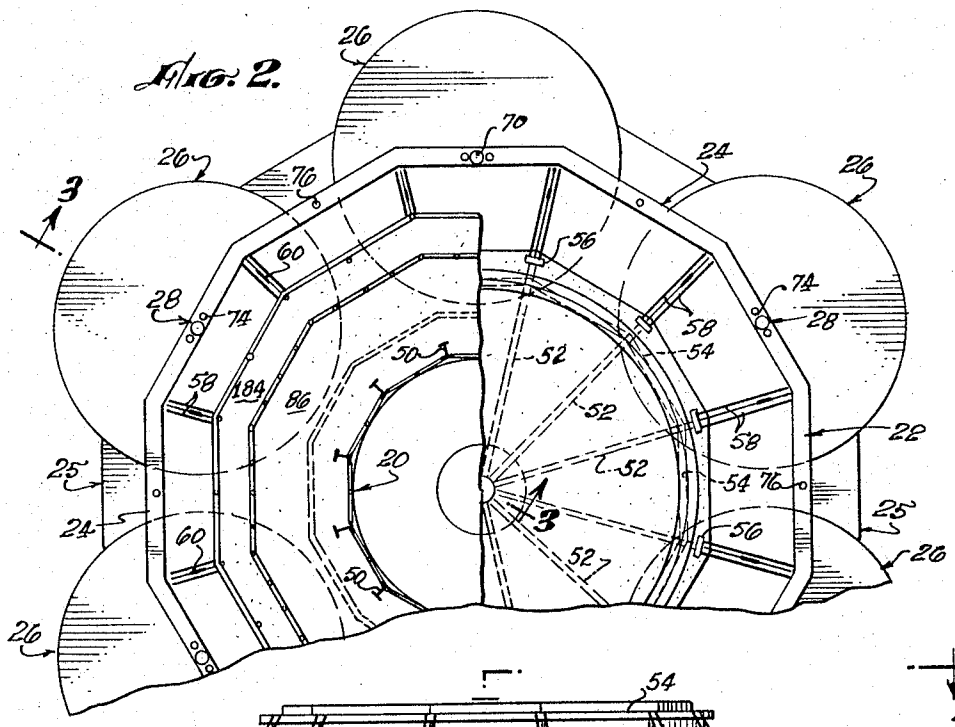
Jan. 24, 1967 L. L. ARNOLD 3,299,588

MULTILEVEL BUILDING STRUCTURE WITH PLURAL SUSPENDED REVOLVING COMPARTMENT UNITS AND METHOD OF MAKING SAME

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FIG. 2.



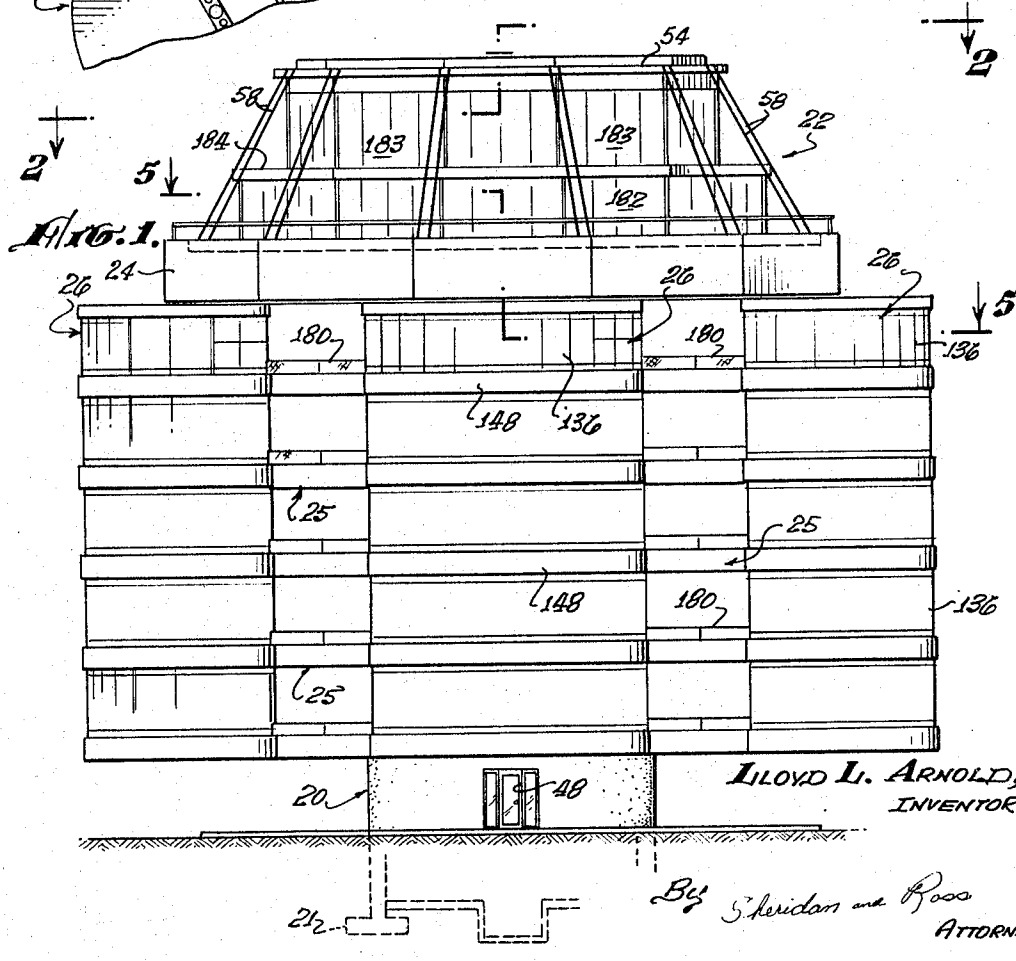


FIG. 1.

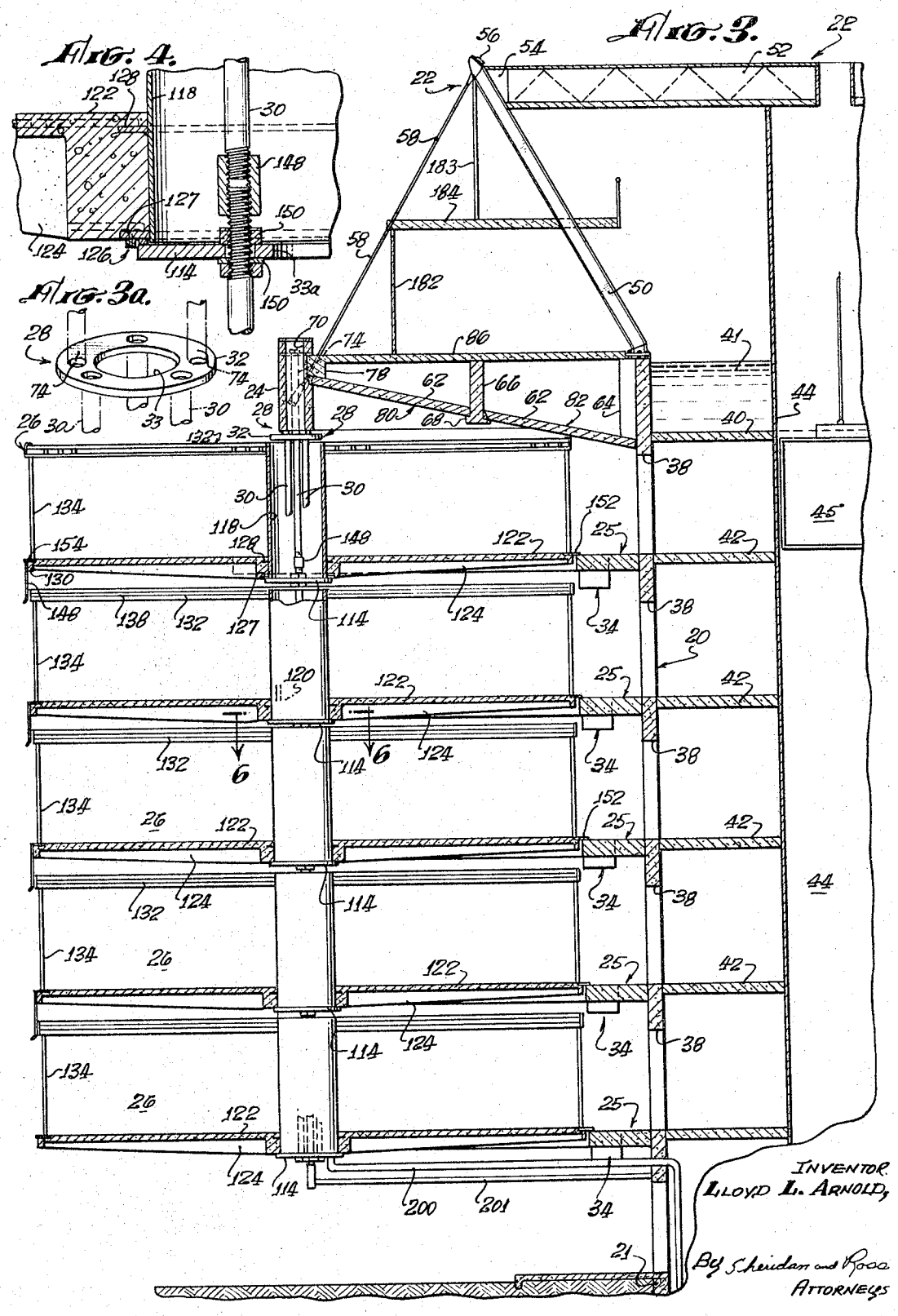
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MULTILEVEL BUILDING STRUCTURE WITH PLURAL SUSPENDED REVOLVING COMPARTMENT UNITS AND METHOD OF MAKING SAME

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Fig. 5.

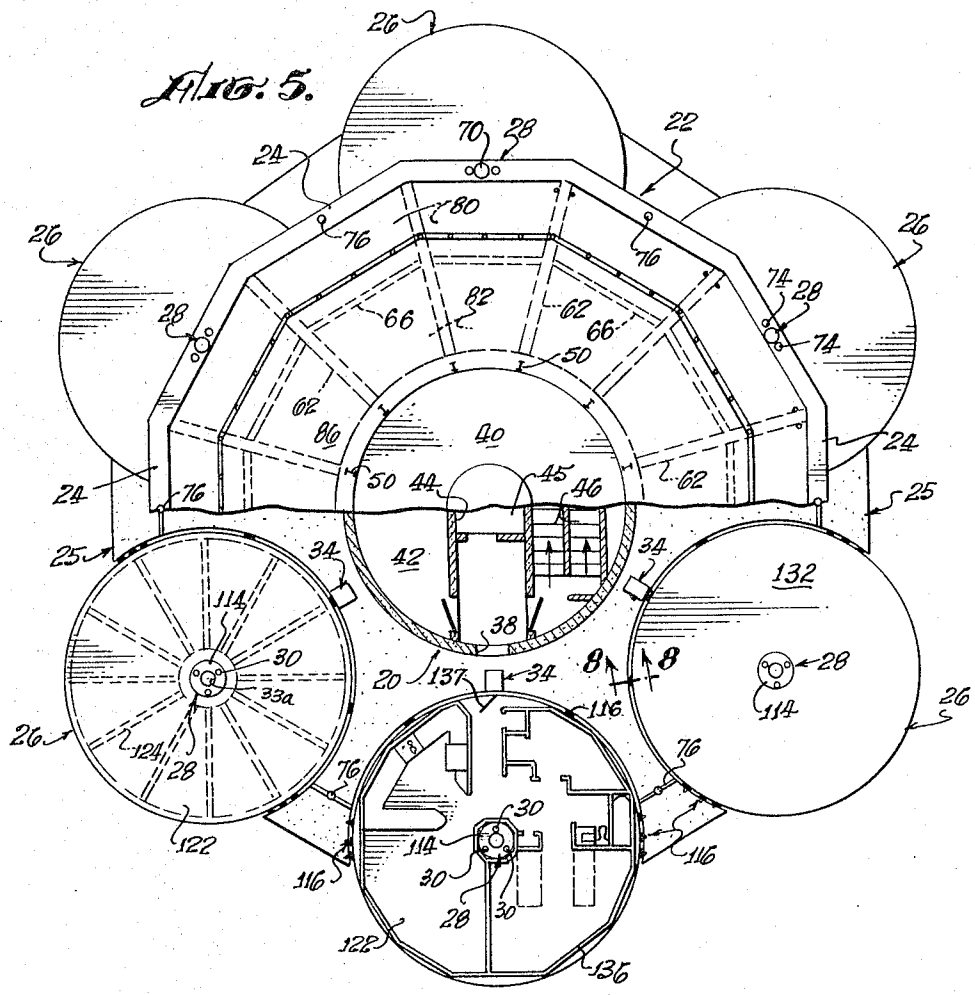
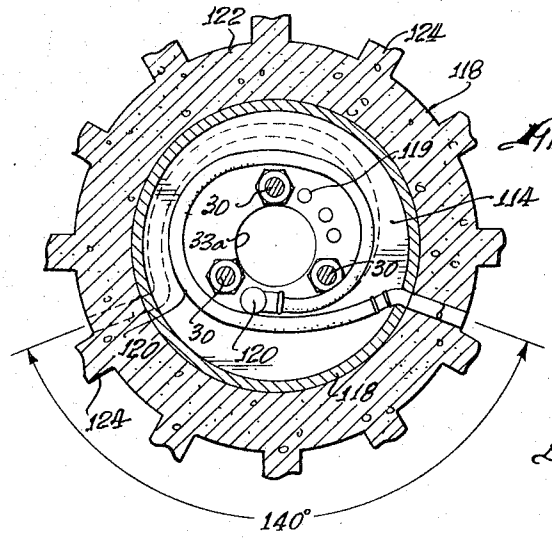


Fig. 6.



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FIG. 7.

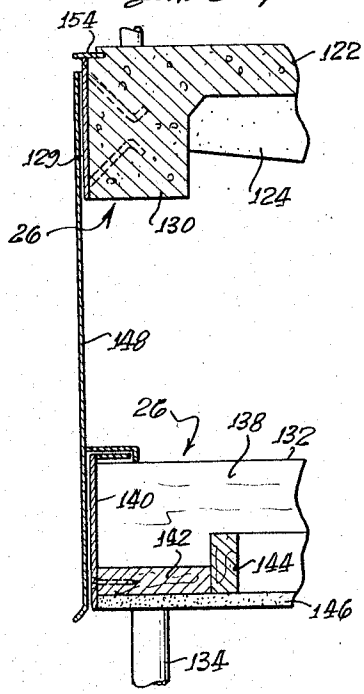


FIG. 8.

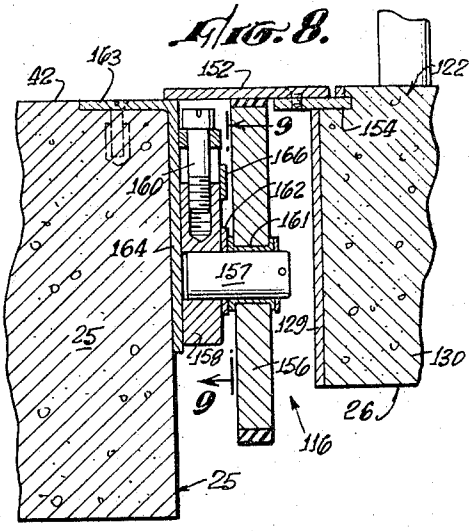


FIG. 9.

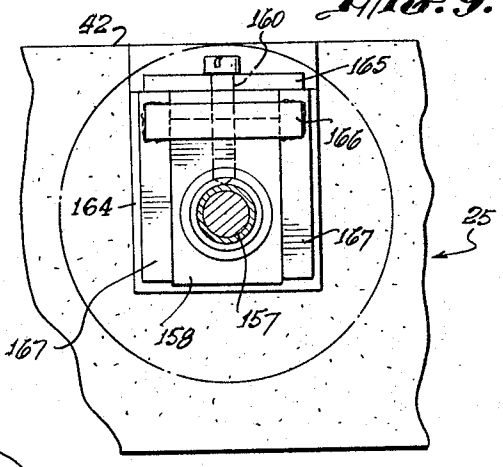
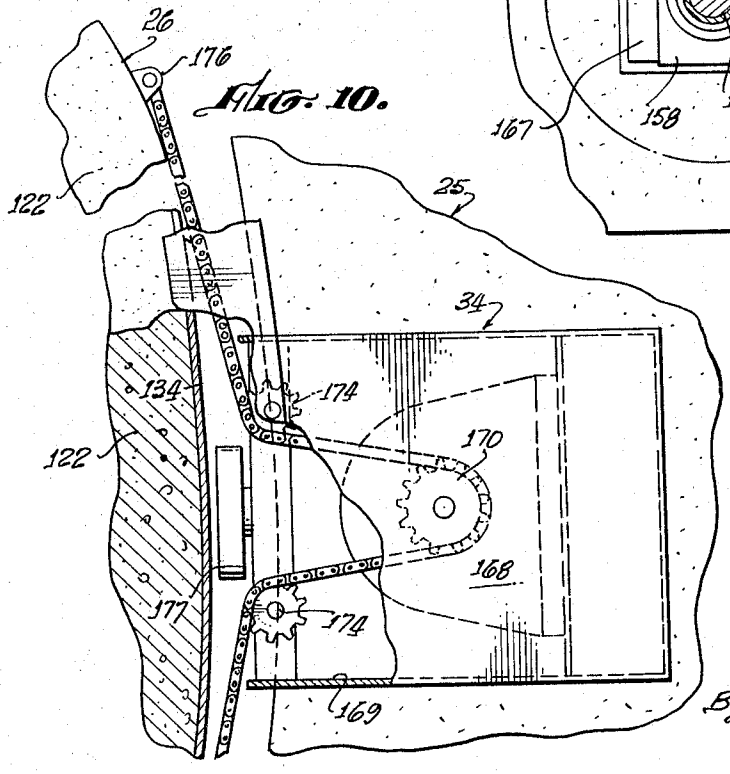


FIG. 10.



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FIG. 12.

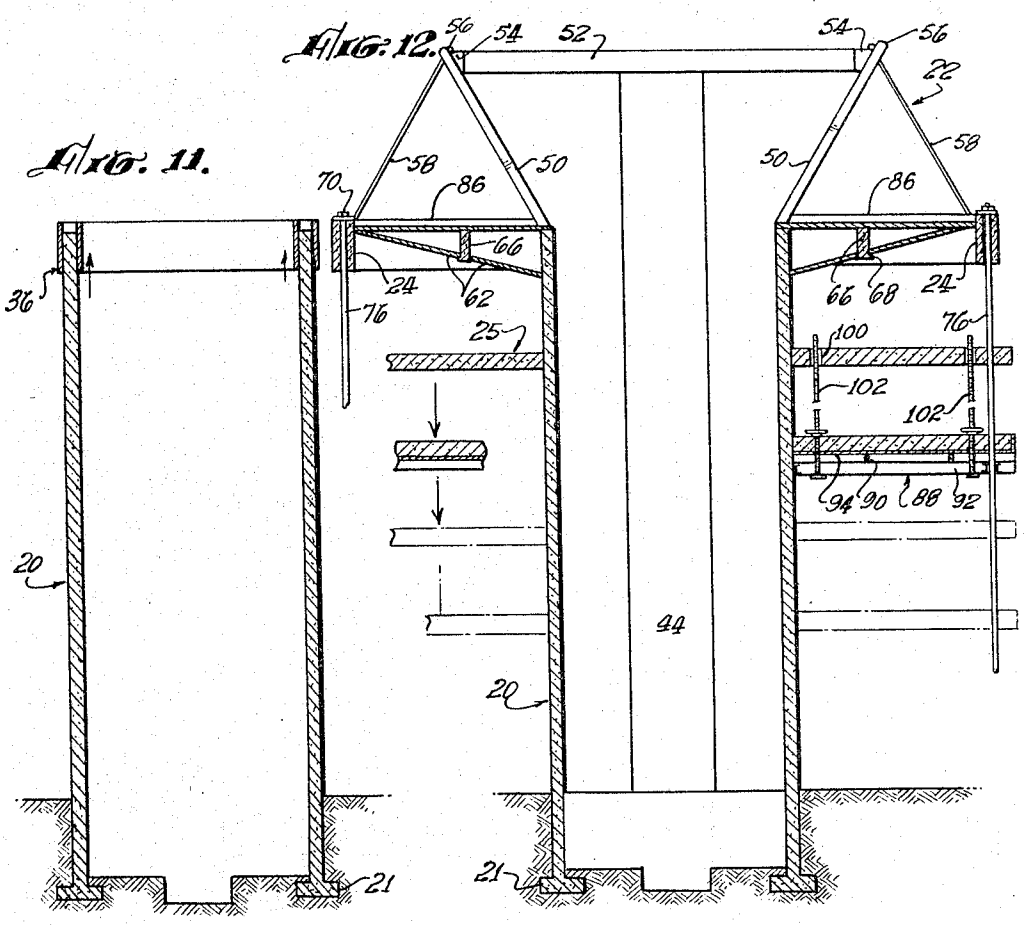
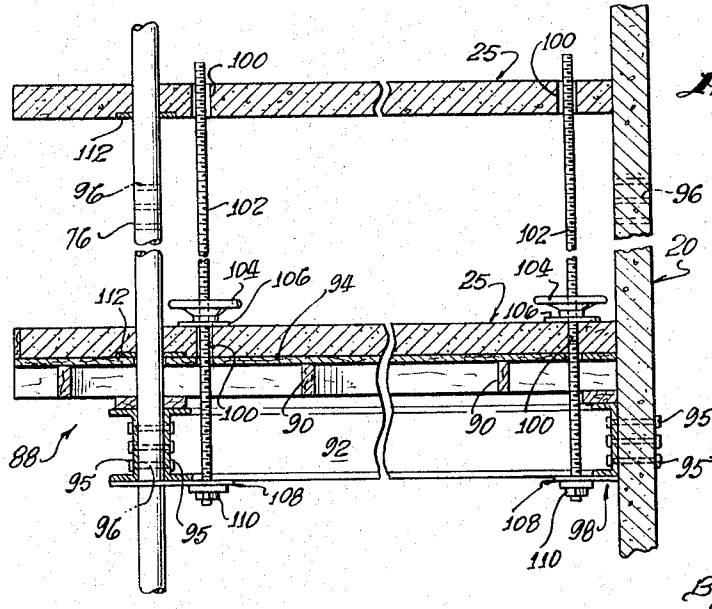


FIG. 11.

FIG. 13.



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MULTILEVEL BUILDING STRUCTURE WITH PLURAL SUSPENDED REVOLVING COMPARTMENT UNITS AND METHOD OF MAKING SAME

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Filed July 10, 1963, Ser. No. 293,967
18 Claims. (Cl. 52—65)

The present invention relates to building constructions. More particularly, the present invention relates to economically advantageous building constructions wherein individual units of the structures have movement relative to the remainder of the structure, and to methods and techniques for the construction thereof.

Prior to the present invention efforts have been made to provide buildings having structural portions which rotate relative to other portions thereof. Such constructions, however, have not been capable of providing features of economy and, particularly, in any such degree as to come into popular usage. The present invention provides structures and methods of assembly which make possible the economical utilization of space, materials, and labor in the provision of building structures wherein a large plurality of units may be independently mounted on a stationary supporting structure for individual controlled rotation relative to one another and relative to the supporting structure.

This is accomplished, in the present invention, by providing a strong central core portion, mounting superstructure over the central core portion; and suspending a plurality of angularly spaced stacks of rotatable units from the superstructure in such a manner that the units are rotatable relative to each other. Such a construction has many advantages which will be fully set forth hereinafter. Some of these advantages are that constructions under the present invention, as thus far described, provide sheltered parking and recreational areas beneath the lowest level of each stack of rotatable units, improved privacy as between units, since no unit has any wall common with any other unit, and the unit cost of construction is less than for conventional constructions. Buildings according to the present invention may be made of any materials which are suitable, and by any practical construction methods, although the specific exemplary showing herein is of a preferred concrete construction and adapts itself to the employment of novel concrete forming techniques as will be fully described herein.

It should be evident that buildings according to the present invention may be used for storage, offices, apartments, and for many other purposes, although the illustrated example is of an apartment dwelling construction.

It is an object of the present invention to provide improved building constructions wherein individual compartments thereof are rotatable relative to one another.

Another object of the present invention is to provide improved building constructions, and methods for the erection thereof.

Still another object of the present invention is to provide building constructions wherein pluralities of apartment or compartment units are arranged in stacks, one above the other, and in which each such apartment or compartment unit is rotatable or oscillatable relative to each of the others.

A further object of the present invention is to provide improved building constructions wherein a plurality of apartment or compartment units are mounted in spaced radial relationship about a central core landing, each being mounted for rotation about its own axis for motion relative to the landing and to the other units.

A still further object of the present invention is to provide an improved method for the construction of concrete building structures whereby concrete forms are shifted downwardly from the top of the construction to form the various floor levels from the topmost down.

Yet another object of the present invention is the provision of improved apartment building constructions wherein individual apartment units may be pre-formed apart from the basic building and lifted into final assembled position, as by crane means.

These and other objects and the advantages attendant thereto will become readily apparent from the following detailed description, taken in conjunction with the appended drawings, wherein like reference numerals have been applied to like parts throughout, and wherein:

FIGURE 1 is a front elevational view of a building structure according to the present invention;

FIGURE 2 is a partial sectional view of the structure of FIGURE 1, taken along the line **2—2** thereof;

FIGURE 3 is an enlarged partial sectional view of the structure of FIGURES 1 and 2, taken along the line **3—3** of FIGURE 2;

FIGURE 3*a* is a fragmentary enlarged perspective view of a transition plate element;

FIGURE 4 is an enlarged sectional view of a detail of the construction, i.e. the means for supporting individual units in the stacks of units;

FIGURE 5 is a sectional view of the building construction of FIGURES 1 to 4, taken along the line **5—5** of FIGURE 1;

FIGURE 6 is an enlarged sectional view, taken along the line **6—6** of FIGURE 3 and illustrating the details of the stack core structures.

FIGURE 7 is an enlarged fragmentary sectional view of the facing detail of the structure of FIGURES 1 to 6;

FIGURE 8 is an enlarged fragmentary sectional view of a typical roller bearing and support forming a detail of the invention and is taken along the line **8—8** of FIGURE 5;

FIGURE 9 is a section taken along the line **9—9** of FIGURE 8, showing adjustment details of the bearing of FIGURE 8;

FIGURE 10 is a schematic showing of exemplary means for effecting rotation of individual structural compartments.

FIGURES 11, 12, and 13 are schematic showings of a method of assembly which is made possible by the present invention, FIGURE 11 showing the central core element; FIGURE 12 showing the mode of supporting pallets for forming horizontal members; and FIGURE 13 being an enlarged fragmentary view taken of a portion of FIGURE 12 to better illustrate the details thereof.

The improved building structure of the present invention may obviously be constructed in a variety of methods according to known techniques. However, one of the advantages of structures according to the present invention is that they make it possible to utilize novel construction methods which are extremely advantageous from the point of view of economy and simplicity. Hence, while the building construction may be made by other methods, it is considered that the concrete pouring technique hereinafter termed the "drop-form" method, forms a part of the present invention.

Building structures according to the present invention are shown on the drawings in a single example which is obviously merely typical of structures within the scope of the invention since the height, the number of stacks of units, and many of the minor structural details could obviously be varied without departing from the spirit of the invention.

The exemplary structure under the present invention, as shown in the drawings is comprised of basic components including a central core **20** (see FIGURES 2, 3, and 5); a superstructure supported by the core **20**,

the superstructure being generally designated by the reference numeral 22; a parapet comprised of beams 24 (FIG. 5) and forming a part of the superstructure 22; an externally scalloped cantilever deck 25 (FIG. 5) attached to the core 20 at each floor level; a plurality of stacks (six in the illustrated example) of individual compartments or apartments 26 arranged about the core, each such compartment being couched in a scallop of the cantilever deck 25, as shown; means (generally designated by the reference numeral 28) supporting the compartments by suspension from the superstructure on heavy rods 30, supported from the parapet beams 24 by the plate 32 (FIGURE 3*a*); and means generally designated by the reference numeral 34 (and specifically shown in FIGURE 10) for rotating the compartments as desired for changing their orientation relative to one another and to the central core.

The preceding description is only of the very basic general parts. Obviously many details of bearings, support means, utility line provisions, etc., are of importance, but in order to avoid duplication and undue length of this specification, such details will be described in conjunction with the description of an example of how a structure such as is shown in the drawings is constructed, with accentuation of details of methods or structures where such accentuation is deemed necessary in pointing out the essential features of the present invention. Thus, the supporting tower or core 20 is the first element to be constructed and is started below grade level on footings as at 21 and is built by the so-called "slip-form" construction method, wherein concrete forms 36 (see FIGURE 11) are moved up with the tower as it is poured, making it one continuous, uninterrupted operation until the top is reached, and in this procedure, provision is made for doors 38 at each floor level (see FIGURE 3). Floor slabs are then poured at each level in the core 20, and preferably these are poured by the "drop-form" method to be described hereinafter, starting with the top core deck 40 which will become the floor of a pool 41, if desired, and proceeding downwardly with intermediate floor decks 42.

The deck 40 is provided with a central circular opening, and as soon as the said deck 40 has sufficiently set to sustain the necessary loading, the circular steel elevator shaft 44 is placed therethrough and bolted in place (by standard means, not shown) to extend through the said opening, up through the pool 41, and to the top of the structure (see FIGURE 3). For erection convenience, it may be seen that the elevator shaft 44 serves as a convenient central support structural member and eventually houses an elevator 45.

As may be best seen in FIGURE 5, provision is made in the decks 42 for the inclusion of stairs 46 which may be constructed and finished as and when desired. It will also be noted (see FIGURES 2 and 3) that the grade (ground floor) level of core 20 is the entrance lobby for the entire building, having doors 48 to give access to the main lobby (not shown) and that the method of support and suspension of the remainder of the building provides extensive covered parking and walk areas under the bottom-most compartments or apartments to give extreme economy of use of the land.

After the positioning of the elevator shaft, the next step in the sequence of erection is the erection of the superstructure 22. This is started by the placing and securing the outwardly and upwardly projecting steel or precast concrete columns 50. The columns 50 are secured at their bases by being bolted to previously placed anchor plates (not shown) which are embedded in the core 20. At the upper extremity of the columns 50 they are secured and tied to the previously erected elevator shaft 44 by means of radial roof deck trusses 52 (see FIGURES 2, 3, and 12). The trusses 52 are tied together laterally by means of roof-bracing trusses 54, bolted or otherwise secured to each other to provide a rigid structure capable of supporting both vertical and lateral loading. It is to be noted that trusses 52 and 54 may either be of metal or pre-cast concrete.

At the end of the inclined columns 50 there are provided extending means 56 to serve as an anchor adjusting means for post-tensioning cables 58. Temporary turnbuckles 60 (FIG. 2) are used to adjust the tension of cable 58 as and for reasons to be mentioned in the description of the erection of pool deck beams 62.

The pool deck beams 62 are preferably precast and are installed by connection to base plates (not shown) on the related inclined columns 50. At their outer extremities the beams 62 are temporarily supported by the turnbuckle members 60 and are adjusted to proper elevation by said turnbuckles. The beams 62 are then secured to one another and braced by lateral bracing beams 66 (preferably precast) which are inboard of the outer ends of the beams 62 as best seen in FIGURE 3. The bracing beams 66 may be secured to the radial beams 62 by any desirable means, as for example by welding special weldments (not shown) which may be cast in connecting beams as they are formed. The bracing beams 66 may have a flanged bottom as at 68 for support of precast bottom slabs which form a part of the support of the pool deck surface to be later described.

After the erection of the frame structure formed by beams 62 and 66, the next step in construction may be the erection of the preferably partially precast parapet beams 24. The beams 24 comprise the main support for apartment units and are necessarily of very heavy construction. Only a portion of each end of each beam is not precast and this is done so that the bottom anchorage for post-tensioning cables 58 may be placed in the gap in the beam (as best seen in FIGURE 3). The parapet beams 24 serve to radially brace and tie together the ends of the radial pool deck beams and they are secured (by conventional means, not shown) in the positions best shown in FIGURES 2, 3, 5 and 12, the adjustment for leveling being made by turnbuckles 60 (FIG. 2) with the heavy cables 58 functioning as the final supporting and tensioning means.

It is noteworthy that, as part of the construction of the parapet beams 24 there are holes precast therein at their centers, as will now be described. Inspection of FIGURES 1, 2 and 5 will show that alternate parapet beams 24 serve different functions since some serve to directly support stacks of apartment units and others do not. The alternate beams 24 which support apartment units have large holes (in the order of 14 inches) precast therein, as at 70. Openings of this size are necessary for the purpose of providing space for passage of erection crane cables, sheaves, and hooks to permit a crane to reach through the openings to the ground for subsequently hoisting and securing individual and separately formed apartment units or compartments into place. Each apartment unit 26 will weigh approximately 60,000 pounds and such a load necessitates the use of at least two ⅞" round cables for hoisting. Two holes are provided adjacent each opening 70 and these are for accommodating support rods such as the rods 74 for carrying virtually all the apartment loads. Rods 74 may vary in diameter from 2 inch round to 4 inch round, dependent on the number of stories involved. The selection of sizes and the manner of support of rods 74 in the openings 72 are well within the capability of one skilled in this art.

Alternate parapet beams 24 are provided with a single small opening, through which permanent support rod hangers are positioned, the opening and the hangers being designated by the reference numeral 76, and these hangers serve the function of providing outer support for the intermediate floor decks 25.

Weldments, not shown, may be provided in the ends of and in the bottoms of each of the parapet beams 24 for securing said parapet beams to the brackets at the

outer extremities of the previously erected precast radial beams **62**.

Next in the desirable sequence of erection is the installation of precast concrete bottom (compression ring) slabs. These slabs are pie-shaped and are secured around the perimeter of the structure in the plane of the radial beams **62** of FIGURE 3. One group is supported between the parapet beams **24** and on the flanges **68** of lateral beams **66** and the other internal group is supported on the core **20** and on the flanges **68** of the lateral beams **66**. Reference numerals **80** and **82** have been applied to the outer and inner groups of bottom slabs (in FIGURE 3) by arrows, to indicate their position. In practice the slabs **80** and **82** are somewhat smaller than the opening which they are to fill and leave about a two to three inch wide gap all around the slabs where they adjoin adjacent structural members. After proper placement and securement, the voids around the perimeters of the slab may be dry-packed with concrete to complete the securement of the slabs and to insure their functional action as a complete compression ring around the core for the support of quite substantial weights.

Next, the top portion of a deck **86** is formed and cast in place at the top level of the core. If a pool is provided above the top core deck **40** the deck **86** may be designated the "pool deck." Part of this pour results in thickening of the core **20** at its top (as at **64**) and in thickening of the parapet beams (as at **78**). The top slab or deck **86** acts somewhat as a tension ring which, together with the bottom slab, which acts as a compression ring, combines to act more or less as the complete structural support for the construction below, which will be later described.

The exterior projecting and scalloped-shaped intermediate floor decks **25** are next erected. These are preferably poured in place and it is one of the advantages of the present invention that these decks (as well as the inner horizontal decks of the core **20**) may be formed by a "drop-form" method which is best illustrated in FIGURES 12 and 13. In the drop-form method, pallets **88** are assembled on the ground and are installed and hung from hanger or supporting rods **76** which have been previously described as supported from alternate parapet beams **24**. As shown in FIGURE 12, the pallets **88** are of quite heavy construction comprising pallet framing joist members **90** which are supported on basic pallet structural members **92** and to which, in turn the palet decking **94** is secured. The pallets are formed in segments on the ground and are first hoisted into position at the top-most level for pouring of the cement decks. Each segment is supported by bolts **95** inserted through bolt holes **96** in the hanger rods **76**, and is also similarly secured to the outer surface of the core **20**, as shown, at **98**.

Each pallet section **88** is provided with openings adapted to be aligned with openings **100** which are formed in each deck in the pouring thereof. Openings **100** are each of a size to support a lowering rod **102**, the said rod being of a length greater than the vertical distance between decks. The rod **102** is threaded, as shown, and has a threaded operating wheel **104** thereon, as well as a bearing plate **106** against which wheel **104** operates when turned in a direction to cause rod **102** to move downwardly. A pallet support bar **108** is adapted to be attached to the end of the lowering rod **102** to support the pallet during the lowering operation and to be held in position by a nut **110**, as shown.

Prior to the pouring of each deck, shear plates such as the plate **112** are attached to each hanger rod **76** by any suitable means. Reinforced concrete is then formed by pouring concrete onto the pallet supported as stated above, on the rods **76** and on the core **20**. The lowering rods **102** and their parts are not installed until after the pouring operation, it being necessary only that the openings **100** be formed in each segment.

After the poured reinforced concrete deck has sufficiently set to be able to sustain its own dead load weight without structural detriment, the suport pallet segments may be lowered to the next pour position. To accomplish this result a threaded rod **102** is inserted through each hole **100** and the support bar **108** of each is caused to bear against the bottom of the pallet by adjusting the wheel **104** and bearing plate **106** to cause the pallet to be gripped between the plate **106** and the bar **108**, and take its weight off of bolts **95**. The bolts **95** are then all removed. Each segment **88** may then be lowered by turning wheels **104** in a direction to cause threaded rods **102** to move downwardly. With plates **106** bearing on top of the concrete the support bars **108** will move downwardly, carrying the pallet segment with them. When the pallet segment has been lowered sufficiently to be aligned with the next lower set of bolt holes **96**, bolts **95** are installed, the rods **102** are removed, and the next lower deck is ready to be poured. This sequence is repeated until all the decks are poured.

The above described pouring technique is advantageous in that gravity may be utilized in moving the pallets between pouring operations and this technique may be used in constructing buildings according to the present invention, for forming the internal core decks **40**, **42** as well as for forming the scalloped outer floor level slabs or decks **25**.

The individual apartment units **26** are preferably formed on the ground and hoisted into their final position. Ground preparation for these units may be progressing while the floor slabs **25** are being poured, but they cannot be actually raised to permanent position until after the pallets **88** have been removed. Preferably, only the basic structural elements are formed on the ground and the units are finished after assembled in final position, in order to minimize the weight to be lifted in each case.

Briefly the apartment units **26** may be described as basically of circular construction mounted for rotation about a fixed axis and on a central base plate and bearing **114** (see FIGURES 3 and 4). Each unit is supported centrally on its bearing plate **114** and in addition receives contributory support along a substantial portion of its perimeter from wheel type radial bearings **116** (see FIGURES 8 and 9) affixed to the surrounding and rigidly supported deck slabs **25** (see FIGURE 5). The utility supply lines **119** and waste lines **120** are included in central cores **118** as shown in FIGURE 6, and these non-rotating lines extend through the base plates **114** from the ground to the topmost of the vertically aligned apartments. Flexible hose and/or tubing is used inside the core to make connections to the rotating portion of the fixed plumbing and piping. The dotted line in FIGURE 6 indicates the extreme rotated position of the waste line.

A typical apartment construction is best seen in the bottom half of FIG. 5 showing sections of three apartment units taken at different planes. The section to the left is taken through the base assembly, the one in the center is taken on a medial plane through the apartment walls and the one to the right on a plane above the ceiling. The base assembly (see FIGURES 4 and 5) comprises a central core **118** in the form of a heavy metal cylinder, a base comprising the deck **122** and radial ribs **124** monolithically poured with the deck **122**, the base being welded to the central core **118** by weldments (not shown). The apartment base assembly also includes the previously mentioned base or bearing plate **114**, an oil impregnated bearing assembly **126** and lower and upper stiffener rings **127** and **128**, respectively, the said stiffener rings being welded to the core cylinder **118** around its periphery. The base assembly also includes (FIG. 7) a curved plate forming a continuous fascia **129** which is used to form the outer perimeter of the assembly. It should be noted that the outer perimeter of the base deck **122** is thickened and reinforced as at

130 and that fascia 129 is embedded therein as shown in FIGURE 7.

The ceiling 132 of each apartment assembly is supported at its outer extremities by light weight columns 134 (FIG. 3) at approximately thirty degree intervals, with spaces between floor and ceiling and the columns 134 to be framed and enclosed by a curtain wall type construction 136, the details of which are not shown in detail but which is illustrated in FIGURE 1. A ceiling support ring (not shown) is welded to the outer surface of each apartment core 118 to support the inboard portion of each ceiling 132. The ceiling, as supported on the columns 134 and the ceiling support ring is comprised of radial beams 138 which are spaced angularly about 30 degrees from one another and which may be of wood. Beams 138 are connected at their outer ends by a curved steel plate of fascia 140 connected to a curved railing strip or stiffener 142 which is notched into the beams ends as shown in FIGURE 7. The framing between the radial beams 138 is provided by 2 x 4 joists and the finish 146 of the ceiling is attached thereto in any desired standard technique.

The space between the ceiling of one apartment and the base deck assembly of the next higher apartment is covered by a curved steel fascia plate 148 for the extent of the apartment which is outward of the scalloped decks 25.

Apartment units, as described, are preferably assembled on the ground. Each such unit is then hoisted in place, the stacks of apartments being constructed from the top down, of course. For this purpose an apartment is positioned on the ground beneath its final assembly position. Crane cables and the crane hook are inserted through the large openings 70 in parapet beams 24. It is also to be noted that each support plate 32 (see FIGURES 3 and 3*a*) has an opening 33 as large as opening 70 (about 14 inches) therein and is supported externally of the opening 70 by the rods 74 previously described. Three support rods 30 hang from the plate 32 to support the uppermost apartment.

As each apartment is hoisted into place, couplings are made, as by special coupling rings 148 (FIG. 3) designed to form a connection at least as strong as bars 30, and the washers 150 are used to fix relative positions of the parts, as shown in FIGURE 4. It should be noted that the plate 114 has a 14 inch opening 33*a* equivalent to that of the opening 70 in parapet beam 24 and of the opening 33 in the conversion plate 32, whereby the crane parts may extend through all of these coaxial openings to lift successive apartments in place. It should also be noted that the cores 118 are of a size to allow disposition of utility lines 119 and 120 outside of the opening 33*a* and the support rod connections (see FIGURE 6).

Attention is now directed to FIGURES 8 and 9, illustrating the details of radial bearing means 116 used to furnish support at the periphery of apartment units in a manner to permit their rotation, FIGURE 8 showing the relationship, space-wise, between the rotatable deck 122 of the apartment unit and the fixed deck 25 between apartment units. A substantial gap, in the order of four or five inches may be allowed between the fixed and movable decks to eliminate the need for extreme accuracy in pouring and forming the component parts and to minimize bumping while lifting apartments into place. Adjustment provisions are made in each bearing, as well as in a gap cover 152, to accommodate such inaccuracies. Thus, after the apartment unit is hoisted into position and secured, the radial bearing assemblies 116 are dropped into position and secured in place, and a segmental gap cover 152 is secured over the gap between the fixed and movable decks, the segments being secured to the movable deck 122, as by attachment to a plate 154 as shown in FIGURE 8. The gap cover is installed and properly aligned to ride on rubber treaded wheels 156 in each of the radial bearing assemblies 116.

Each radial bearing assembly comprises a rubber treaded wheel 156, a shaft 157 mounting the wheel 156 for rotation. The shaft 157 is rigidly attached and welded to a vertically adjustable wheel mount 158. The wheel mount 158 is tapped and threaded for a cap screw 160 for vertical adjustment of the mount 158. The wheel 157 is mounted on a bronze bushing 161 spaced from the mount 158 by a washer 162 for free turning of the wheel 156, the latter being held on the shaft 157 by a washer and a pin as shown in FIGURE 8. A mounting base 164 is attached to the fixed deck 25, as by anchor bolt means 163 shown, and the vertically adjustable wheel mounting 158 is held in position therein by means of a top bar 165, a guide cleat 166 and guide side bars. Thus, by adjustment of tap screws 160 on the various radial bearings 116 the horizontal orientation of each apartment may be controlled, and for this purpose access openings may be provided in gap cover segments 152, as desired.

Attention is now directed to FIGURE 10 showing an example of a motor means arrangement 34 for controlling rotation of an apartment. In the example shown, a reversible electric motor shown schematically at 168 is mounted adjacent each apartment unit in an appropriate housing 169 on the edge of the fixed deck 25, below the top surface thereof and in a position generally on a radius connecting the center of the core 20 and the geometric center of the apartment unit. The motor 168, drives the gear 170 through reduction gearing. A sprocket drive chain 172 is led over idler gears 174 mounted in the housing 169, and to a connection on deck 122 such as the end connection 176. Thus, rotation of the gear 170 in either direction tends to move the chain in one direction or another to cause rotation of the apartment unit. A special bearing 177 may be provided for beaming loads either upwardly or downwardly. The above constitutes merely a simple example of rotating means and it should be obvious that many variations thereof would be possible within the spirit of this disclosure. In the example given it would be desirable to permit 70 degrees of rotation in either direction from a medial position wherein the apartment door 137 would be over the motor housing 169. In the illustrated example, the door would always open onto the deck 25, inside the parapet beams 24 which are between apartment stacks if the 70 degree limitation is observed. Accordingly, the sprocket chain is centered on the central door position and is made of a length so that the limit of its motion in either direction allows only 70 degrees or less of rotation. Preferably limit switches (not shown) are included in the arrangement.

Each apartment contains switch control means within itself for operating its motor means 34 for controlling the own orientation so that the occupants may shift the position of the apartment as they desire.

The above description is of the general structure and method of construction of a building according to the present invention. It is desirable that railings such as the railings 180 be provided on the decks 25 between apartment units, as best seen in FIGURE 1. Similarly glass windows 182, 183 may be provided above the pool deck level for light and for observation purposes as well as a walkway 184 if such features are desired.

The specific internal layout or floor plan of the apartments may vary and can be simply constructed with standard materials and curtain walls by known techniques. The utilities connection for each apartment extend through the core thereof (see FIGURE 6) and the connections for all of the apartments in a stack extend through and are connected in the coaxial apartment cores 118 and extend from the bottom-most core, as at 211 into the central core 20 and thence to the basement of the structure. Preferably torsional bracing 201 is attached to the bottoms of

the lowest rods **30** (see FIGURE 3) to inhibit twisting of rods **30** when apartments are rotated.

From the above it may be seen that the structures, methods and techniques of the present invention provide improved building structures wherein stacks of individually rotatable apartments are supported from above from a cantilevered parapet type superstructure. The central core which supports the entire structure houses elevator and stair means as well as providing means for utility and recreation facilities at each level. The structure further provides exceedingly attractive and functional swimming pool and a sun-roof facilities.

Insofar as construction methods are concerned it is important to note that the structure of the present invention permits use of the "drop-form" method described herein which permits the builder to work with gravity in dropping the forms from level to level rather than against gravity in raising the forms from level to level as in conventional practice. In structures according to the present invention either or both the core decks **40, 42** and the scalloped cantilever decks **25** may be formed by the "drop-form" method if desired.

Obviously many variations in detail of structures and procedures are possible without departing from the spirit of the invention as described herein. Accordingly, it is to be understood that the invention is not intended to be limited by specific examples illustrated and described herein, but rather by the scope of the appended claims.

What is claimed is:

1. A building structure comprising a vertical central core member, a rigid column member mounted centrally of said central core member; a superstructure on the top of said core member partially supported from said rigid column member by suspension means and partially supported from said central core by cantilever means, said superstructure extending radially outwardly beyond the extent of said core member, a parapet formed at the perimeter of said superstructure, at least one stack of compartment units, each said stack comprising a plurality of compartment units positioned one above the other, and means suspending said stack of said compartment units from said parapet.

2. A building structure comprising a vertical central core member, a rigid column member mounted centrally of said central core member; a superstructure on the top of said core member partially supported from said rigid column member by suspension means and partially supported from said central core by cantilever means, said superstructure extending radially outwardly beyond the extent of said core member, a parapet formed at the perimeter of said superstructure, a plurality of self-contained compartment units, said compartment units being arranged in a plurality of vertical stacks spaced angularly about said core, and means to suspend each of said stacks from said parapet.

3. A building structure comprising a vertical central core member, a superstructure mounted on the top of said core member, said superstructure extending radially outwardly beyond the extent of said core member, a parapet formed at the perimeter of said superstructure, a plurality of decks mounted on said core member externally thereof below said superstructure and extending horizontally outwardly therefrom, said decks being spaced vertically from one another, the outer perimeter of each of said decks being of scalloped form, the scallops of the various decks being one above the other, a plurality of self-contained compartment units, said compartment units being arranged in a plurality of vertical stacks, with a compartment positioned with the lower level thereof engaged in each of said scallops, and means suspending each of said stacks from said parapet.

4. A building structure according to claim **3**, wherein the number of compartments supported in each stack is such as to provide a suspended vertical height less than the distance from said parapet to the ground, whereby to provide covered ground area below said compartments.

5. A building structure according to claim **3**, wherein the engagement of each of said compartment units within its associated scallop of a deck is on bearing means which permit rotation of the compartment relative to its said associated scallop, and cooperating means mounted on the said compartment and deck for causing rotation thereof relative to one another.

6. A building structure according to claim **3**, further characterized in that said central core member has an entry door at ground level and has internal horizontal floors coinciding in vertical level with that of said decks, doors opening from each of said floor levels onto the deck at that level, and means internally of said core for providing access from floor level to floor level.

7. A building structure comprising a vertical central core member, a superstructure mounted on the top of said core member, said superstructure extending radially outwardly beyond the extent of said core member, a parapet formed at the perimeter of said superstructure, a plurality of decks mounted on said core member externally thereof below said superstructure and extending horizontally outwardly therefrom, said decks being spaced substantially equally vertically from one another, the outer perimeter of each of said decks being of scalloped form, the scallops of the various decks being one above the other, a plurality of self-contained compartment units, said compartment units being arranged in a plurality of vertical stacks, with a compartment positioned with the lower level thereof engaged in each of said scallops, said parapet comprising thickened reinforced angularly related beams connected to one another to form a polygon, alternate beams overlying said scallops and the compartments engaged therein, said alternate beams each having a large opening therein of a size to permit passage therethrough of erection crane acble, sheaves and hooks, whereby compartment units may be raised to positions thereunder by crane means, a pair of smaller openings on either side of said large openings, and support means positioned in said smaller openings for suspending a stack of compartment units therefrom.

8. A building structure according to claim **7**, wherein each of said compartment units comprises a hollow central sleeve, annular floor and ceiling constructions spaced one above the other and connected to said sleeve at their inner ends, said floor and ceiling constructions being supported in spaced relationship from one another at their outer ends by posts attached therebetween.

9. A building construction according to claim **8**, further characterized in that said hollow central sleeve includes means cooperating with said support means for suspending the compartment, said hollow central sleeve including space for accommodating the utility lines for the said compartment.

10. A building structure comprising a vertical central core member, a superstructure mounted on the top of said core member, said superstructure extending radially outwardly beyond the extent of said core member, a parapet formed at the perimeter of said superstructure, a plurality of decks mounted on said core member externally thereof below said superstructure and extending horizontally outwardly therefrom, said decks being spaced substantially equally vertically from one another, the outer perimeter of each of said decks being of scalloped form, the scallops of the various decks being one above the other, a plurality of self-contained compartment units, said compartment units being arranged in a plurality of vertical stacks, with a compartment positioned with the lower level thereof engaged in each of said scallops, said parapet comprising thickened reinforced angularly related beams connected to one another to form a polygon, alternate beams overlying said scallops and the compartments engaged therein, said alternate beams each having

a large opening therein of a size to permit passage therethrough of erection crane cable, sheaves and hooks, whereby compartment units may be raised to positions thereunder by crane means, a pair of smaller openings on either side of said large openings, and support means positioned in said smaller openings for suspending a stack of compartment units therefrom, the beams between said alternate beams having central openings therein, hanger rods extending through said openings and vertically downwardly through said decks to space said decks from one another to serve as a strengthening brace and support for said decks and to serve as a support for holding forms for construction of said decks.

11. A building structure comprising a vertical central core member, a superstructure mounted on the top of said core member, said superstructure extending radially outwardly beyond the extent of said core member, a plurality of decks mounted on said core member externally thereof below said superstructure and extending horizontally outwardly therefrom, said decks being spaced substantially equally vertically from one another, the outer perimeter of each of said decks being of scalloped form, the scallops of the various decks being one above the other, a plurality of self-contained compartment units, said compartment units being arranged in a plurality of vertical stacks, with a compartment positioned with the lower level thereof engaged in each of said scallops, and means supending each of said stacks from the outwardly extending portion of said superstructure.

12. A method for constructing building structures comprising the steps of forming a hollow vertical central core, attaching a superstructure to the top of said core and extending said superstructure radially outwardly of said core entirely about the periphery of the core, constructing a plurality of vertically spaced scallop-shaped decks externally of the core member and attached thereto below said superstructure and extending horizontally outwardly from the core member, forming self-contained compartment units, lifting said compartment units into positions nested within the scallops of said decks to form a plurality of stacks of compartment units, and connecting means to said superstructure and to said compartments to suspend said compartments from said superstructure.

13. A method of constructing building structures comprising the steps of forming a hollow vertical central core, attaching a superstructure to the top of said core and extending said superstructure radially outwardly of said core entirely about the periphery thereof, constructing a plurality of cantilevered scalloped decks one below the other at spaced levels below said outwardly extending superstructure and supporting said decks at their inner ends on said core and at their outer ends between the scallops of the decks by attachment to angularly spaced hanger rods attached to the outer framework of said superstructure and to said decks, forming compartment units separate from the structure, lifting said compartments one at a time into position wherein they are in said scallops and in stacks one above the other under said superstructure, and installing means in said superstructure and attached to said compartments for suspending said compartments from said superstructure.

14. A method according to claim 13 wherein the said cantilivered scalloped decks are formed by placing concrete forming pallets in horizontal position below said superstructure by attaching said pallets to said central core and to said hanger rods, pouring concrete into said pallets to form a cantilever deck extending outwardly from said core, allowing said concrete to harden, placing threaded lowering rods through the hardened deck, the lowering rods extending through the pallets and having support means at the lower portions thereof adapted to support the pallets, placing a threaded control wheel on each of said lowering rods, unfastening the pallets from their attachment to said hanger rods and said central core, lowering said pallets by turning said control wheels to cause the said lowering rods to be moved downwardly, continuing such lowering movement until the pallets reach the next lower desired level of a horizontal deck, fastening the pallets to the central core and to the hanger rods, removing the lowering rods and the associated control wheels and support means, and repeating the pouring, hardening, and lowering of pallets procedure until the desired number of horizontal decks has been formed.

15. In a rotatable housing unit supported by a non-rotatable central support means wherein a continuous unbroken utilities connection must be maintained as the unit rotates, a utilities system which comprises a main utilities line extending parallel to said central support means adjacent thereto and a flexible utilities connection connected at one end to the main line at a point near said central support means on a level with said unit and the other end extending into said unit, the length of said connection between its point of connection to the main line and its point of entry into the unit being sufficient to permit its winding and unwinding through the angle of rotation of the unit as it rotates.

16. In a rotatable housing structure comprising at least one unit rotatable about a central stationary support means, a utilities system comprising a non-rotatable main line extending centrally of said unit adjacent said central support means, and a flexible connection having one end connected to said main line on a substantial level with said unit and the other end extending into said unit, the length of said connection between its point of connection to the main line and its point of entry into the unit being such that it permits winding and unwinding of the connection around a point on the radius of said central support means through the angle of rotation of the unit as it rotates.

17. The building structure of claim 11 including a utility system which comprises a main utilities line extending parallel to said central core member adjacent thereto and a flexible utilities connection for each of said compartment units connected at one end to said main line on a level with its respective compartment unit and the other end extending into its respective compartment unit, the length of said connection between its point of connection to the main line and its point of entry into its respective compartmet unit being sufficient to permit its winding and unwinding through the angle of rotation of its respective compartment unit as the unit rotates.

18. The building structure of claim 11 including means for adjusting the elevation of said superstructure.

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