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Aylon

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[54] **MASONRY BLOCK AND BUILDING PANELS**

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[52] **U.S. Cl.** **52/605,** 52/259, 52/437, 52/439, 52/606

[51] **Int. Cl.** **E04c 2/04,** E04c 1/08

[58] **Field of Search** 52/436, 437, 438, 606, 52/607, 259, 227-229, 503, 504, 505, 605, 439

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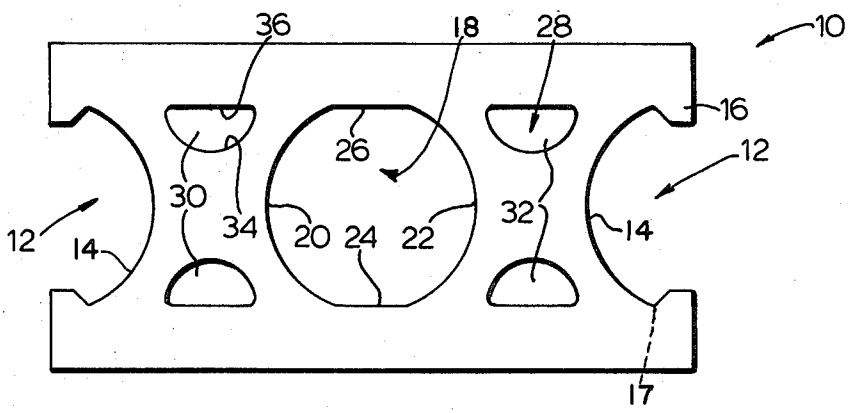
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Primary Examiner—Alfred C. Perham
Attorney, Agent, or Firm—Sim & McBurney

[57] **ABSTRACT**

A masonry building block capable of being used in prefabricated structural panels is provided and includes cores therethrough to receive reinforcing rods in the height of the prefabricated panel.

3 Claims, 9 Drawing Figures



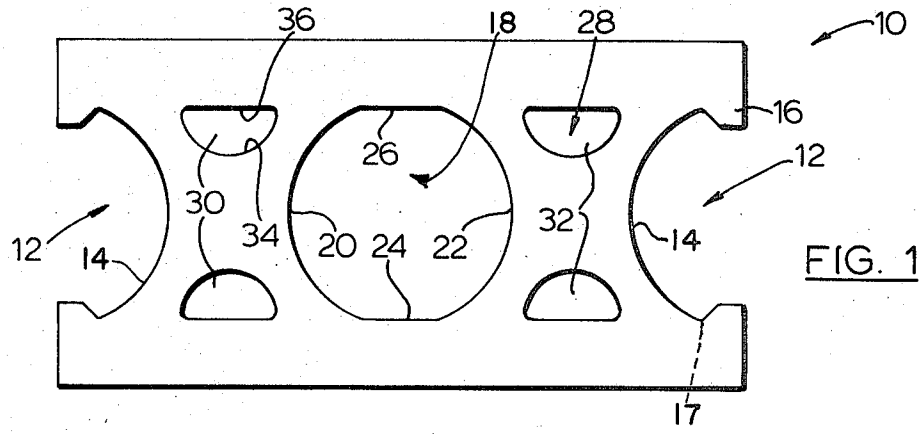


FIG. 1

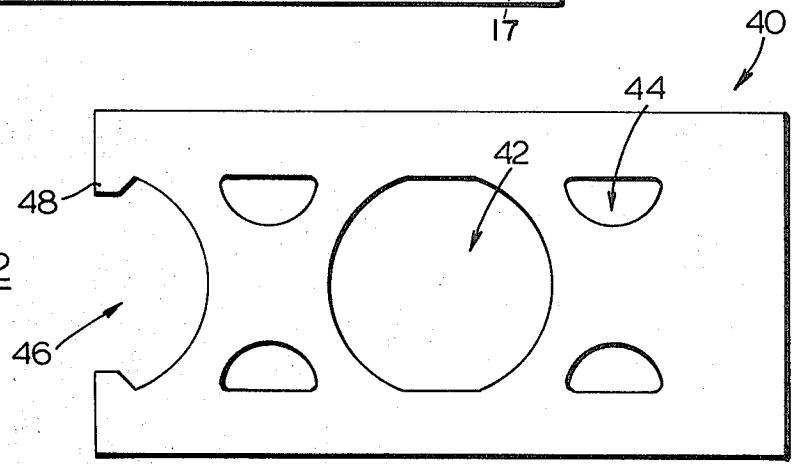


FIG. 2

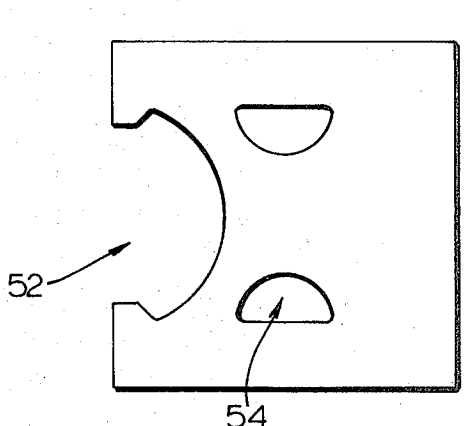


FIG. 3

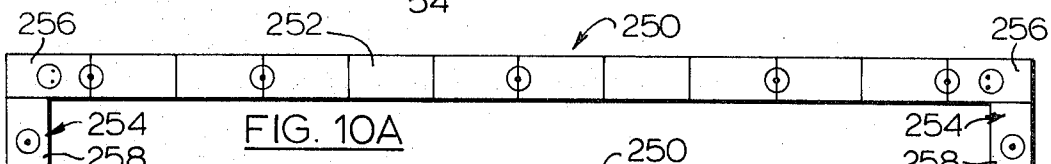


FIG. 10A

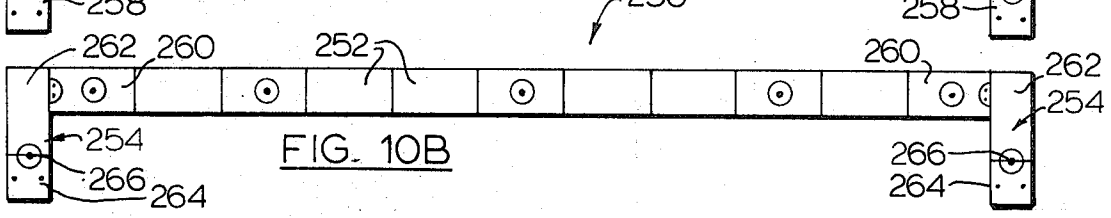


FIG. 10B

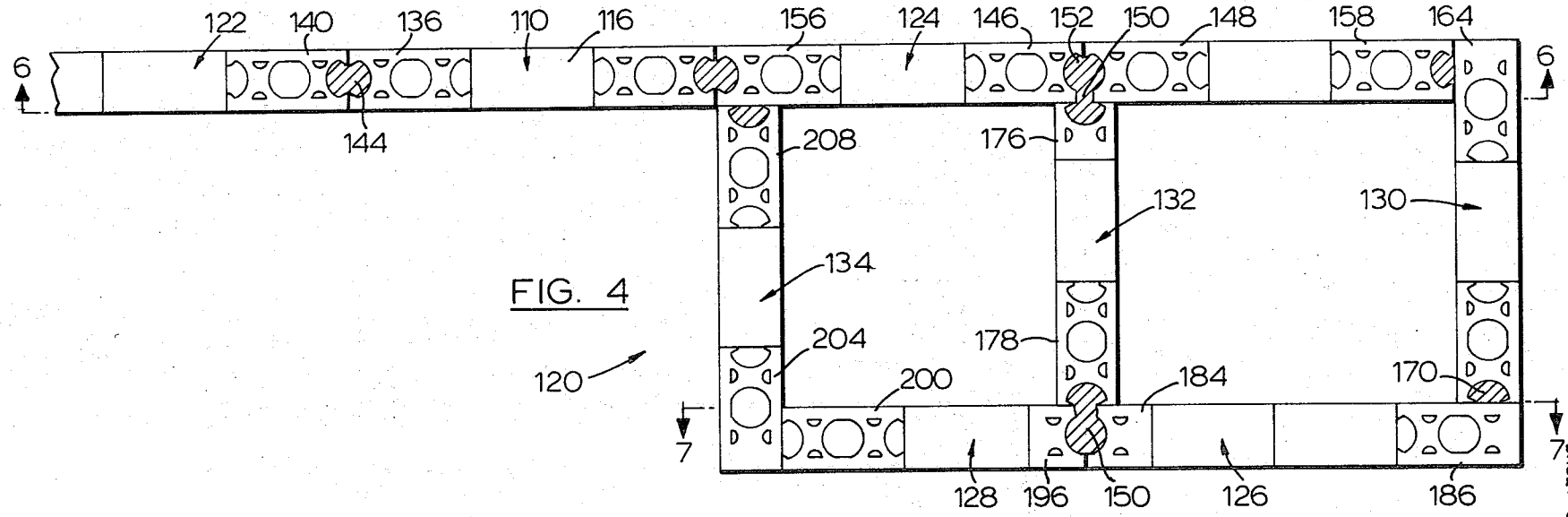

122
140
136
110
116
156
124
146
152
150
148
158
164
6
144
208
176
132
130
134
204
178
120
200
184
170
7
128
196
150
126
186

FIG. 4

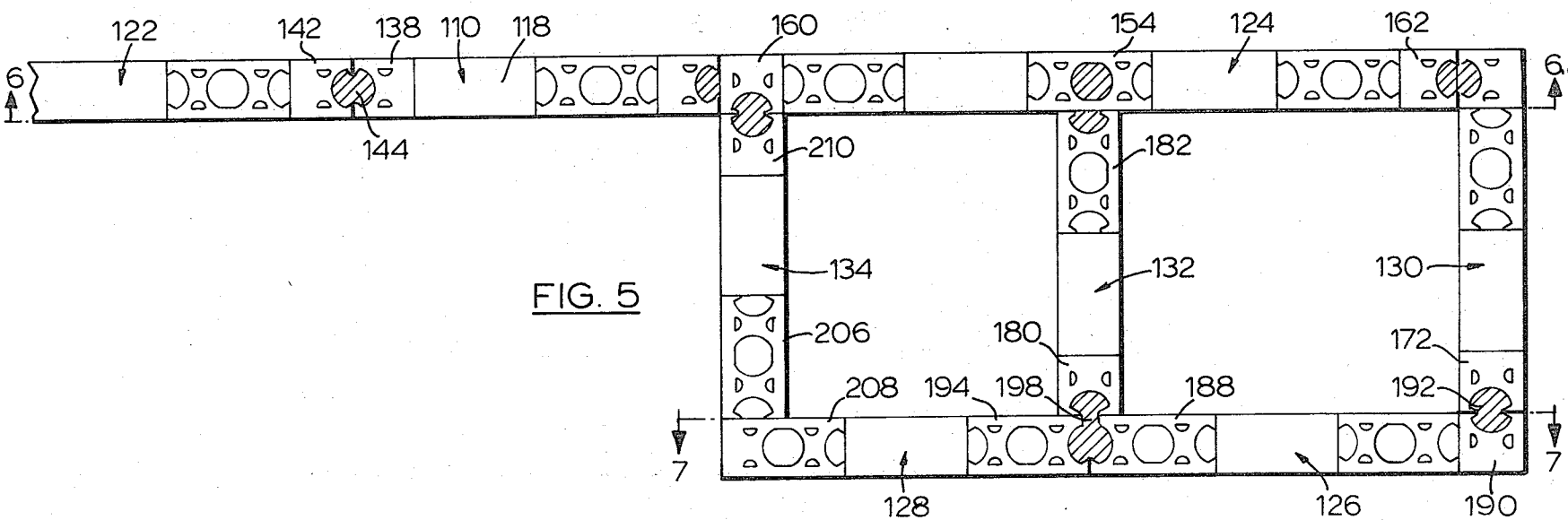

122
142
138
110
118
160
154
124
162
6
144
210
182
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132
130
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180
172
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194
198
188
192
7
128
126
190

FIG. 5

FIG. 6

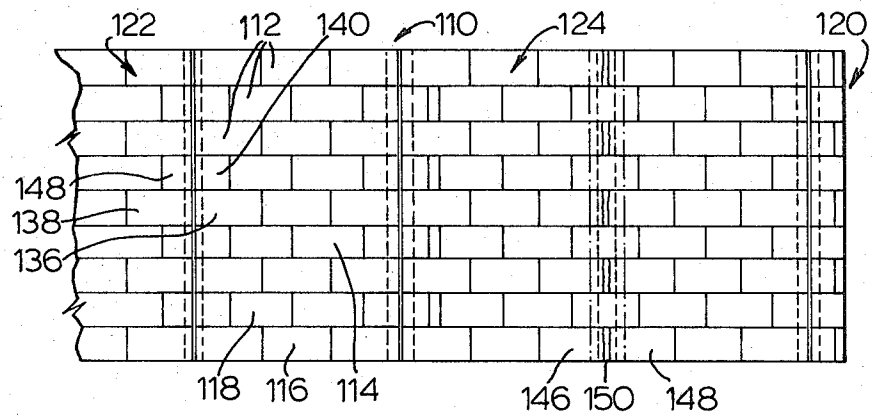


FIG. 7

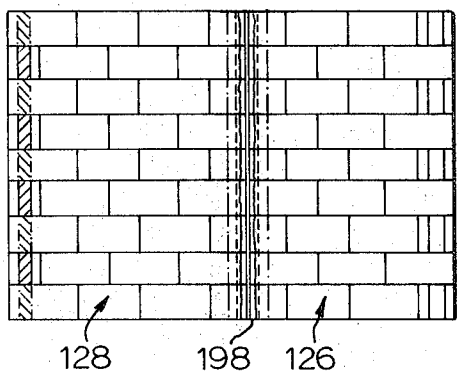
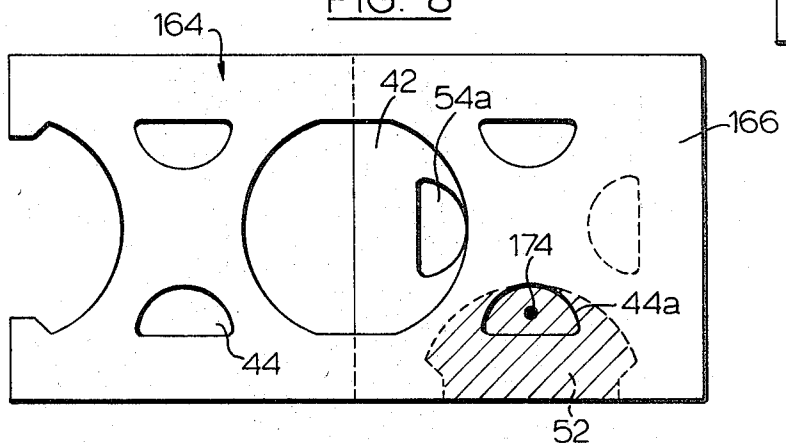


FIG. 8



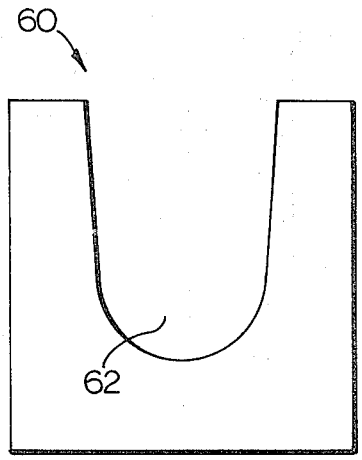


FIG. 9

MASONRY BLOCK AND BUILDING PANELS

This invention relates to a novel masonry block and to novel building panels.

In the construction of buildings, generally a plurality of individual building blocks is juxtaposed and joined one to another at the building site to provide the required structure, for example, a wall. Many differing types of masonry block have been suggested, and a number of prefabricated panels also have been suggested.

However, such prefabricated panels generally either lack structural strength in flexure or buckling resistance or are bulky and unwieldy. In accordance with the present invention there is provided a novel masonry block from which may be constructed prefabricated panels having the desired structural strength in flexure and buckling resistance while at the same time are not bulky and unwieldy.

The invention is described by way of illustration with reference to the accompanying drawings, in which:

FIG. 1 is a plan view of one form of masonry block of the invention;

FIG. 2 is a plan view of a second form of masonry block of the invention;

FIG. 3 is a plan view of a third form of masonry block of the invention;

FIG. 4 is a sectional plan view of the first and alternate courses of a building structure utilizing the blocks of FIGS. 1 to 3;

FIG. 5 is a sectional plan view of the second and alternate courses of a building structure utilizingg the blocks of FIGS. 1 to 3;

FIG. 6 is an elevational view taken on line 6—6 of FIGS. 4 and 5;

FIG. 7 is an elevational view taken on line 7—7 of FIGS. 4 and 5;

FIG. 8 illustrates the supposition of the courses of FIGS. 4 and 5 at a corner joint;

FIG. 9 is a section of a unit accommodating horizontal steel reinforcement; and

FIGS. 10A and 10B illustrate a plan view of courses of a prefabricated panel in accordance with a further embodiment of the invention.

In the drawings, referring first to FIG. 1, there is illustrated a masonry block 10, manufactured of concrete or any convenient material and having any desired dimensions. Standard building industry practice utilizes blocks which have a nominal modular size of 16 × 8 × 8 inches and the block 10 may be so dimensioned. Adhesive-bonded blocks have dimensions slightly smaller than the modular size to allow for the thickness of adhesive, bonding the blocks together.

The end faces of the block 10 each have recesses 12 which may be of any convenient shape and generally extend the dimension of the end face between the top and bottom surfaces. Preferably, the recesses 12 in plan each are defined by a part circular surface 14 which terminates at each end in lips 16 which project inwardly of the recess 12 towards each other. The lips 16 are formed so that, by use of, for example, a builders trowel, the portion of the block between an extremity of a surface 14 and the adjacent side wall of the block may be removed as indicated by a typical fracture line 17. Blocks 10 are utilized with one or more of the lips 16 removed in this manner in certain embodiments of building structures formed from these blocks as described in more detail below with reference to FIGS. 4 to 7.

The lips 16 perform as keys providing mechanical bond with the concrete grouting positioned in the recess 12, which serves in the provision of a stable interlocking structural joint between separate prefabricated panels, as well as a stable interlock beteen blocks within the panel itself, wherever concrete grouting is emloyed internally.

A central core 18 is formed through the block 10 and extends continuously between the top face and the bottom face. The core 18 has any convenient shape and iss substantially perpendicular to the top and bottom faces. Preferably, the core 18 has a cross-sectional shape including two opposed part circular surfaces 20 and 22, the adjacent extremities of which are joined by parallel straight line surfaces 24 and 26. The straight line surfaces 24 and 26 are substantially parallel to the side walls of the block 10.

The central core 18 and the recesses preferably are dimensioned so that the surfaces 20 and 22 of part-circular cross-sectional shape have substantially the radius of curvature of the surfaces 14 of the recesses 12. Additionally, the length of the straight line surfaces 24 and 26 preferably is substantially twice the straight line distance between the extremities of the surfaces 14 and the external face of the end surfaces of the block 10. The reason for this preferred dimensioning will become apparent hereinafter when prefabricated structures are discussed.

One preferred form of the central core 18 and the recesses 12 is illustrated. As will become more apparent hereinafter, these features may have any desired cross-sectional shape and preferably each recess 12 has a cross-sectional shape which is substantially half the cross-sectional shape of the central core 18, so that if two blocks 10 are placed in abutting end-to-end relationship, the combined cross-sectional shape of the adjacent recesses 12 is substantially that of the central core 18. Dimensioning in this manner is preferred for the reasons set forth in detail below.

Four satellite core 28 are provided extending continuously through the block 10 from the top face to the bottom face, substantially perpendicular thereto. The satellite cores 28 are arranged in two pairs 30 and 32. Each pair is located between the central core 18 and a recess 12.

In the embodiment illustrated, there are four individual satellite cores. This number is preferred to accommodate structural reinforcing steel and other practical considerations. It is possible to employ other numbers of such satellite cores, although the number generally is even and at least two satellite cores are required.

The satellite cores 28 are positioned regularly spaced from the recesses 12 and the central core 18. Where numbers of such cores 28 other than four is employed, it is necessary to ensure that they are adequately positioned with reference to the central core 18 and the recesses 12 so that upon positioning of the blocks 10 upon one another in a building structure with the vertically adjacent blocks 10 being offset from a central block, the satellite cores 28 are aligned throughout the vertical height of the building structure. This relationship is discussed in more detail below with reference to FIGS. 4 to 8.

Each of the satellite cores 28 may be of any convenient shape and preferably each of the satellite cores 28

is of substantially the same cross-sectional shape. In FIG. 1 a preferred form of the satellite cores **28** is illustrated and the cores **28** each have a cross-sectional shape including a semi-circular portion **34** and a straight line portion **36.** Each pair **30** and **32** of satellite cores **28** includes complementarily cross-sectional-shaped cores.

The straight line portion **36** of each satellite core **28** preferably extends substantially parallel to the side faces of the block **10** and the semi-circular portion **34** extends inwardly of the side faces of the block.

While the satellite cores **28** are illustrated in FIG. **1** as having a particular cross-sectional shape, this shape may be varied as desired. Generally, however, the cores **28** each have substantially the same cross-sectional shape. The choice of cross-sectional shape to some degree is dictated by the chosen cross-sectional shape of the central core **18,** as will become more apparent hereinafter during discussion of wall constructions utilizing the blocks **10.**

The satellite openings **28** are positioned inwardly of the side walls of the block a predetermined distance and the minimum distance is determined by the building regulations for the jurisdiction in which the building to be erected using the blocks **10** is located. In the preferred embodiment illustrated in FIG. **1,** the straight line portions **36** of the longitudinally aligned satellite cores **28** of each pair **30** and **32** are in a straight line with each other and additionally with the appropriate straight line surface **24** and **26** of the central core **18.**

The purpose of the satellite cores **28** will become apparent hereinafter during discussion of building structures formed from the blocks **10.**

The block **10** represents a basic building block from which a variety of structures may be formed. These structures may be prefabricated or constructed on-site, as described in more detail below. The versatility of the blocks **10** in being able to provide both an on-site built structure and also satisfactory prefabricated building panels for later erection on-site represents a considerable advance in the art of building materials.

While the building block illustrated in FIG. **1** may be utilized in a variety of building structures as the basic unit, in order to provide smooth flat ends and corners in typical prefabricated and on-site built structures, other specialized end-blocks are provided by this invention employing basically the same concepts as are embodied in the block **10** of FIG. **1.**

FIGS. **2** and **3** illustrate typical modifications of the structure of block **10** to provide end-blocks for various uses. Thus, in FIG. **2,** a block **40** includes a central core **42,** satellite cores **44** and a recess **46** in one end face only of the block. The form and shape of the central core **42** are substantially the same as those of the central core **18** of FIG. **1,** the form and shape of satellite cores **44** are substantially the same as those of the satellite cores **28** in FIG. **1,** and the form and shape of the recess **46** are substantially the same as those of the recessess **12** of FIG. **1.** In common with recesses **12** of FIG. **1,** the recess **46** has lips **48** at the end face. Reference is made to the above discussion of the equivalent items in FIG. **1** and the comments made therein with reference thereto apply equally here. A further form of end-block is shown in FIG. **3.** An end-block **50** is approximately half the longitudinal size of blocks **10** and **40** and has a single recesss **52** formed in one end. A single pair of satellite cores **54** also is provided. The half-block **50,** as compared with block **10,** lacks a central core of the type **18** and has only a single pair of satellite cores **54.** The form and shape of recess **52** and of satellite cores **54** are substantially those of recesses **12** and satellite cores **28** of block **10.** The discussions above with reference to these items apply to the equivalent items in block **50.**

The blocks shown in FIGS. **1** to **3** represent the blocks necessary to provide prefabricated wall panels or structural walls constructed on-site having a plurality of differing manners of interconnection one with another, as described in detail below with reference to FIGS. **4** to **8.** Using blocks **10** and **40** of the nominal dimension $16 \times 8 \times 8$ inches, and blocks **50** of the nominal dimension $8 \times 8 \times 8$ inches, it is possible to provide prefabricated or on-site building structures which are based upon an 8 inch module.

Prefabricated wall structures of any desired dimension may be provided utilizing the blocks of FIGS. **1** to **3.** The prefabricated wall structures or panels may be structured so that the finished structural item may include rectangular openings at any desired location for windows or the like, consistent with the basic 8 inch module.

In addition to use in the prefabrication and onsite building of wall panels, the building blocks illustrated in FIGS. **1** to **3** may be used to provide piers, columns, spandrels, girders, beams and lintels by applying the constructional principles discussed below with reference to FIGS. **4** to **8.**

A typical building structure formed from prefabricated wall units is illustrated in FIGS. **4** to **8.** A number of differing manner of joining the prefabricated panels is illustrated.

A typical prefabricated panel **110** includes a plurality of individual courses **112** in which blocks **114** are provided. The courses **112** are arranged so that alternate ones are identical but adjacent ones vary from each other. The blocks **114** in each course abut each other in end-to-end relation and the line of abutment of the blocks **114** in one course is located at approximately the mid-point of the length of the vertically adjacent blocks **114.** The blocks **114** in adjacent courses therefore are offset from each other. In this way, there are provided continuous passages throughout the height of the panel defined by the central cores in the blocks of one set of alternate courses and the adjacent end recesses of blocks in the other set of alternate courses.

Additionally, the satellite cores in vertically adjacent blocks of the courses are aligned throughout the height of the wall **110** and hence continuous passages defined thereby also are provided.

In the panel **110,** the first course **116** and each alternate course in the height of the panel typically consists of a plurality of end-to-end aligned blocks **114,** each of such blocks **114** being of the type illustrated in FIG. **1.** The second course **118,** and each alternate course in the height of the panel includes two differing forms of blocks **114.** The bulk of these courses **118** is provided by a plurality of blocks **114** of the type illustrated in FIG. **1,** arranged so that the point of end-to-end contact with an adjacent block is located at the approximate mid-point in the length of the blocks **114** in the courses **116.**

At each end of the courses **118** is provided a block of the type illustrated in FIG. **3,** in each instance with

its recess **52** projecting outwardly for joining of the wall **110** to an adjacent wall panel. Thus, throughout the height of the panel **110** at each side edge is a continuous vertical channel defined by the recesses **12** and **52** of the blocks adjacent the edges. Such a channel is an essential feature in the joining of the wall panel to adjacent panels. Other edge channel configurations are possible as will become apparent in the further discussion below of FIGS. **4** to **8.** The satellite cores **54** in the end blocks align with the end pair **30** or **32** of satellite cores in the vertically adjacent blocks of courses **116.**

The panel **110** is illustrated as commencing from the bottom and terminating at the top with courses of the type **116.** This construction is preferred from an ease of construction and an aesthetic point of view, but other configurations may be adopted. For example, the panel **110** may commence and terminate with courses of the type **118.** Alternatively, the panel **110** may commence with a course of type **116** and terminate with a course of the type **118.** Further, the panel may commence with a course of the type **118** and terminate with a course of the type **116.**

Each block **114** in each course **112** is joined to the adjacent one by any convenient adhesive. There is a number of commercially available construction material adhesives and any of such adhesives may be utilized. Also, the vertically adjacent blocks are adhesively bonded together by any convenient adhesive. The continuous passages defined by the central cores and end recesses are filled in whole or in part with grouting in accordance with any specific structural design or may be used for the ducting of utilities.

In order to provide the desired structural strength to the prefabricated panel **110,** steel reinforcing rods of any desired size are positioned in a selected number of the continuous passages defined by the vertically aligned satellite cores and these passages are filled with grout or concrete. Prior art systemss do not provide continuous passages of small cross-sectional area to accommodate steel reinforcing, as provided by the present invention. Prior art systems also do not locate reinforcing passages near each face of the block structure, as provided in the present invention, but rather tend to locate any reinforcement centrally of the panel. Hence the present invention is a considerable improvement over the existing art in these respects.

By providing steel reinforcement passages throughout the height of the panel and close to its faces it is possible to provide a prefabricated wall panel having structural strength and flexural resistance and hence it may readily be transported and handled. The panel may readily be joined to other wall panels to provide the desired building structure. The steel reinforcement of the panel has the added advantage that the final building structure is structurally stronger than conventionally formed on-site built structures, and may support heavier loads. The provision of reinforcement close to the faces of the panel results in a structure which is stronger than conventional block walls with equivalent reinforcement in a central position.

The size of the reinforcing rods depends on a number of factors, for example, the size of the panel element to be prefabricated and the ultimate end use of the panel element. As mentioned above, the location of the satellite cores in the blocks **10, 40** and **50** is controlled to some degree by regulations. Most jurisdictions provide a certain minimum cover to reinforcement in reinforced structures and hence when steel reinforcing rods are utilized in the structure in accordance with this invention, then the location of the satellite cores must comply with the appropriate regulationss while at the same time retaining consistency with the principles of the present invention as discussed above.

In the case of large prefabricated elements it may be desired to provide additional structural strength and this may be achieved by utilizing the item shown in FIG. **9.** This is an elongated unit **60** having lateral and vertical dimensions substantially those of the blocks **10.** The unit **60** includes an elongated U-shaped channel **62** which extends the length of the unit. The unit is provided in a length which is the width of the prefabricated panel and is positioned usually at the bottom of the wall panel, although it may be positioned both at the top and bottom of the panel, if desired. A reinforcing rod may be positioned in the channel **62** and hence extending horizontally in the wall. Extensions of the vertical reinforcing rods in the continuous channels defined by the aligned satellite cores are hooked around the horizontal rod or rods and the channel **62** is normally filled with grout or concrete.

As indicated above, all wall panels in accordance with the present invention basically employ a plurality of blocks of the type illustrated in FIG. **1.** The form of the ends of the courses in the wall panels may be varied to provide a variety of different joints with other panels.

A typical building structure including a plurality of prefabricated wall panels is illustrated in FIGS. **4** to **8.** The construction illustrated in FIGS. **4** to **8** is intended to depict the many variations of the form of joint which are posible. In the desired construction, the choice of the type of joint between adjacent panels, and hence the choice of the construction of the panels, depends on the individual requirements. Thus, the building structured from prefabricated panels, constructed in accordance with this invention, may include one or more of the joint forms illustrated in FIGS. **4** to **8.**

As illustrated in FIGS. **4** to **8,** a building structure **120** includes a plurality of prefabricated wall panels or units **110, 122, 124, 126, 128, 130, 132** and **134** which are joined together to form the building structure. As noted earlier in each prefabricated wall panel or element, the bulk of the building blocks are of the form shown in FIG. **1,** and hence in the plan views of FIGS. **4** and **5,** generally the sections of the panels between the edge termination for each panel, have not been shown in detail.

In FIGS. **4** and **5,** there are illustrated respectively the first and each alternate course and the second and each alternate course. Usually the panel or wall element will commence and terminate in its vertical height with the course shown in FIG. **4.** As noted earlier in discussion of panel **110,** this may be varied as desired. It is possible to vary the construction of the courses, so that there is a random selection of courses throughout the height of the panel. However, for ease of construction, it is preferred that each alternate course in the height of the panel is identical.

Since each alternate course throughout the height of each panel or wall element is identical, description of one of each type of course in the height of the panel only is required. The following description, therefore, in describing one course is intended to refer addition-

ally to each alternate course and should be interpreted as such.

The panel **122** is of substantially the same form as wall panel **110** described above and no further description is required. Wall panels **110** and **122** each have an open channel running the height of the ends thereof. Upon abutting the terminal blocks **136** and **138** of panel **110** with terminal blocks **140** and **142** of panel **122** and upon adhesive securement therebetween, grouting may be positioned in the closed keyway **144** defined therebetween.

The wall panel **124** is similar to panel **110** but has important differences relating to its connections with other panels. As seen in FIG. **4**, in one course, at the approximate mid-point of its length the abutting ends of blocks **146** and **148** have been modified. Thus, on each of the abutting ends of blocks **146** and **148**, the lips **16** (FIG. **1**) adjacent to each other and nearest to the wall panel **132** have been removed, so that there is a vertical opening **150** in the course shown in FIG. **4**, providing access to the interior of the core **152** defined by the juxtaposed recesses **12** (FIG. **1**) of blocks **146** and **148**. The provision of the opening **150** serves in the joining of the panel **124** to panel **132** by means of grouting. While this arrangement is illustrated at the mid-point of the width of the panel **124**, clearly the arrangement may be provided at any convenient location across the width of the panel **124**, depending on the desired location of the panel **132**.

In contrast, as seen in FIG. **5**, in the courses adjacent to those illustrated in FIG. **4**, at the location equivalent to the position of the channel **150**, the block **154** is unmodified, and retains the form shown in FIG. **1**.

The keyway joints at the ends of panel **124** are of different configurations. As seen in FIG. **4**, the alternate courses terminate at each end in block **156** and **158** which is of the basic type shown in FIG. **1**. However, in the courses of FIG. **5**, end blocks **160** and **162**, each of the type illustrated in FIG. **3**, are utilized. The end block **160** is arranged so that its recess **52** opens toward the panel **134** to serve in the joining of the panel **134** to the panel **124**. At the right hand end, as seen in FIG. **5**, the block **162** is arranged in the same manner as in panel **110** with its recess **52** opening towards the panel **130**.

Therefore, at the right hand vertical end of the wall panel **124** there is a continuous open channel, provided by the vertically aligned recesses **12** of the blocks **158** and recesses **52** of the blocks **162**. At the left hand vertical end, there is alternately a recess **12** of blocks **156** and the flat face of blocks **160**, resulting in a castellated keyway.

With the exception of the end blocks **160**, the courses in the wall panel **124** are superimposed to provide continuous grouting cores and continuous reinforcing and grouting channels, as discussed above in connection with panel **110**. At the end blocks **160**, the satellite cores **54** of the end blocks **160** coincide, one with the recess **12** and one with the central core **18** of the block **156**. The recess **52** of the block **160** coincides with one of the satellite cores **28** of the blocks **156**. Thus, grouting and reinforcing rods may readily be utilized at this end of the wall panel **124**.

The wall panel **130** includes in one course (FIG. **4**) a plurality of blocks of the type illustrated in FIG. **1**. The end block **164** adjacent the join with wall panel **124** is of the type illustrated in FIG. **2**. In the other course (FIG. **5**), the wall panel **130** also includes a plurality of blocks of the type illustrated in FIG. **1** and an end block **166** of the type illustrated in FIG. **3**. The end block **166** is positioned with its recess facing the recess of end block **162** of panel **124**. The facing recesses in end blocks **162** and **166** define a keyway **168** therebetween.

At the side of the wall panel **130** adjacent the wall panel **126**, there are provided in adjacent courses blocks **170** (FIG. **4**) of the type shown in FIG. **1** and end blocks **172** (FIG. **5**) of the type shown in FIG. **3**. The end block **172** is positioned with its recess **52** facing the wall panel **126**. Since the recesses **12** of blocks **170** align with the recesses **52** of the end blocks **172**, there is provided a continuous channel in this side of the wall panel **130**.

One of the satellite cores **54** of blocks **166** coincide with the central core **42** of the vertically adjacent blocks **164**. Additionally, one of the satellite cores **42** of the block **164** coincides with the recess **52** of the block **166**. Therefore, there are provided grouting and reinforcement channels. The overlap of the blocks **164** and **166** and the relative locations of the satellite cores **42** and **54**, the central core **42** and the recess **52** are illustrated in FIG. **8**. As seen in FIG. **8**, satellite core **54***a* of block **166** is located wholly within central core **42** of block **164**. Similarly, satellite core **44***a* of block **164** is located wholly within recess **52** of the end block **166**. Thus, the combination of satellite cores and central core and recess provide a plurality of channels to receive reinforcing rods **174**.

With the provision of blocks **164** and **166** in the wall panel **130**, the corner joint between panels **124** and **130** has smooth flat internal and external surfaces.

The wall panel **132** is constructed of alternate courses which contain a plurality of blocks of the type illustrated in FIG. **1**. In one course (FIG. **4**), the end adjacent the wall panel **124** has an end block **176** of the type illustrated in FIG. **3** and having its recess **52** opening towards the vertical opening **150**. At the end remote from the end block **176** is a block **178** of the type illustrated in FIG. **1**. In the other course (FIG. **5**), the arrangement of blocks is reversed. In this case, end block **180** of the type illustrated in FIG. **3** is arranged with its recess **52** opening towards the wall panels **126** and **128**. At the end adjacent the wall panel **124**, a terminal block **182** of the type illustrated in FIG. **1** is provided.

Wall panel **126** is connected to panels **130** and **132**. As seen in FIG. **4**, in one course there is provided a plurality of blocks of the type illustrated in FIG. **1**, together with two end blocks. End block **184** adjacent the wall panel **132** is of the type illustrated in FIG. **3** with one of the lips of the recess **52** removed. End block **186** is of the type illustrated in FIG. **2**. In the other course (FIG. **5**) there again is a plurality of blocks of the type illustrated in FIG. **1** and in this case the end block **188** located adjacent the wall panel **132** is of the same type as block **146**. The lip **16** adjacent the end block **180** is removed. The other end block **190** of this course is of the type illustrated in FIG. **3** with its recess **52** opening towards the recess **52** in end block **172** of the panel **130**. The recesses **52** of the end blocks **172** and **190** define a grouting keyway **192** therebetween. One of the satellite cores **54** of the end block **190** coincides with the central core **18** of the end block **186**, in similar

manner to the relative location of blocks **164** and **166.**

By providing end blocks **186** and **190** on wall panel **126,** the corner join of wall panels **130** and **126** is smooth internally and externally.

The wall panel **128** is provided with ends adjacent the panel **132** similar to those on panel **126** adjacent the panel **132.** Thuss, in one course (FIG. 4) a block **194** of the same type as block **188** is used and in the other course (FIG. 5), a block **196** of the same type as block **184** is used. The abutting ends of the wall panels **126** and **128** by reason of the removed lips, define a continuous vertical opening **198** extending through the height thereof. The continuous vertical opening **198** communicates with the channel defined by the recesses **52** and **12** in the panel **132** to provide a grouting keyway.

The other end of the panel **128** interleaves with the adjacent end of panels **134.** This is achieved by providing for one course (FIG. 4) a block **200** of the type illustrated in FIG. 1 located a distance equal to approximately the width of a block from the ultimate side extremity of the wall. For the other course (FIG. 5), an end block **202** of the type illustrated in FIG. 2 is provided extending a distance equal to approximately the width of a block beyond the extremity of the block **200.** In this way, an end block **204** of the panel **134** (FIG. 4) overlaps the end block **202** of the panel **128** and simultaneously abuts against the block **200** of panel **128.** Similarly, the block **206** (FIG. 5) of the type illustrated in FIG. 1 of unit **134** abuts against the end block **202** of panel **128.** Hence, the ends of the panels **128** and **134** are interleaved to provide a corner structure having smooth internal and external surfaces. Usually, where interconnection is provided, biplanar panels are prefabricated with interleaved interconnections at the corners. This structure is described further below.

In the overlapping of the end blocks **202** and **204,** one of the satellite cores **44** of the end block **202** coincides with the central core **42** of end block **204,** while one of the satellite cores **44** of the end block **204** coincides with the central core **42** of end block **202,** in analogous manner to the overlap illustrated in FIG. **8.** In this way, grouting and reinforcing passages through the eheight of the corner joint are provided.

The wall panel **134** has an end structure adjacent the wall panel **124** which is similar to that of panel **130** adjacent wall panel **126.** As may be seeen in FIG. **4,** the terminal block **208** is of the type illustrated in FIG. **1** and abuts the external surface of the block **156** of panel **124,** while in FIG. **5,** the end block **210** is of the type illustrated in FIG. **3** and has its recess **52** opening towards the recess **52** in end block **160** of panel **124.**

The satellite cores have been indicated as providing passageways for reinforcing rods and grouting. However, certain of the passageways may be utilized to receive handling loops for the prefabricated panels.

It wiil be seen, therefore, that the present invention is able to provide a plurality of differing forms of prefabricated panels, which may be erected and located in any desired location with reference to one another by uing basically a building block of the type shown in FIG. **1** and appropriate use of the blocks of FIGS. **2** and **3** as end blocks for particular purposes.

As will be observed from the above description of the embodiments of FIGS. **4** to **7** that at each corner and joint, there are smooth internal and external surfaces.

There are many forms of joints between prefabricated panels which are possible, as described above, and the particular one utilized will be a matter of choice and convenience for the particular building operation. The types of joint possible may be summarized as follows: (a) a butt joint, such as between panels **110** and **122** for the joining of panels in the same plane. The abutting ends are sealed by means of gaskets and the continuous closed keyway **144** is filled with grouting to complete the structural connection between the panels; (b) a corner joint, such as beteen panels **124** and **130,** or panels **126** and **130;** (c) an interleaved corner joint, such as between panels **128** and **134;** (d) an offset T-joint, such as between panels **124, 110** and **134;** (e) an intersecting T-joint, such as between panels **132** and **124;** and (f) a centric T-joint, such as between panels **126, 128** and **132.**

The interleaved corner joint between panels **128** and **134** usually is used to provide a biplanar prefabricated panel which may be erected in an upright position before joining with other panels without the use of shores or other auxiliary hardware.

The two courses of a typical panel formed in this manner are illustrated in FIGS. **10A** and **10B.** The course illustrated in FIG. **10A** represents the bottom and top courses and each alternate course therebetween, while the course illustrated in FIG. **10B** represents the other alternate courses in the panel.

As shown in FIGS. **10A** and **10B,** the panel **250** includes a first wall portion **252** which extends in a first plane and is of substantial width. Any desired width may be used. Second wall portions **254** each is located in a plane perpendicular to the plane of the first wall portion **252** and extends only a short distance from the first wall portion **252.** At the corner joints of the first and second wall portions **252** and **254,** the blocks are interleaved as illustrated above in connection with the joint between panels **128** and **134,** to provide a prefabricated panel with corner joints having smooth inner and outer faces.

In the course illustrated in FIG. **10A,** the end blocks **256** each is of the type illustrated in FIG. **2** with the flat end face providing the outer extremity of each end of the first wall portion **252.** In this course, the remainder of the blocks are shown in FIG. **1.** The second wall portions **254** in this course each is provided by a single block **258,** which may be of the type shown in FIG. **1** or of the type shown in FIG. **2** with the flat end wall thereof being remote from the first wall portion **252.**

In the course illustrated in FIG. **10B,** the end blocks **260** of the first wall portion **252** each are of the type illustrated in FIG. **1** and hence the same as the remainder of the blocks in the course. Each of the end blocks, **260** terminates one half-block distance from lateral extremities of the first wall portion **252** of the course shown in FIG. **10A.**

The second wall portions **254** of this course each includes a block **262** of the type shown in FIG. **2** with its flat end face being located adjacent the end block **260.** At the end of the blocks **262** remote from the flat end is located a half block **264** of the type illustrated in FIG. **3,** the recesses of the blocks **262** and **264** cooperating to form a channel **266** to receive grouting. The satellite cores are provided with reinforcement as discussed above.

It will be seen, therefore, that in accordance with this embodiment of the invention, there may be provided a

prefabricated panel which possesses improved structural strength in flexure and buckling resistance and also is self-standing.

As mentioned above, the principles involved in constructing the wall elements described above may be utilized to form other structural elements, such as piers, columns, spandrels, girders, beams and lintels.

The constructional elements described above are the structural load bearing wall panels for the particular building structure. Any desired architectural functions may be superimposed on the faces of the panels where apropriate by patterning, texturing or the like.

Modifications are possible within the scope of the invention.

I claim:

1. A masonry block capable of cooperating with other like blocks to provide a structural panel, said block having a rectangular parallelepiped shape and including substantially parallel and smooth top and bottom faces and two end faces,

said block having an axial plane extending perpendicularly of said top and bottom faces and extending longitudinally of said block subdividing the width of said block into two areas of substantially equal dimension,

a central core extending between and substantially perpendicularly to the top and bottom faces and cross-sectionally shaped so that the portion thereof on one side of said plane is the mirror image of and has the same cross-sectional area as the portion thereof on the other side of said plane,

a recess formed in each end face and extending between said top and bottom faces, each of said recesses having the same cross-sectional dimension and having a combined cross-sectional shape and area substantially the same as those of the central core, and

four satellite cores positioned with a first two between the central core and the recess in one end face of the block an a second two between the central core and the recess in the other end face of the block,

each satellite core having substantially the same cross-sectional area and extending between and substantially perpendicularly to said top and bottom faces, the satellite cores being separated from each other, the central core and the recess within the block by material of construction of the block,

one member of each of said first and second two satellite cores being positioned on one side of said axial plane and each having substantially the same cross-sectional shape and the other member of each of said first and second two satellite cores being positioned on the other side of said axial plane and each having the same cross-sectional shape which is the mirror image of the cross-sectional shape of said one member,

the central core having a cross-sectional shape consisting of two part-circular portions the ends of which are joined by straight line portions, the two part-circular portions of the central core having the same centre and radius of curvature, the centre of curvature of the two part-circular portions being located in said axial plane, the straight line portions of said central core being parallel to the longitudinal edges of the block,

each of the satellite cores having a cross-sectional shape which includes a semicircular portion and a diametrical portion joining the ends of the semicircular portion, the diametrical portions of said satellite cores being parallel to the longitudinal edges of the block,

the one members of said first and second two satellite cores having their diametrical portions in the same straight line and in straight line alignment with one of the straight line portions of the central core, the other members of said first and second two satellite cores having their diametrical portions in the same straight line and in straight line alignment with the other straight portion of the central core,

each recess having a crosss-sectional shape including a part-circular portion of substantially the same radius of curvature and circumferential length as the part-circular portions of said central core and having its centre of curvature located at the bisection of the plane of the respective end face and said axial plane,

the semicircular portions of the satellite cores projecting inwardly of the longitudinal areas of the block and the radius of curvature thereof being such that the furthest distance between the adjacent longitudinal edge of the block perpendicularly thereto and the semicircular portion is substantially equal to the radius of curvature of the part-circular portions of the central core and the part-circular portion of the recesses,

the total cross-sectional area of said satellite cores being less than the cross-sectional area of said central core,

the ends of said diametrical portions of said first two satellite cores closer to their adjacent recess lying in a plane which extends perpendicularly to the longitudinal edges of the block,

the ends of said diametrical portions of said second two satellite cores closer to their adjacent recess lying in a plane which extends perpendicularly to the longitudinal edges of the block,

the centres of curvature of the semicircular portion of said first two satellite cores being located substantially one-quarter of the length of the block from their adjacent end face,

the centres of curvature of the semicircular portions of said second two satellite cores being located substantially one-quarter of the length of the block from their adjacent end face.

2. The block of claim **1** wherein each of said recesses includes lips which extend inwardly of the mouth of the recess towards each other.

3. The block of claim **1,** constructed of concrete and wherein said satellite cores are adapted to receive structural panel reinforcing rods in stable position therein and are spaced from said axial plane the maximum distance which still allows surface-to-reinforcement cover conforming to the building code to be maintained.

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