

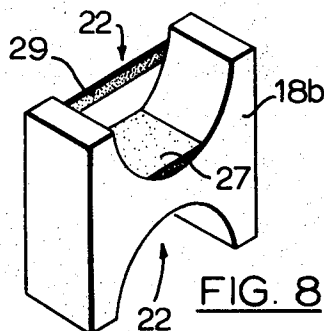
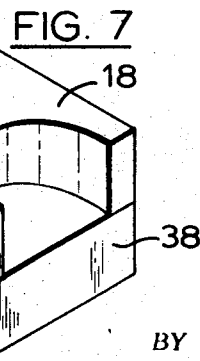
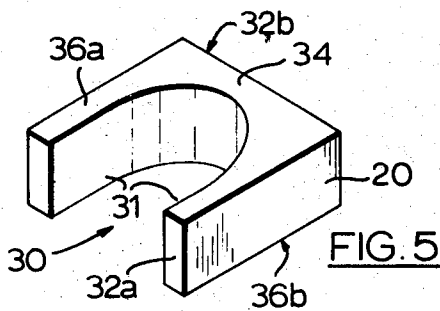
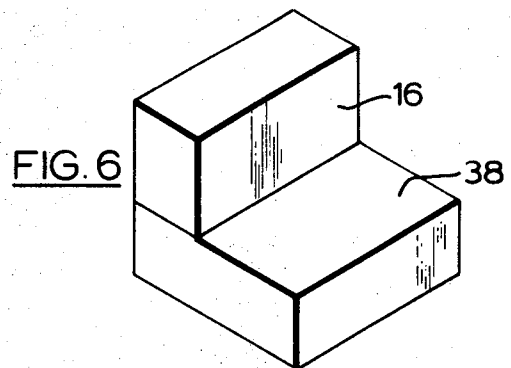
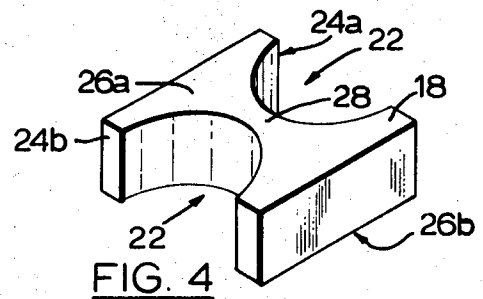
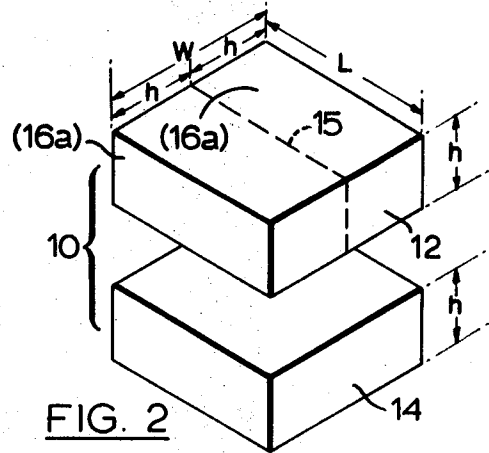
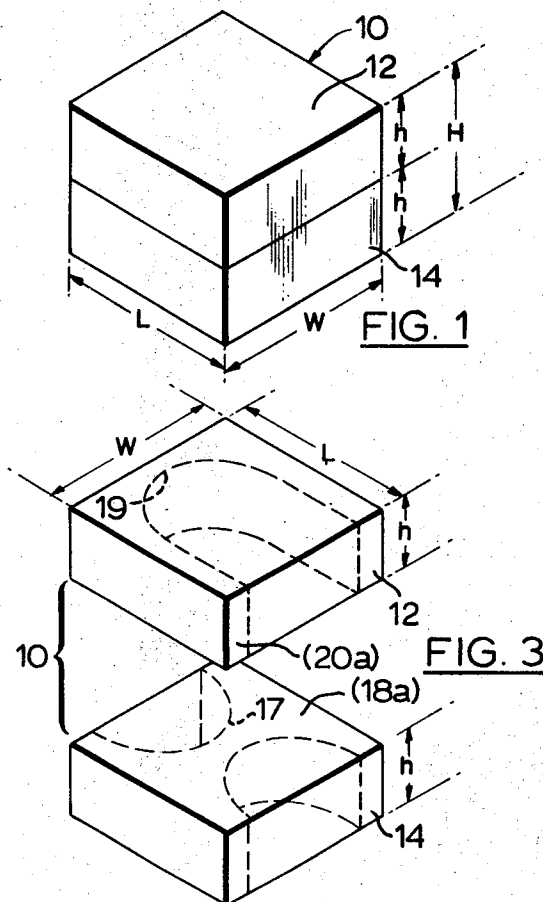
Sept. 20, 1971

R. MORIYAMA
MODULAR FURNITURE

3,606,461

Filed Nov. 3, 1969

3 Sheets-Sheet 1



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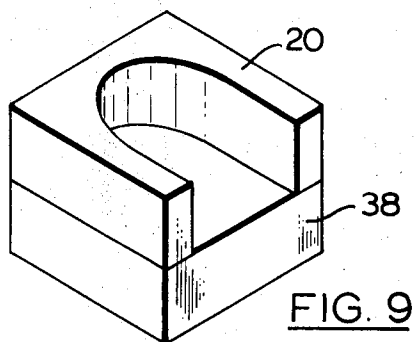


FIG. 9

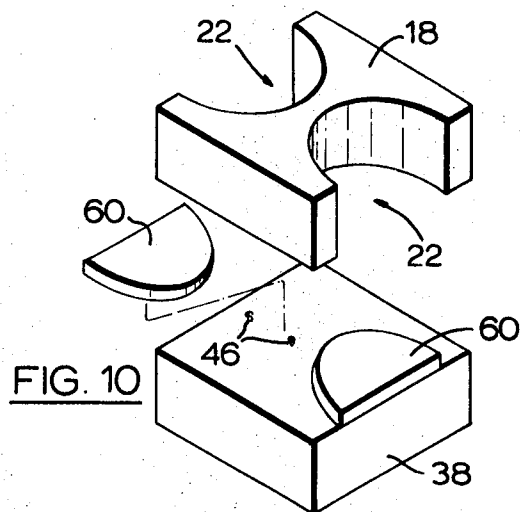


FIG. 10

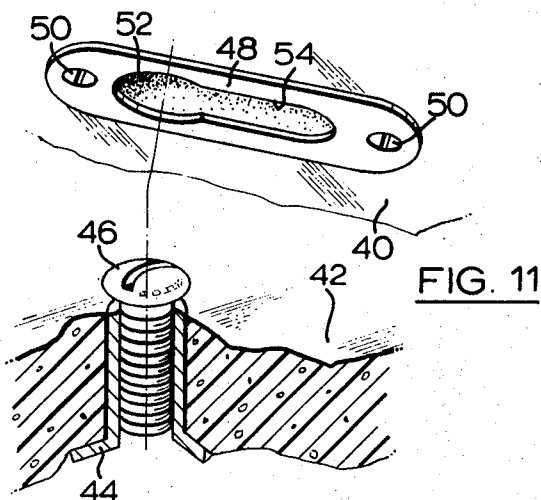


FIG. 11

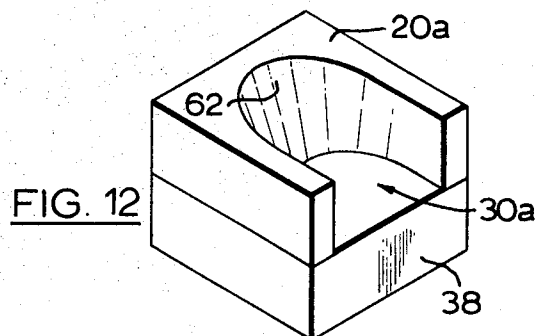


FIG. 12

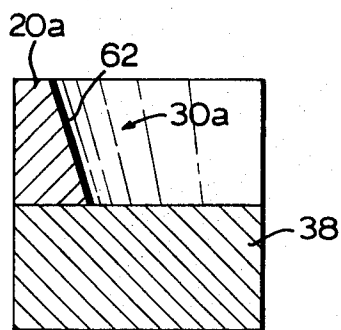


FIG. 13

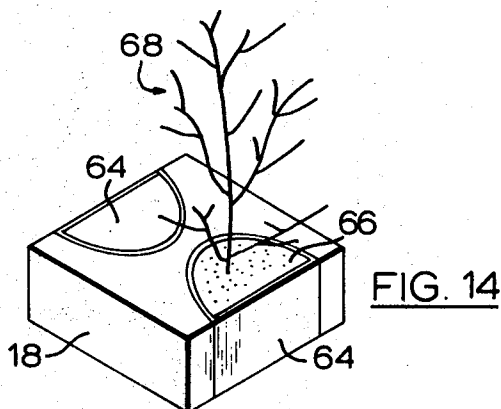


FIG. 14

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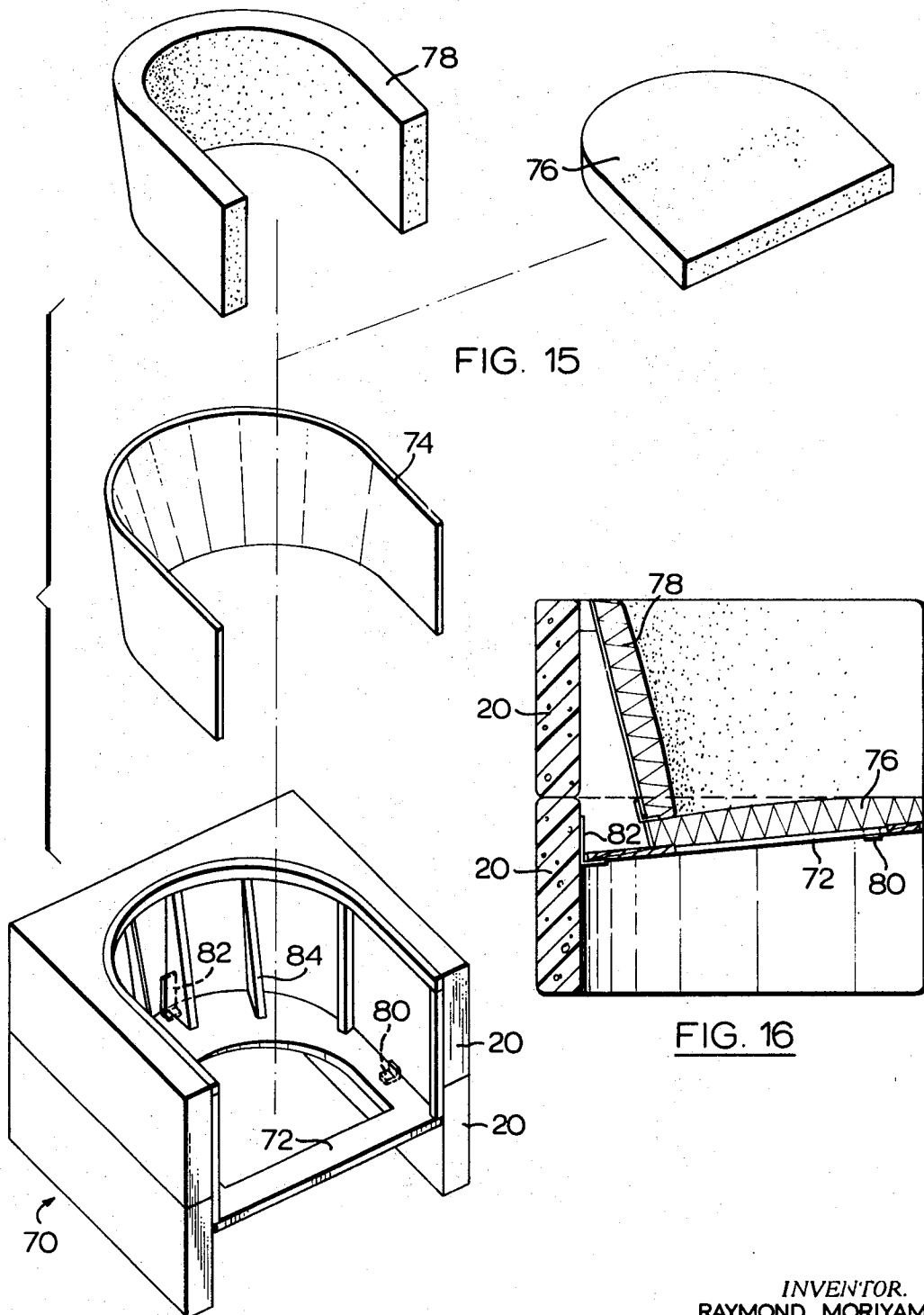
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3 Sheets-Sheet 3



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3,606,461
MODULAR FURNITURE
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Filed Nov. 3, 1969, Ser. No. 873,371
Int. Cl. A47c 1/12, 13/00, 7/02
U.S. Cl. 297-445 **10 Claims**

ABSTRACT OF THE DISCLOSURE

Modular furniture wherein the dimensions of each piece of furniture within a grouping are based on the dimensions of a cube, a one-half cube, or a one-quarter cube. The modular furniture may comprise a base element and a furniture function defining element in juxtaposed position thereto; and at least two of the effective dimensions of length, width and height of any one of the structural elements which goes to make up the modular furniture will equal at least two of those dimensions in another one of the structural elements which also goes to make up the modular furniture.

FIELD OF THE INVENTION

This invention relates to modular furniture. In particular, the invention teaches a grouping of modular furniture, each item of which essentially comprises a structural base element on which may be juxtaposed a structural defining element, cushioning means, etc. The conceptual basis for all of the modular furniture taught in this invention is a cube, and all of the structural elements which relate one to another and which go to make up various items of modular furniture are related to the cube, a one-half cube or a one-quarter cube, as will be seen hereafter.

The modular furniture of this invention has been developed so that in any given installation comprising a number of items of modular furniture, a clear relationship among the items of that installation is established. To this end, the modular furniture is particularly designed so that the structural elements which go to make up the items of furniture may conveniently be molded of a suitable material. Further, since the modular furniture may comprise two structural elements placed one in a juxtaposed position on the other, a convenient fastening means is shown whereby any two such elements can be held in juxtaposed relationship, and also so that certain other elements such as cushions may be securely fastened to the furniture items. However, it will be seen that in many cases it may not be necessary that the juxtaposed structural elements be fastened one to the other as their own weight and concomitant inertia will very often serve to assure structural stability of the furniture items.

SUMMARY OF THE INVENTION

It is an object of this invention to provide modular furniture and the structural elements therefor in which the dimensional relationships of all of the structural elements which go to make up the modular furniture have a notable relationship to a cube, a one-half cube or a one-quarter cube.

It is a further object of this invention to provide structural elements for modular furniture as noted herein which are readily and easily manufactured with sufficient structural rigidity and stability.

A still further object of this invention is to provide structural elements for modular furniture as noted herein in which certain of the elements may function as defining elements whereby the specific function of any furniture item comprising that element is defined; and in which the defining elements may be interchanged to juxtaposed rela-

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tionships over various base elements having specific dimensional relationships thereto.

BRIEF DESCRIPTION OF THE DRAWING

These and other objects and features of this invention are more clearly described hereafter in association with the drawing in which:

FIG. 1 is an orthographic representation of a cube made of two juxtaposed one-half cubes;

FIG. 2 is an orthographic representation of two one-half cubes showing a dimensional relationship of certain of the structural elements which may be developed from a one-half cube;

FIG. 3 is an orthographic representation showing dimensional relationships of two further structural elements which may each be developed from a one-half cube;

FIG. 4 is an orthographic representation of a structural element which is developed from a one-half cube;

FIG. 5 is an orthographic representation of a further structural element which is developed from a one-half cube;

FIGS. 6, 7, 8 and 9 are orthographic representations of furniture items, each of which comprises structural elements which are derived from a one-half cube;

FIG. 10 is an exploded orthographic representation of the furniture item of FIG. 7 showing the further addition of cushion elements thereto;

FIG. 11 is an exploded view, partially in cross section, and on a larger scale, of a fastening means for securing two elements in juxtaposed relationship;

FIG. 12 is an orthographic representation of a furniture item which is a further development of that shown in FIG. 8;

FIG. 13 is a cross sectional view taken through the centre line of FIG. 11;

FIG. 14 is an orthographic representation of the structural element of FIG. 4 showing its use as an ancillary furniture piece;

FIG. 15 is an exploded orthographic representation showing the assembly of a still further furniture item in accordance with this invention; and

FIG. 16 is a cross sectional representation taken through the centre line of the furniture item of FIG. 14.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The cube 10 shown in FIG. 1 comprises two one-half cubes, 12 and 14 respectively. The dimensions of the cube are indicated as length L, width W and height H; and obviously, when 10 is a cube,

$$L=W=H$$

The length and width of each one-half cube 12 or 14 is also L or W, and the height of each one-half cube is h . Obviously, since 12 and 14 are each a one-half cube,

$$h=\frac{1}{2}H$$

It should be noted that it is difficult, using standard manufacturing techniques, to produce structural elements as will be discussed in detail hereafter wherein all of the dimensions are precisely nominal. That is to say, while this invention relies upon the "basic cube" relationship of the dimensions of any of the structural elements as being equal or having another specified relationship, the invention comprehends that the physical elements will have dimensions which are substantially equal within reasonable tolerances. It may also happen that the specific design of one or another of the structural elements of this invention may be slightly under- or over-dimensioned because of visual illusion; but the visual effect of the assembled furniture item using such structural elements will still relate specifically to the basic cube concept.

The cube 10 of FIG. 1 is exploded in FIG. 2 and in

FIG. 3. Turning specifically to FIG. 2, it will be seen that the length, width and height relationships of each of the one-half cubes 12 and 14 are as previously noted. The dashed line 15 shown in the one-half cube 12 would separate the one-half cube 12 into two further elements 16a which would each be a one-quarter cube, if the one-half cube 12 were to be cut along that line. (Because of the conditional effect of the dashed line 15, the reference numerals relating to the structural elements which would result if the respective one-half cube were cut along that line are shown in parenthesis in FIGS. 2 and 3.) The width of each of the structural elements 16a is h , and it will be noted from the dimensional relationship set forth above that, since

$$h = \frac{1}{2}H$$

then,

$$h = \frac{1}{2}W$$

The one-half cubes 12 and 14 illustrated in FIG. 3 are each shown with a further series of dashed lines 19 and 17 respectively, which illustrate the dimensional relationships of two further structural elements 20 and 18a respectively. Again, it is noted that the dimensional relationships of each one-half cube 12 and 14 are as set forth above.

The structural elements 16a, 18a and 20a reappear as structural elements 16, 18 and 20 respectively in FIGS. 6, 4 and 5 respectively. The effective dimensional relationships of each of the structural elements 16, 18 and 20 have been noted above, and it is further noted that the element 16 is substantially one-half of a one-half cube, i.e., a one-quarter cube. Further, the structural elements 18 and 20 have cut-outs formed therein as noted hereafter.

There are a pair of cut-outs 22 formed in opposed faces 24a and 24b of the element 18. Each of the cut-outs 22 extends from the top surface 26a to the bottom surface 26b of the element 18; and each of the cut-outs 22 extends substantially across the width of the opposed faces 24a and 24b. The distance that each of the cut-outs 22 extends into the element 18 is less than one-half the length of the element 18, so that a bridge 28 separates the innermost ends of each of the cut-outs 22 and is substantially centrally located on the element 18 when viewed from above. This latter relationship is assured when the cut-outs 22 are semi-circular with a diameter less than the length or width of the one-half cube.

A cut-out 30 is formed in the structural element 20 illustrated in FIG. 5. Cut-out 30 extends substantially through the length of the element 20 from face 32a thereof to leave a bridge 34 only at one end of the element 20 near the face 32b opposed to face 32a. The cut-out 30, like the cut-outs 22 of the element 18, extends through the height of the element 20 from the top surface 36a to the bottom surface 36b. The innermost end of the cut-out 30 may conveniently be semi-circular, and of corresponding diameter to each of the cut-outs 22 in element 18. The outer portion of the cut-out 30 is defined by straight edges 31 which are substantially parallel to the outer edges of the element 20.

It should be noted with respect to any of the elements discussed herein, except as noted hereafter, that each of the surfaces of each of the structural elements is discrete. That is to say, each of the surfaces defining a face or a top or the edges of a cut-out of any of the elements described herein is a continuum following the nominal plane or curve intended for each respective surface, as the case may be. However, the bottom surfaces of any of the elements may or may not be a continuum depending primarily on the manner in which the element is manufactured and the materials which it comprises, as is explained in greater detail hereafter. Also, the definition of each of any of the discrete surfaces of any of the structural elements according to this invention as being a continuum comprehends a lip or tongue and/or groove

formed therein so as to enhance and secure the juxtaposed relationship of any of the structural elements one to another, as is also discussed hereafter.

FIG. 6 illustrates a simple bench-type furniture item which is formed by the juxtaposition of a one-quarter cube element 16, as discussed above, over a one-half cube element 38. The one-half cube 38 is substantially identical to any of the one-half cubes 12 or 14 as previously discussed; and is conveniently referred to hereafter as a base element. In the furniture item illustrated in FIG. 6, the structural element 16 functions as a defining element, and defines the function of the furniture piece to be that of a straight-backed bench or chair.

In like manner the furniture element 18 juxtaposed on base element 38, as in FIG. 7, is a defining element which defines the function of that furniture item as a double, back-to-back, chair.

Still further, the structural element 20 juxtaposed on the base element 38, as illustrated in FIG. 9, is a defining element which defines the function of that furniture item as a tub-type chair.

The furniture item shown in FIG. 8 is another type of chair which may comprise a structural element 18b, which is similar to the structural element 18 of FIG. 4, turned up on either of its faces 24a or 24b. A cushion 27 may be placed as shown in the lower end of the uppermost (in this case) cut-out 22, and a strap 29 is securely fastened at its ends so that it lies across the width of the uppermost cut-out 22 near its upper end, and at one side thereof. The fastening means used to secure the cushion 27, or the ends of strap 29, in place may be similar to the fastening means discussed hereafter with reference to FIG. 11.

It has been noted that the surfaces, with the possible exception of the bottom surface, of each of the structural elements which may comprise an item of furniture in accordance with this invention are discrete. It has also been noted that the discrete surface of any of the elements may comprehend, particularly in a top surface, a lip or tongue and groove formed therein. Each of FIGS. 6, 7 and 8 demonstrate basic furniture items which may be made by the juxtaposition of one or other of the defining elements on a base element. Other furniture items may simply comprise one element, particularly a one-half cube or a one-quarter cube, and a cushion, whereas another type of furniture item where the defining and base elements are identical is noted hereafter in the discussion with respect to FIGS. 14 and 15. It becomes evident that, when a modular furniture item in accordance with this invention comprises a base structural element and a defining structural element, in order for it to function properly and with a minimum of discomfort to the user, each of the defining elements used must be in a secure relationship to the base element so that the defining element does not readily move when leaned upon. Also, of course, each of the base elements must have sufficient structural strength and rigidity to support the defining element placed thereon without discernible deformation; that is to say, each base element must be strong enough to support a defining element when placed in juxtaposition thereon, and as well to support the weight of a user of the furniture item formed thereby.

Each of the structural elements according to this invention may be formed in a variety of ways and from a variety of materials. For example, the structural elements may be formed from a fabric or other lightweight covering stretched over a suitable frame or skeleton. Alternatively, the structural elements may be formed with plywood or other structural sheet material secured to a suitable frame. In still other cases, the structural elements may be formed of a plastic such as polyethylene or nylon which may be suitably molded such as by slush molding or blow molding; and in still further cases, the structural elements of this invention may be formed

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from concrete, which may either be solid or a stressed reinforced concrete shell. Without limiting the generality of the foregoing discussion, it can be noted that several examples of furniture items made in accordance with this invention comprise monolithic elements which are of a slush molded polyethylene skin with a blown polyurethane core, while other examples comprise plywood formed over a frame.

It has been found that when any of the defining elements have a sufficient weight that their inertia is high, it may not be necessary to fasten the elements to the base elements with additional fastening means. It has also been found in those circumstances, that furniture items made according to this invention and comprising a defining element in juxtaposition on a base element, may be used by a person without significant movement of the defining element over the base element as the user leans against the defining element. It is also convenient, at least in certain cases, that a defining element of any furniture item be easily removable from the base element for purposes of cleaning or maintenance.

However, in many circumstances some means to prevent lateral slipping of the defining element over the base element may be required. For those purposes, a lip may be formed in at least a portion of the top surface of the base element to interfere or otherwise correlate to a lip formed on the bottom of any of the defining elements which might from time to time be juxtaposed on the base element. Alternatively, means may include tongue and groove arrangements formed with either the tongue or the groove (or both) in various portions of the top surface of a base element and correlating integers on the bottom surface of any of the defining elements.

A fastening means having more secure results may include threaded means, and may be such as those illustrated in FIG. 11. The skin or surface portions of a base and a defining element, or an element and a cushion, are represented at 42 and 40 respectively. Formed in the skin 42 is a T nut 44 which threadably engages a round headed bolt 46. A keyway 48 is conveniently fastened by rivets or screws 50 to the surface 40. To secure the fastening means, bolt 46 is turned into the T nut 44 until there remains beneath the underside of the head of the bolt and the surface 42 sufficient clearance to snugly accommodate the thickness of the material of the keyway 48. The element having the keyway 48 is then placed so that the wide portion 52 thereof fits over the head of the bolt 46, and the element is moved so that the keyway 48 moves laterally along the shaft of the bolt 46 so that the bolt enters the narrow portion 54 and the keyway is secured between the surface 42 and the underside of the head of bolt 46.

Still other attachment means between elements may comprise double ended bolts which would thread into T nuts or other bolt receiving means formed in opposed surfaces such as 40 and 42, and which draw the opposed surfaces together as the bolt is threaded into each of the receiving means.

Another practical example of the use of fastening means is illustrated in FIG. 10. That figure shows an exploded orthographic representation of a chair not unlike that illustrated in FIG. 7, except that each of the seat portions defined by the cut-outs 22 on the upper surface of the base element 38 has a cushion 60 fastened thereto. Each cushion 60 may be fastened to the upper surface of the base element 38 by means such as those illustrated in FIG. 10, including a pair of bolts 46 which are turned into suitable receiving T nuts placed in the upper surface of the base element 38. When the defining element 18 is juxtaposed on the base element 38 and the cushions 60 are secured to the upper surface, the cushions may serve as stop means to restrict lateral movement of the defining element 18 with respect to the base element 38. Of course, other furniture items may simply

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comprise the base element 38 and the cushions 60; while still other furniture items may comprise a one-quarter cube 16 with a cushion 60 securely fastened thereto.

FIGS. 12 and 13 show a chair not unlike that illustrated in FIG. 9. However, the defining element 20a has the inner end 72 of the cut-out 30a formed therein in a sloping relationship to the top surface of the defining element and the base element 38. The tub-type chair therefore provides a sloping back against which the user may recline.

The element 18 illustrated in FIG. 14 is shown in an ancillary use to the modular furniture of this invention. In FIG. 14, suitable containers 64 are shown placed into the cut-outs 26 of the element 18, and in one of the containers soil 66 and a plant 68 are also shown. The element 18 is thereby shown in FIG. 14 to secure waste receptacles and planters so that they also relate dimensionally and visually to the modular furniture of this invention.

A different construction for a tub-type chair is shown in FIGS. 15 and 16. It will be noted that the chair 70 comprises two elements 20 in juxtaposed relationship, together with additional framing elements. These additional elements include a chair frame 72, a back frame 74, seat cushion 76 and tub cushion 78. The inner portion of the back is sloped in a manner similar to that as shown at 62 in FIGS. 12 and 13; but in this chair the seat is also sloped upwardly towards the front so as to provide a piece of sitting furniture of more normal circumstances so far as the tilt of the seat portion thereof is concerned.

The frame 72 is secured into the base element by means of clips 80 and 82. The clips 80 and 82 may themselves be secured to the inside surfaces of the base element in a manner such as that discussed above with respect to FIG. 11. Ribs 84 support the back frame 74; and the seat cushion 76 and tub cushion 78 are placed into the assembled tub chair as indicated in FIG. 16.

It is clear that the tub-type chair illustrated in FIGS. 15 and 16 satisfies all of the particulars of the modular furniture according to this invention. The base and defining elements in this case are virtually identical one to the other, but when they are in juxtaposed relationship the effective outer dimensions of the tub chair assume those of the basic cube as discussed above. Further, it is evident that the structural rigidity of the base element must be sufficient to support the frame and other elements which go to make up the chair, as well as the weight of the user.

Any of the modular furniture items, particularly those such as are shown in FIGS. 7, 9, 11 and 14, may be covered with a suitable material such as vinyl, leather or other upholstery materials.

There has been described a grouping of modular furniture where the dimensional relationships of all of the structural elements which go to make up the modular furniture have a specific relationship one to another and to a "basic cube" concept as discussed above. It has been noted that the various structural elements which are illustrated and discussed are such that they may be readily and easily manufactured and assembled together, with sufficient structural rigidity and stability as to satisfy the furniture functions for which they are designed. The interchangeability of various of the structural elements of the specific designs has been noted.

The various structural elements, particularly defining elements such as elements 18 and 20 may also be useful for framing display devices such as shelving and display cases. This is especially convenient where it is decided to establish an architectural grouping where all of the items of furniture and equipment relate to a basic theme. It is also noted that modular furniture made in accordance with this invention may be useful either indoors or out-of-doors; and where the modular furniture is made of suitable plastic materials or concrete, permanent out-of-door use may be easily realized.

I claim:

1. In modular furniture as disclosed, wherein an item of furniture comprises at least a structural base element and a structural defining element; whereby the structural defining element, when placed over and supported by the structural base element, functions in combination with the structural base element so as to define the overall surface configuration of that item of furniture;

and wherein the item of furniture has an overall surface configuration of a predetermined shape adapted to receive a part of the anatomy of the user of the furniture item;

and wherein at least the structural defining element may be adapted, in a different orientation than when placed over and supported by the structural base element, for other purposes than to function in combination with the base element so as to define a specific item of furniture;

structural elements including a structural base element and a structural defining element, said structural base element being adapted to support a structural defining element when placed in vertically juxtaposed relationship therebeneath, without discernible deformation of the base element;

wherein said structural base element has substantially equal dimensions of length and width and has its dimension of height substantially equal to one-half of either the dimension of height substantially equal to one-half of either the dimensions of length or width so that said base element is effectively a one-half cube;

and at least one of the dimensions if length or width of a structural defining element is substantially equal to the dimension of either length or width of said base element, and the dimension of height of said structural defining element is substantially equal to the dimension of height of said base element.

2. The combination of claim 1 wherein said structural base element is substantially rectilinear; and wherein the length of a structural defining element placed over said base element is substantially equal to the length of said base element and the width and height of said defining element are each substantially equal to the height of said base element.

3. The combination of claim 1 wherein said structural base element is substantially rectilinear; and wherein the length and the effective width of a structural defining element placed thereover and supported thereby are each substantially equal to the length or width of said base element; and wherein said structural defining element has a pair of cut-outs formed throughout its height on opposed sides thereof, each defined by a discrete surface extending from the top to the bottom surface of said defining element; each of said cut-outs extending substantially across with width of its respective opposed side, and each extending less than one-half of the length of said structural defining element.

4. The combination of claim 1 wherein said structural base element is substantially rectilinear; and wherein the length and the effective width of a structural defining element placed thereover and supported thereby are each substantially equal to the length or width of said base element; and wherein said structural defining element has

a cut-out formed throughout its height from one side thereof, and extending substantially across the width thereof and substantially through the length thereof; said cut-out being defined by a discrete surface extending from the top to the bottom surfaces of said structural defining element.

5. The combination of claim 4 wherein said structural base element is substantially rectilinear; and wherein the innermost portion of the discrete surface defining said cut-out is arcuate, and extends from the top to the bottom of said structural defining element at an angle to the perpendicular.

6. The combination of claim 1 wherein said structural base element is substantially rectilinear; and wherein cushion means are fastened to at least a portion of the upper surface thereof.

7. The combination of claim 1 wherein said structural base element is substantially rectilinear; and wherein cushion means are fastened to the upper surface of said base element in a portion thereof left exposed by a cut-out formed in a structural defining element when said defining element is placed on said base element and supported thereby.

8. The combination of claim 1 wherein a structural defining element is releasably secured to said structural base element with threaded fastening means.

9. The combination of claim 1 wherein each of the structural base element and the structural defining element is a substantially monolithic structure.

10. The combination according to claim 4 wherein each of said structural base element and said structural defining element has formed therein a cut-out extending substantially across the width thereof and substantially through the length thereof, each said cut-out being defined by a discrete surface extending from the top to the bottom surfaces of each of the respective structural elements;

said structural defining element and said structural base element being securely fastened together in a position so that said cut-outs are substantially co-extensive;

and wherein support means and cushion means are secured to the discrete surfaces defining said cut-outs in said structural base and structural defining elements, respectively, so that said cushion means defines back and seat means in a chair formed thereby.

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PAUL R. GILLIAM, Primary Examiner

U.S. Cl. X.R.

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