearing wall panels that enclose the lowermost dwelling. Also, the decks of the pallets forming the floor of the second dwelling preferably either end at or are interrupted at points corresponding to the positioning of the load bearing wall panels. This permits mounting a second pair of load bearing wall panels directly on the first pair of load bearing wall panels to form the walls for the second floor dwelling.

When the second set of pallets are in place, a second pair of load bearing wall panels and a second pair of shear wall panels are installed. Then a third set of pallets including a service core for a third dwelling are mounted on the second pair of load bearing wall panels to form a ceiling for the second floor dwelling and the floor for a third dwelling. This procedure is repeated until all of the dwellings in the apartment are formed. Then prestressed concrete pallets are mounted on the uppermost load bearing wall panels to form the roof of the uppermost dwelling, and of the stack of dwellings. The interiors of the several dwellings are then grouted, and floor and wall coverings installed, whereupon the structure is ready for occupancy.

As will be appreciated by those skilled in the art, prestressed concrete pallets of the type employed in the practice of the present invention can be supported only at the two design load bearing points. In most instances, the blank pallets are handled by means of eyes cast in the concrete. However, the pallets upon which the service core is formed make this method of handling the pallets impractical. Accordingly, each service core is set in place by means of a pair of picking bars which extend under the support points of the beams of the pallet, a harness including members for connection to the opposite ends of the two picking bars, and a crane which operates through the harness and the picking bars to lift and position the pallet. On the other hand, both for fire prevention purposes and for the sake of appearance, it is highly desirable that the enclosure of each service core extend substantially into engagement with the pallet located next about the service core. To this end the enclosure of each service core is equipped with at least one picking bar slot positioned to permit withdrawal of one of the picking bars that will be used to install the service core or pallet above the service core. The picking bars used in the installation of the pallets weigh approximately **400** pounds. This necessitates reinforcing the picking bar slots to such an extent that the picking bar does not damage the service core as it is withdrawn.

The building codes of the various cities and states typically require a fire barrier having a one hour rating between adjacent dwellings in a multi-family dwelling. In the practice of the present invention this requirement is easily fulfilled with respect to pallets that do not comprise service cores by simply filling the spaces between the decks of the pallets and the load bearing wall panels and the shear wall panels with grouting. On the other hand, the enclosures of the service cores prevent access to these spaces and thereby prevent the filling of the spaces with grouting. For this reason the service cores are preferably installed with one edge of the deck engaged with the adjacent wall panel. At the other end of the deck a strip of sheet metal is secured between the enclosure and the deck. The strip of sheet metal is extended over the upper edge of the load bearing wall panels that supports the deck and is engaged by the load bearing wall panel that is mounted on the supporting panel to provide the necessary fire barrier.

In accordance with a particular embodiment of the invention, double loaded service cores are utilized in the construction of adjacent dwellings. That is, a single prestressed concrete pallet is equipped with two complete but separate sets of mechanicals, one for each of the adjacent dwellings. In such cases it is necessary to form a fire barrier having a one hour rating between the portion of the service core that is individual to one of the dwellings and the portion that is individual to the other dwelling.

The majority of the fire barrier for a double loaded core may comprise a wall including at least one layer of five-eights inch sheet rock. A pair of diverging sheet metal flanges are provided at the upper end of this wall for engagement with a beam of the pallet that is installed above the double loaded core to form the upper portion of the fire barrier. The fire barrier wall is also provided with a stub wall which is slidably supported at the end of the deck that will be engaged with a load bearing wall. During installation of the double loaded core the stub wall is retracted. Then, after the load bearing wall panels adjacent the double loaded core have been installed, the stub wall is moved outwardly and is engaged with the adjacent load bearing wall panel. By this means the fire barrier between the portions of the double loaded core that are individual to the separate dwellings is extended to the full height and the full width of the core.

In addition to the foregoing, the present invention incorporates numerous features which contribute greatly to its overall practicality. For example, notwithstanding the strength of prestressed concrete pallets, it has been found that a direct connection between a particular pallet and the enclosure of a service core situated beneath the pallet is not workable. Instead a slip joint is employed to provide a pleasing appearance while permitting relative movement between the pallet and the service core as a result of live loads.

Another important feature of the invention involves the manner in which convenience outlets are provided at spaced points around each dwelling. Thus, electrical conduits are formed in the load bearing wall panels when the panels are manuafactured. After the panels are installed, electric service lines are directed from the adjacent service cores through the conduits in the load

bearing wall panels and along the shear wall panels. The shear wall panels are typically covered with wood panelling or the like, so that the resulting dwelling is equipped with suitable convenience outlets and yet has no exposed conduit or wiring.

Still another important feature of the invention involves an improved method of forming the enclosures of the service cores. It has been found that a great deal of time is wasted if the enclosures are formed by finishing the walls on one side, installing the walls on the pallet by fastening through the panel frame into the pallet, and then finishing the walls on the other side of the panel. In accordance with the present invention holes are formed in the pallets along the lines that will comprise the walls of the enclosures. This permits the walls to be completely finished and then secured to the pallets by means of lag screws which are inserted through the holes in the pallets from the bottom.

DESCRIPTION OF THE DRAWINGS

A more complete understanding of the invention may be had by referring to the following Detailed Description when taken in conjunction with the accompanying Drawings, wherein:

FIGS. 1–7 are illustrations of progressive steps in a method of fabricating dwelling units incorporating the invention;

FIGS. 8 and 9 are illustrations of presetressed concrete pallets utilized in the practice of the invention;

FIG. 10 is a view taken generally along the line 10—10 in FIG. 5 in the direction of the arrows;

FIGS. 11 and 12 are perspective and end views, respectively, showing a method of and apparatus for installing service cores which is utilized in the practice of the invention;

FIG. 12A is an end view of an alternative type of prestressed concrete pallet that can be utilized in the practice of the invention;

FIG. 13 is an elevational view of an apartment complex constructed in accordance with the invention;

FIG. 14 is a plan view of the apartment complex shown in FIG. 13;

FIGS. 15A–15C are an enlarged plan view of one of the apartments comprising the apartment complex shown in FIG. 13;

FIG. 16 is an enlarged plan view illustrating the service core of one of the apartment buildings shown in FIG. 14;

FIG. 17 is a sectional view taken generally along the line 17—17 in FIG. 16 in the direction of the arrows;

FIG. 18 is a sectional view taken generally along the line 18—18 in FIG. 16 in the direction of the arrows;

FIG. 19 is an enlargement of the upper portion of FIG. 18;

FIG. 20 is a sectional view taken generally along the line 20—20 in FIG. 16 in the direction of the arrows;

FIG. 21 is an illustration of special slots which are utilized in the practice of the invention to facilitate the installation of prestressed concrete pallets on previously erected load bearing walls;

FIG. 22 is a sectional view taken generally along the line 22—22 in FIG. 14 in the direction of the arrows;

FIG. 23 is an enlargement of a portion of FIG. 22;

FIG. 24 is a sectional view taken generally along the line 24—24 in FIG. 14 in the direction of the arrows;

FIG. 25 is an enlargement of a portion of FIG. 24;

DETAILED DESCRIPTION

Method of Dwelling Construction

Referring now to the Drawings, and particularly to FIGS. 1–7 thereof, a method of dwelling construction incorporating the present invention is employed to construct an apartment building **48.** As is best shown in FIG. **1,** the first step in the method comprises the erection of a pair of load bearing wall panels **50** and **52.** The wall panels **50** and **52** are both formed from prestressed concrete and are both nominally **6** inches thick. The wall panels **50** and **52** are further similar in that they are both provided with a plurality of slots or notches **54** formed in the upper ends and with a plurality of support members **56** which project inwardly from points adjacent their lower ends. The notches **54** are generally U-shaped, but comprise inwardly tapered side walls, and some of the notches **54'** in the wall **50** extend only part way through the wall so as to provide a flush outer surface. The supporting members **56** may comprise any convenient construction, but preferably comprise pipe stubs cast into the panels **50** and **52** and extending inwardly therefrom. One difference between the wall panels **50** and **52** is that the wall panel **50** is provided with a door opening **58.**

Referring now to FIG. **2,** the next step in the method of dwelling construction comprises the installation of a service core **60.** The service core **60** comprises a prestressed concrete pallet **62** and an enclosure **64** formed on the pallet **62.** The service core **60** further comprises complete mechanicals for a dwelling unit, i.e., complete kitchen facilities, complete bathroom facilities, and complete temperature control facilities.

The prestressed concrete pallet **62** of the service core **60** is shown in FIG. **8.** The pallet **62** comprises a deck **66** and three beams **68** which depend from the deck **66.** Thus, the pallet **62** is of the type commonly known as a triple T deck. A plurality of tension members **70** extend through each beam **68** of the pallet **62** and serve to prestress the beams, whereby the beams **68** are adapted for support at spaced points indicated by the arrows **72** to support a load on the deck **66.** As is well known in the art, a prestressed concrete pallet of the type shown in FIG. **8** is subject to breakage unless it is properly supported.

The cross sectional configuration of the pallet **62** is shown in FIG. **12.** Those skilled in the art will appreciate the fact that the invention may also be practiced using either solid core or hollow core prestressed concrete pallets **62'** of the type shown in FIG. **12A.** The pallet **62'** comprises a deck **66'** and a plurality of beams **68'** which depend from the deck **66'** between cylindrical passageways **69'.** A plurality of tension members **70'** extend through a lower portion **71'.** One difference between the pallet **62** and the pallet **62'** is that whereas the beams **68** of the pallet **62** are exposed, the bottom of the pallet **62'** is flat.

Referring again to FIG. **2,** the enclosure **64** of the service core **60** is formed on the deck **66** of the prestressed concrete pallet **62.** The enclosure **64** is preferably formed from materials of the type used in constructing conventional homes and similar buildings, i.e., two by four and two by six studs, drywall panels, and similar materials. The enclosure **64** includes interior partitions which separate the various mechanicals of the dwelling unit into kitchens, bathrooms, and the like, and further

includes at least one end wall and a dropped or false ceiling **76.**

In accordance with the illustrated embodiment of the invention, the service core **60** is completely fabricated at a factory by means of mass production techniques. The fabrication of the core **60** comprises construction of the walls, partitions, and ceilings in suitable jigs and fixtures, installation of the walls, partitions, and ceilings, installation of all mechanicals, installation of electrical, plumbing, and heating/air conditioning risers for the mechanicals, installation of all doors and cabinetry, installation of floor and wall coverings, and painting. Thus, when the service core **60** is installed between the load bearing wall panels **50** and **52,** it is complete and ready for use. this feature of the invention is highly advantageous in that it not only reduces the cost of a dwelling by applying mass production techniques to the construction of the service core, but also reduces the time that is required to finish a dwelling following the beginning of construction at the dwelling site.

Upon completion of the manufacture of the service core **60** at the factory, it is transported to the site of the building **48** by truck. During such transportation, the service core **60** is supported solely at points corresponding to the support points of the beams. This is accomplished by means of members positioned under the support points of the beams to maintain the remainder of the pallet out of contact with the bed, etc. of the truck.

The service core **60** is installed by means of apparatus of the type shown in FIGS. **11** and **12.** A pair of picking bars **78** are positioned under the beams **68** of the pallet **62** at points corresponding to the support points of the beams. The picking bars **78** are engaged by a harness **80** comprising a plurality of cables **82** and a spreader frame **84** which functions to cause the cables **82** to extend vertically upward from the picking bars **78** to points above the enclosure **64** of the service core **60.** The cables **82** are connected to a beam **86** which is in turn supported by a cable **88** extending from a crane (not shown). By this means the crane functions through the harness **80** and the picking bars **78** to lift and position the service core **60.**

Referring again to FIG. **2,** the service core **60** is installed between the load bearing wall panels **50** and **52** with each beam **68** of the pallet **62** engaged with one of the support members **56.** It will be appreciated that due to manufacturing tolerances and in order to facilitate the installation of the core **60** between the wall panels **50** and **52,** the length of the pallet **62** is necessarily somewhat less than the distance between the interior surfaces of the walls. The resulting gap is accommodated by positioning the deck **66** closely in engagement with the wall panel **50,** whereupon a suitable entry in the enclosure **64** is aligned with the door opening **58** in the wall panel **50.** This forms a small gap between the deck **66** and the wall panel **52.** However, an end wall is provided at the end of the enclosure **64** remote from the door opening **58,** whereby the gap is not visible from within the service core **60.**

The next step in the method of dwelling construction comprises the installation of a pair of blank prestressed concrete pallets **90** between the load bearing wall panels **50** and **52.** The pallets **90** are handled by means of cables **92** which are connected to eyes **93** in the pallets. The same procedure could be employed in handling service cores except that the enclosures of the service cores prevent access to the eyes of the pallets. Thus, the service cores must be handled by means of picking bars.

The blank pallets **90** are identical to the pallet **62** of the service core **60** in that they each comprise a deck, three beams depending from the deck, and tension members extending through the beams for prestressing the pallets. The pallets **90** are positioned between the wall panels **50** and **52** with their respective beams engaged with the support members **56** of the walls. The decks of the pallets **90** are therefore aligned with the decks **66** of the pallet **62,** whereby the pallets **90** cooperate with the pallet **62** to form the floor of a dwelling unit.

As is best shown in FIG. **4,** the installation of the pallets **90** is followed by the installation of a pair of shear wall panels **94** and **96.** The wall panels **94** and **96** are formed from prestressed concrete, but differ from the load bearing wall panels **50** and **52** in that they are nominally **4** inches thick. The shear wall panels include window openings **98** and a door opening **100** and serve the dual functions of enclosing the ends of the dwelling unit and maintaining the load bearing walls erect.

The shear wall panels **94** and **96** are preferably connected to the load bearing wall panels **50** and **52** by forming welds between suitable members which either comprise part of or are connected to the reinforcing structure of the wall panels. The load bearing wall panels and the shear wall panels may also be joined by other techniques of the type commonly employed in the construction industry to connect prestressed concrete structural members. The various prestressed concrete pallets which are employed in the practice of the invention may be connected to the load bearing wall panels by similar techniques, however, it has been found that it is often unnecessary to connect the pallets to the load bearing wall panels in any fashion.

Upon the installation of the shear wall panels **94** and **96,** the lowermost apartment of the apartment building **48** is structurally complete. Thereafter, a service core **102** for a second dwelling unit is mounted on the load bearing wall panels **50** and **52.** As is shown in FIG. **5,** the service core **102** comprises a prestressed concrete pallet **104** and an enclosure **106** formed on the pallet **104.** The service core **102** further comprises complete mechanicals for the second apartment.

The pallet **104** of the service core **102** is illustrated in FIG. **9.** The pallet **104** is similar to the pallet **62** in that it comprises a deck **108** and three beams **110** which depend from the deck. A plurality of tension members **112** extend through the beams **110** to prestress the beams and thereby adapt the beams for support at spaced points indicated by the arrows **114** to support a load on the deck **108.**

The pallet **104** also differs from the pallet **62** in several important respects. First, the deck **108** is discontinued at spaced points **116** corresponding to the positioning of the load bearing wall panels **50** and **52.** Second, the deck **108** and the beams **110** extend beyond one of the support points **114** to form a cantilever portion **118** of the pallet **108.** At least some of the tension members **112** extend through plastic tubes **120** or are otherwise disengaged from the material of the beams **110** in the cantilever portion **118.** This is necessary in order that the portion **118** can be supported in cantilever fashion.

The installation of the service core **102** is illustrated in FIG. **10.** The picking bars **78** of the lifting and positioning apparatus shown in FIGS. **11** and **12** are engaged with the beams **110** of the pallet **104** at points adjacent the support points **114.** At the end of the pallet **104** comprising the cantilever portion **118,** a picking bar **78** may be positioned at a point located outside the positioning of the load bearing wall panel **50.** Therefore, no problem is encountered in removing the picking bar after the service core **102** is installed. On the other hand, at the opposite end of the core **102,** a picking bar **78** must be engaged with the core **102** at a point located within the positioning of the load bearing wall panel **52.** To this end the servide core **60** is provided with a picking bar slot **122.**

The picking bar slot **122** comprises a reinforced portion of the false ceiling **76** of the core **60** which is purposely constructed to have sufficient strength to support the picking bar after it is disengaged from the harness **80.** By way of example, picking bars suitable for use in the practice of the present invention typically weigh approximately **400** pounds. In such a case the picking bar slot **122** is preferably formed from two by twelves and two by sixes so as to have sufficient strength to support the picking bar.

Referring again to FIG. **5,** the enclosure **106** of the service core **102** is similar to, and may in fact be identical to, the enclosure **64** of the service core **60.** The enclosure **106** includes a dropped or false ceiling **124** including a picking bar slot **126** and also includes an end wall which is situated at the end of the enclosure **106** remote from the cantilever portion **118** of the prestressed concrete pallet **104.** Like the enclosure **64,** the enclosure **106** is preferably completely fabricated by mass production techniques prior to the installation of the service core **102.**

The service core **102** is installed on the load bearing wall panels **50** and **52** with each beam **110** of the pallet **104** engaged with one of the notches **54** of the load bearing wall panels. As has been indicated, the deck **108** of the pallet **104** is discontinued at points corresponding to the positioning of the load bearing wall panels. This permits the positioning of the upper surface of the deck **108** of the pallet **104** either in alignmetnt with, above or below the upper surfaces of the load bearing wall panels **50** and **52,** as desired.

Those skilled in the art will appreciate the fact that due to the nature of prestressed concrete pallets, the service core must be supported at points corresponding to the positioning of the load bearing wall panels **50** and **52.** However, notwithstanding this requirement, it has been found that the service core **60** may be provided with members extending into engagement with the pallet **104** of the service core **102.** These members do not support the pallet in the true sense, but merely limit and control deflections of the pallet due to varying live loads thereon.

Following the installation of the service core **102,** a pair of blank prestressed concrete pallets **128** are mounted on the load bearing wall panels **50** and **52.** The pallets **128** are simialr to the pallet **104** of the service core **102** in that they each comprise a deck, three beams depending from the deck, and tension members extending through the beams to prestress the pallet. Also, the decks of the pallets **128** are discontinued at points corresponding to the positioning of the load bearing wall panels. The pallets **128** are mounted on the load bearing wall panels with each beam of the pallet engaged with one of the notches **54** or **54'** of the load bearing wall panels.

Referring now to FIG. **6,** the next step in the method of dwelling construction comprises the positioning of a second set of load bearing wall panels **132** and **134** on the load bearing wall panels **50** and **52.** The wall panels **132** and **134** are similar to the wall panels **50** and **52** in that they are constructed from prestressed concrete and in that they are nominally six inches thick. Also, the wall panels **130** and **132** are provided with notches **136** and **136'** in their upper edges which are identical to the notches **54** and **54',** and the wall panel **132** is provided with a door opening **138** which is similar to the door opening **58** in the load bearing wall panel **50.**

Folowing the installation of the load bearing wall panels **132** and **134,** a pair of shear wall panels **140** and **142** are mounted on the shear wall panels **90** and **96,** respectively. The wall panels **140** and **142** are formed from prestressed concrete and are nominally **4** inches thick. A plurality of window openings **144** and a door opening **146** are formed in the walls **140** and **142** at points corresponding to the window openings **98** and the door openings **100** of the shear wall panels **94** and **96.** The shear wall panels **140** and **142** function to enclose the ends of the second apartment of the apartment building **48** and to maintain the load bearing wall panels **132** and **134** erect.

Upon completion of the foregoing steps, the second apartment of the apartment **48** is structurally completed. Thereafter the steps are repeated to form additional apartments. It will be understood that the additional apartments are positioned directly above the previously formed apartments and thereby function to increase the height of the apartment building **48.** When all of the apartments comprising the apartment building **48** have been constructed, prestressed concrete pallets similar to the pallets **90** are positioned on the uppermost load bearing wall panels to form the roof of the apartment building. At this point the apartment building **48** is complete insofar as its structural components are concerned.

After the roof of the apartment building **48** has been installed, the interiors of the various apartments comprising the apartment building are finished. This involves filling the gaps between the wall panels and the pallets and between the wall panels per se with grouting, forming connections between the electrical, plumbing, and heating/air conditioning risers of the service cores of the apartments, constructing interior partitions to define bedrooms, closets, and the like, installing electrical wiring, including telephone and television wiring, installing doors and windows in the door and window openings of the wall panels, and the like. The interiors of the apartments are also finished. This involves installing carpeting, painting the interior surfaces of the load bearing wall panels, installing thermal insulation and paneling on the interior surfaces of the shear wall panels, and spraying the under surfaces of the pallets which do not comprise service cores with an asbestos material. The latter procedure has been found to be highly advantageous in that it provides the interiors of the apartments with a "beamed" ceiling effect which is highly pleasing in appearance, in that it provides sound deadening qualities, and in that it provides increased fire protection for the apartments. Upon completion of the finishing of the interiors of the apart-

ments, the apartment building **48** is ready for occupancy. In actual practice it has been found that when the present invention is utilized, a three story apartment building can be completed and ready for occupancy within a few weeks following the start of construction. This extremely short completion time is made possible because the service cores of the dwelling units of the apartment building are completely fabricated before construction at the dwelling site is commenced.

Referring now to FIG. **7**, there is shown a completed three story apartment building **148** constructed in accordance with the present invention. The building **148** includes a load bearing wall **150** which does not have pallet portions extending cantilever from it. In many building projects utilizing the present invention, such a wall will be a "double loaded" wall in that prestressed concrete pallets will be supported from both sides of the wall.

It is preferable that one apartment building such as the apartment building **148** be completed at least to the extent that the roof is installed prior to starting an adjacent apartment building. This is to facilitate the complete enclosure of the first apartment building and thereby eliminate any possibility of damage to the interior of the building due to weather. Then, after the first apartment building has been completed, the construction of the next adjacent apartment building is commenced.

The construction of the adjacent apartment building involves the erection of a load bearing wall **152** in spaced relation to the load bearing wall **150** of the first apartment building and then supporting prestressed concrete pallets between the load bearing walls **150** and **152.** As has been described previously, at least one prestressed concrete pallet of each dwelling unit of the second apartment building will have a service core formed on it. In the typical apartment building, each dwelling unit will also include blank prestressed concrete pallets.

The only substantial difference between the construction of the first apartment building and the construction of the second apartment building is due to the fact that one of the load bearing walls of the second apartment building has previously been completed to its entire height. This causes the positioning of the beams of prestressed concrete pallets in the notches of the double loaded load bearing wall to be somewhat more involved than is the case when the adjacent load bearing wall panels have not been installed prior to the installation of the pallets. To this end, notches **154** are preferably formed at the lower edges of each panel of the double loaded load bearing wall to facilitate the installation of the beams of prestressed concrete pallets in the notches formed in the upper ends of the next adjacent panel of the load bearing wall.

The notches **154** are best shown in FIG. **22.** Each notch **154** comprises an inwardly tapered portion formed in an upper load bearing wall panel **156** at a point aligned with a U-shaped notch **158** formed in a load bearing wall panel **160** positioned just below the panel **156.** The notches **154** are equal in width to the notches **158,** whereby the positioning of the beams of prestressed concrete pallets in the notches **158** is facilitated.

First Embodiment

Referring now to FIG. **13,** a garden apartment complex **200** constructed in accordance with the present invention is shown. The complex **200** comprises a pair of three story garden apartment buildings **202** and **204** and a pair of two story garden apartment buildings **206** and **208.** The lowermost apartments of the apartment buildings comprising the complex **200** are provided with patios **210** and the upper apartments are provided with balconies **212.** The apartments in the three story apartment buildings **202** and **204** are provided with fireplaces **214.** "Double loaded" entry ways **216** are utilized in the complex **200.** These comprise cantilever portions **218** of prestressed concrete pallets utilized in the three story apartment buildings **202** and **204.**

A typical floor of the apartment complex **200** is shown in FIG. **14,** it being understood that the various floor plans illustrated in the Drawings are representative only and that none of the specific floor plans shown comprises part of the present invention. Each floor of each apartment building in the apartment complex **200** comprises three prestressed concrete pallets **220** including a center pallet **220'** having a service core formed on it. The pallets **220** comprising the apartment buildings **202** through **208** are supported on load bearing walls **222** and are enclosed by shear walls **224.** It will be noted that the pallets **220** comprising the apartment buildings **206** and **208** are partially supported by a double loaded load bearing wall **222'.** As has been indicated, the double loaded entry ways **216** comprise cantilever portions **218** which extend inwardly from the service core pallets of the apartment buildings **202** and **204.**

The apartment building **202** comprises apartments **230** each including an entry **232** comprising part of the service core and extending to one of the double loaded entry ways **216.** The entry **232** of each apartment **230** interconnects a living room **234** and a hallway **236** which extends to a den **238** and a bedroom **240.** The service core further includes a bathroom **242** and a kitchen **244,** and is completed by an enclosure **246** for the heating/air conditioning facilities of the apartment, a closet **248** in the entry **232,** and a closet **250** in the hall **236.** A partition **252** extends between the den **238** and the bedroom **240** to define a pair of closets **254** and **256.**

The apartment buildings **204** and **206** comprise apartments **260** which are somewhat larger than the apartments **230** of the building **202.** Each apartment **260** includes an entry **262** which extends to one of the double loaded entry ways **216.** The entry **262** interconnects a living room **264** and a hall **266** which extends to a pair of bedrooms **268** and **270.** The service core of each apartment **260** includes the entry **262,** two bathrooms **272** and **274,** a kitchen **276,** a plurality of closets **278,** and an enclosure **280** which houses the heating/air conditioning apparatus for the dwelling unit **260.** The bedrooms **268** and **270** are separated by a pair of closets **282** and **284.**

Each floor of the apartment building **208** comprises two relatively small apartments **290.** The apartments **290** each comprise an entry **292** which extends to one of the double loaded entry ways **216** and which is provided with a closet **294.** The entry **292** extends to a living room **296** which in turn extends to a bedroom **298.** The living room **296** and the bedroom **298** are sepa-

rated by a partition **300** defining a closet **302.** Each apartment **290** of the apartment building **208** is completed by a bathroom **304,** a kitchen **306** and enclosures **308** for heating/air conditioning equipment, all of which are mounted on the service core.

The apartment building **208** differs significantly from the buildings **202, 204,** and **206** in that each floor of the building **208** comprises a double loaded service core including complete and separate mechanicals for two dwelling units. This comprises a highly important feature of the present invention in that it facilitates the construction of relatively small dwelling units on a very efficient and economical basis. One important aspect of the double loaded service core concept is that since each service core is common to two dwelling units, it is necessary to establish a fire barrier having at least a one hour rating between the portion of the core common to one dwelling unit and the portion of the core common to the other dwelling unit.

The various features of the dwelling units **230** of the apartment building **202** are shown in greater detail in FIGS. **15A, 15B,** and **15C.** The service core of the dwelling unit **230** comprises walls and partitions **320** which are formed from materials of the type commonly employed in the construction of conventional houses and similar buildings, i.e., two by four and two by six studs **322,** dry wall panels **324,** and the like. The walls **320** enclose telephone, television, electrical and plumbing risers **326,** and additional risers extend through the enclosure **246.** Access panels **328** and **330** are provided to permit interconnecting the electrical, plumbing, and heating/air conditioning facilities of adjacent dwelling units **230** in the apartment building **202.** The various closets and rooms of the dwelling unit **230** are provided with hollow core doors **332** of the type commonly employed in houses, apartment buildings, and the like.

The bathroom **242** of each apartment comprises a dressing table **334** including a sink **336,** a toilet **338,** and a bathtub **340.** The kitchen **244** is similarly completely equipped in that it comprises a refrigerator **342,** a stove **344,** a sink **346** and a dishwasher **348.** Full cabinet facilities **350** are also provided in the kitchen **244.**

One of the most important aspects of the present invention comprises a system for providing electrical outlets at convenient points around the periphery of each of the rooms of an apartment. Each load bearing wall **222** is equipped with electrical conduits **352** which are formed in the wall when it is cast. The conduits **352** comprise inlets **354** formed at points aligned with and positioned above the false ceiling of a service core. The conduits **352** further comprise various outlets **356** including outlets **356'.** The outlets **356'** of each conduit **352** are positioned at the outer ends of the load bearing wall **252.**

When each apartment is finished additional conduits **358** are connected to the conduits **352** at the outlets **356'.** The conduits **358** are secured to the inner surfaces of the shear walls **224** and extend to outlets **360** positioned at convenient points along the shear walls. During subsequent finishing the inner surfaces of the shear walls **224** ae covered with paneling sections **362** so that both the conduits **352** and **358** are completely hidden from view in the finished dwelling unit. The conduits **358** may include portions **364** extending through the interior partitions of the apartment to suitable outlets **366,** if desired.

It will be understood that although the system for providing convenient electrical outlets in apartments constructed according to the present invention has been illustrated in conjunction with an apartment **230** of the apartment building **202,** the same system is utilized in the apartments comprising the apartment buildings **204, 206,** and **208.** Of course, the routing of the various electrical conduits and the positioning of the various outlets will vary in accordance with particular requirements. However, in each instance the load bearing walls are equipped with suitable conduits, including inlets that will ultimately be aligned with a service core during manufacture and the conduits of the load bearing walls are connected to conduits secured to the interior surfaces of the shear walls during finishing.

Referring now to FIG. **16,** the double loaded service core which is employed in the apartments of the apartment building **208** is shown in greater detail. The double loaded core comprises walls and partitions **370** formed from wooden studs and drywall panels. The walls **370** enclose electrical and plumbing risers **372.** Additional risers extend through the enclosures **308.** Access panels **374, 376,** and **378** are provided for facilitating the interconnection of the electrical, plumbing, and heating/air conditioning facilities of adjacent apartments.

The bathrooms **304** of the apartments **290** each comprise a dressing table **380** equipped with a sink **382,** a toilet **384** and a bathtub **386.** The kitchens **306** of the apartments **290** are similarly fully equipped. Thus, each kitchen **306** comprises a stove **388,** a sink **390,** and a refrigerator **392.** Each kitchen **306** is further provided with a pass through **394** which is situated at counter height.

As will be appreciated by those skilled in the art, one problem that is encountered in the construction of multifamily dwelling units comprises fire protection. The building codes of most cities and other jurisdictions require a fire barrier having at least a **1** hour rating between adjacent dwelling units of a multi-family building. The present invention comprises various systems for providing such a fire barrier while at the same time adapting dwelling unit construction to mass production techniques. Many of these systems are illustrated in conjunction with FIG. **16** and the sectional views taken therefrom.

When a service core for a dwelling unit comprising the present invention is installed, the end of the service core comprising the entry is positioned as close as possible to the adjacent load bearing wall. This results in a very small gap **400** at the entry end of the service core. The gap **400** is easily filled with grouting to provide the necessary fire barrier. On the other hand, the positioning of the entry end of the service core as close as possible to the adjacent load bearingg wall results in a relatively large gap **402** at the opposite end of the service core. Since the end of the core remote from the entry is normally equipped with an end wall **404,** access to the relatively large gap **402** is not readily available.

Referring now to FIG. **17,** a system for providing a fire barrier having at least a one hour rating in the gap **402** is shown. A sheet metal lip **406** is secured between the end wall **404** and its supporting deck **408.** When the service core including the deck **408** and the wall **404** is installed, the lip **406** is extended over the upper edge of the load bearing wall section **410** which supports the service core. Thereafter, when the next load bearing

wall section **412** is mounted on the load bearing wall section **410**, the lip **406** is trapped between the bottom of the wall section **412** and the top of the wall section **410**. By this means the lip **406** forms a fire barrier across the gap **402**.

Since each service core of the apartment building **208** serves two dwelling units, it is necessary to form a fire barrier between the portions of each service core individual to one dwelling unit and the portion of each core individual to the other dwelling unit. As is best shown in FIG. **16**, each service core of the apartment building **208** comprises a wall **414** comprising at least two layers of five-eighths inch drywall sheets. The wall **414** extends the entire length of the service core and forms the majority of the fire barrier between the opposed portions of the service core.

Referring now to FIGS. **18** and **19**, the upper end of the wall **414** comprises a pair of opposed flanges **416** formed from sheet metal. The flanges **416** are positioned to receive a beam **418** comprising a portion of a prestressed concrete pallet **420** which is installed above the service core. By this means the flange **416** and the beam **418** cooperate to complete the upper portion of the fire barrier between the opposed portions of the service core.

As has been indicated, the service cores of dwelling units comprising the present invention are installed with the entry end positioned as close as possible to the adjacent load bearing wall. In the case of double loaded cores, this practice results in a gap between the end of the wall **414** remote from the entry and the load bearing wall adjacent thereto. To this end, the wall **414** is equipped with a stub wall **422** which is formed from sheets of five-eighths inch drywall or some other fire retardant material.

The stub wall **442** is slidably supported in the wall **414** and is retracted during the installation of the service core. Following installation of the service core and the adjacent load bearing walls, the stub wall **422** is moved outwardly and into engagement with the adjacent load bearing wall. By this means the fire barrier provided by the wall **414** is extended across the entire distance between the load bearing walls which enclose the service core.

It will be appreciated that notwithstanding the use of the flanges **416** and the stub wall **422**, it is possible that small gaps may remain in the fire barrier between the opposed portions of the service core following the installation of the adjacent load bearing walls, the positioning of the stub wall **422** and the mounting of a prestressed concrete pallet above the service core. In such a case, pieces of five-eighths inch drywall are employed to close any gaps. Access to such gaps for use in installing the drywall pieces is gained through the access panels **374**, **376**, and **378** of the service core.

Referring now to FIG. **20**, several important features of the present invention are shown. As will be appreciated from the foregoing, the prestressed concrete pallets which are utilized in the practice of the invention are supported entirely by prestressed concrete load bearing walls. That is, the enclosures of the service cores which are utilized in the practice of the invention to house the mechanicals of one or more dwelling units are not used in any way as structural or supporting members. This fact is clearly illustrated in FIG. **20** wherein portions of a lower service core **430** and an upper service core **432** which is supported on a prestressed concrete pallet **434** are shown. The service core **430** includes an outer wall **436** which extends above a false ceiling **438**. The wall **436** does not, however, engage the pallet **434**. Quite to the contrary, a gap **440** is purposely maintained between the upper end of the wall **436** and the pallet **434**.

Notwithstanding the high strength of prestressed concrete pallets, it has been found that such pallets exhibit certain flexibility. This is especially noticeable when a large number of persons is supported on a particular pallet. As has been indicated it has been determined that members may be extended between pallets to limit this flexure. However, it cannot be completely eliminated. The gap **440** is therefore provided in order to permit the prestressed concrete pallet **434** to flex downwardly without damaging the wall **436**.

It will be appreciated that the gap **440** would be objectionable if it could be observed from within the dwelling unit incorporating the service core **430**. To this end a strip **442** is secured to the underside of the pallet **434** and extends downwardly beyond the upper end of the wall **436**. The strip **442** thus cooperates with the wall **436** to form a strip joint between the underside of the pallet **434** and the upper end of the enclosure of the service core **430**. Such a slip joint hides the gap **440** and yet permits movement of the pallet **434** relative to the core **430**.

In the practice of the present invention the various walls and partitions of the service cores are assembled in suitable jigs and fixtures. It has been determined that considerable time and expense can be saved if the walls and partitions are completely finished on both sides while they are in the jigs and fixtures. However, such practice would appear to be negated since it would then be impossible to secure the walls and partitions to the deck of a prestressed concrete pallet.

This difficulty can be overcome by boring holes **444** through the deck of a prestressed concrete pallet along lines that will comprise the walls and partitions of a service core. The walls and partitions are then completed on both sides in suitable jigs and fixtures. The completed walls and partitions are positioned at their proper places on the pallet and are secured to the pallet by lag screws **446** which are inserted through the holes **444** and threadedly engaged with the walls and partitions. This technique has been found to be highly satisfactory in that it permits complete finishing of the walls and partitions on both sides and yet provides means for rigidly securing the completed walls and partitions to the decks of prestressed concrete pallets.

As has been indicated, the pallets that are utilized in the practice of the present invention are apt to flex subjected to varying live loads. On the other hand, the walls and partitions of the enclosures of the service cores are relatively inflexible, at least insofar as bending with the pallets is concerned. To this end the connections between the pallets and the walls are preferably rendered somewhat resilient, for example by mounting springs, such as the Belleville washers **448** shown in FIG. **20**, at suitable locations to accommodate relative flexure between the walls and the pallets.

Various additional details of the apartment complex **200** are illustrated in FIGS. **22–25**. Referring first to FIG. **22**, the various apartment buildings comprising the complex **200** are provided with roofs **450** which are formed on prestressed concrete pallets, but which are otherwise finished by conventional techniques to pre-

vent moisture from entering the apartments of the complex. As is best shown in FIG. 23, the cantilever portions 218 comprising the double loaded entry ways 216 extend adjacent to but do not engage the load bearing walls comprising the next adjacent apartment buildings. As has been indicated, the decks of the prestressed concrete pallets are normally discontinued at points corresponding to the positioning of the load bearing walls. The decks, may, however, be extended at points corresponding to the door openings to provide a suitable door sill 452.

Referring now to FIGS. 24 and 25, the structural details of the dwelling units at the shear walls 224 are shown. Sections of thermal insulation 454 are mounted on the inner surfaces of the shear walls 224 and are covered by the paneling sections 352. As has been indicated, the conduits 368 also extend behind the paneling sections 362 and are therefore fully hidden from view. FIG. 25 further illustrates the use of carpeting 456 and a sprayed asbestos coating 458 on the upper and lower surfaces of blank prestressed concrete pallets.

although preferred embodiments of the invention have been illustrated in the accompanying drawings and described in the foregoing detailed description, it will be understood that the invention is not limited to the embodiments disclosed, but is capable of numerous rearrangements, modifications and substitutions of parts and elements, without parting from the spirit of the invention.

What is claimed is:

1. The dwelling unit comprising:
a pair of spaced load bearing wall panels;
a pair of prestressed concrete pallets extending between and supported by the load bearing wall panels;
one of said pallets bearing substantially the entire kitchen, bathroom and temperature control facilities for the dwelling unit;
the other of said pallets being positioned adjacent said one of the pallets such that the pair of pallets forms the floor of the dwelling unit;
shear control means for preventing movement of the load bearing wall panels in a direction transversely of the load bearing wall panels; and
ceiling means supported by the load bearing wall panels and forming the ceiling of the dwelling unit.

2. The dwelling unit of claim 1 further characterized by:
a third pallet disposed adjacent said one of said pallets to further define the floor of the dwelling unit.

3. The dwelling unit of claim 1 wherein:
the ceiling means comprises a second pair of prestressed concrete pallets.

4. The dwelling unit of claim 3 wherein:
said one of said pallets includes interior walls defining at least one living compartment and a false ceiling supported by the interior walls for at least one said living compartment.

5. The dwelling unit according to claim 1 further comprising:
a second pair of spaced load bearing wall panels positioned on and supported by the first pair of load bearing wall panels;
a second pair of prestressed concrete pallets extending between and supported solely by the first pair of load bearing wall panels;
one pallet of the second pair bearing the entire kitchen, bathroom, and temperature control facilities for a second dwelling unit;
the other pallet of the second pair being positioned adjacent to said first pallet of the second pair for cooperation therewith to form the floor of the second dwelling unit, and
wherein the shear control means also prevents movement of the second pair of load bearing wall panels in a direction transversely of the load bearing wall panels.

6. The dwelling unit according to claim 5 further comprising:
a third pair of prestressed concrete pallets extending between and supported solely by the second pair of load bearing wall panels and forming a ceiling for the second dwelling unit.

7. A dwelling unit comprising:
a concrete pallet including a deck, a plurality of longitudinally extending prestressed concrete beams each depending from the deck, and tension members extending through the beams for prestressing the pallet such that the beams are adapted for support only at or near spaced optimum load support points to support a load on the deck;
a pair of load bearing walls positioned to support said pallet at longitudinally spaced points on the beams depending from the deck to define a habitable area therebetween;
enclosure means formed on the pallet flush with the deck including complete mechanicals for the dwelling unit, said pallet and said enclosure means forming a moveable unit for positioning said pair of load bearing walls;
a second prestressed concrete pallet having at least one depending prestressed concrete beam with spaced optimum load support points, said beam being supported on the load bearing walls at said optimum load support points to define the ceiling of the unit; and
means for maintaining the load bearing walls erect.

8. The motel unit according to claim 7 wherein the means for maintaining the load bearing walls erect comprises a wall extending longitudinally of the pallet and interconnecting the load bearing walls.

9. The motel unit according to claim 8 wherein the longitudinally extending wall is positioned at one edge of the pallet and is finished on both sides to define one wall of the motel units and the opposite wall of an adjacent motel unit.

10. The motel unit according to claim 9 wherein the pallet extends beyond the load bearing walls at both ends to define an entryway at one end of the unit and a balcony at the other end.

11. The dwelling unit comprising:
at least one concrete pallet including a deck portion having a substantially planar upper surface, at least one beam portion depending from the deck portion, and tension members enclosed in the beam portion for prestressing the beam portion such that the beam portion is adapted for support at a pair of spaced points to support a load on the deck portion;
enclosure means formed on the pallet and comprising complete kitchen, bathroom and temperature control means for the dwelling unit;

a pair of load bearing wall means positioned in engagement with the spaced points of the beam portion to support the pallet and the enclosure means thereon;

shear control means for maintaining the load bearing wall means erect;

an additional concrete pallet including a deck portion having a substantially planar upper surface, at least one beam portion depending from the deck portion, and tension members enclosed in the beam portion for prestressing the beam portion such that the beam portion is adapted for support at spaced points to support a load on the deck portion, and wherein the load bearing wall means supports the additional pallet adjacent the first pallet for cooperation therewith to form the floor of the dwelling unit; and

ceiling means formed by a plurality of concrete pallets each including a generally planar deck portion having at least one beam portion depending from the deck portion and tension members enclosed in the beam portion for prestressing the beam portion such that the beam portion is adapted for support at spaced points to support a load on the deck portion, the concrete pallets of the ceiling means being supported by the load bearing wall means.

12. The multi-family dwelling unit comprising:

a pair of substantially vertically extending load bearing walls;

a first substantially planar deck extending horizontally between the load bearing walls and supported thereby;

enclosure means formed on the deck and including complete mechanicals for two dwelling units, including a fire barrier extending substantially the entire length of the deck between the two sets of mechanicals;

at least second and third decks supported by the load bearing walls and positioned adjacent to the deck bearing the enclosure means for cooperation therewith to define the floor of the two dwelling units;

additional decks supported above the first, second and third decks comprising the floor of the two dwelling units to form the ceiling of the two dwellings units; and

cooperating means on the fire barrier and on one of the first, second and third decks for extending the fire barrier the entire distance between the floor and the ceiling of the two dwelling units.

13. The multi-family dwelling unit comprising:

at least three substantially planar, horizontally extending decks positioned adjacent one another to define the floors of adjacent dwelling units;

enclosure means formed entirely on the center deck and including complete kitchen, bathroom and temperature control facilities for two dwelling units;

each of the decks comprising a prestressed concrete pallet including a substantially planar deck, at least one beam formed integrally with and depending from the deck, and tension members extending through the beam to prestress the pallet and thereby adapt the beam to support a load on the deck;

load bearing walls mounted at the ends of the pallets; and

at least three additional prestressed concrete pallets supported on the load bearing walls to define the ceilings of the adjacent dwelling units.

14. The dwelling unit comprising:

at least one concrete pallet including a deck portion having a substantially planar upper surface, a plurality of prestressed concrete beam portions depending from the deck portion, and tension members enclosed in the beam portions for prestressing the beam portions such that the beam portions are adapted for support only at or near spaced optimum support points to support a load on the deck portion;

enclosure means formed flush with the deck portion of the pallet, so that the deck portion forms a floor for the enclosure means; and

a pair of vertically extending load bearing walls having notches formed in their upper ends for receiving the beam portions of the pallet and for engagement with the optimum support points of the beam portions to support the pallet and the enclosure means thereon, whereby said enclosure means and said pallet are assembled and placed as a unit on said load bearing walls, said beam portions of the pallet including cantilever portions extending beyond one of said load bearing walls and said deck portion of the pallet including a primary portion positioned between the load bearing walls and a secondary portion positioned outside the load bearing walls on the cantilever portions of the beam portions.

15. The multi-family dwelling unit comprising:

a pair of substantially vertically extending load bearing walls;

a substantially planar deck extending horizontally between the load bearing walls and supported thereby;

enclosure means for forming an enclosure on the deck, said deck forming a floor for the enclosure, said enclosure means including two complete sets of mechanicals, one for each of two dwelling units, said deck and said enclosure means being assembled and placed as a unit on said load bearing walls, said enclosure means including a fire barrier extending substantially the entire length of the deck between said two sets of mechanicals; and

at least two additional decks supported by the load bearing walls and positioned on either side of the deck bearing the enclosure means for cooperation therewith to define the floor of the dwelling units.

16. The dwelling unit comprising:

a prestressed concrete pallet including a relatively thin deck, a plurality of prestressed concrete beams formed integrally with and depending from the deck, and tension members extending through the beams for prestressing the pallet and thereby adapting the beams for support only at or near spaced optimum load support points to support a load on the deck;

enclosure means for forming an enclosure on the deck, said deck forming a floor for the enclosure, and including vertically extending walls situated at the periphery of the deck, a ceiling extending over the deck and between the walls, and at least one partition situated within the walls and beneath the ceiling;

complete kitchen, bathroom, and temperature control facilities mounted on the deck within the enclosure means;

load bearing wall panels having means for engaging the beams at the optimum load support points to support the pallet and thereby support the enclosure means and the kitchen, bathroom and temperature control facilities within the enclosure means, whereby said enclosure means and said pallet are assembled and placed as a unit on said load bearing wall means; and

a second prestressed concrete pallet having at least one depending prestressed concrete beam with spaced optimum load support points, said beam being supported on the load bearing wall means above the enclosure means on the first pallet, enclosure means mounted on the second pallet, and complete kitchen facilities, bathroom facilities, and temperature control facilities for a second dwelling unit supported on the second pallet within the enclosure means thereon.

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