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Sidcup, Kent DA15 7EB(GB)(54) **Panels for demountable structures.**

(57) A panel is disclosed which with other similar panels may be used to make demountable structures. The panel has means enabling its interengagement with other similar panels which are in the form of one or more hollow open ended cylinders carried by U-shaped section edge members of the panel to lie substantially in the plane of the panel at a predetermined spacing one from another such that the extensions of a first panel may lie between the extensions of a second panel when edges of the first and second panels are brought into register with one another to enable a pin member to be passed through and be received in the extensions to couple two panels together.

As described the panel is of a moulded plastics material and has a generally flat and ribbed the central section.

Apparatus including the panels further comprises pin members and closure members having arms for receiving ends of the pin member coupling panels together.

Demountable structures made from the panels are described as are methods of making those structures.

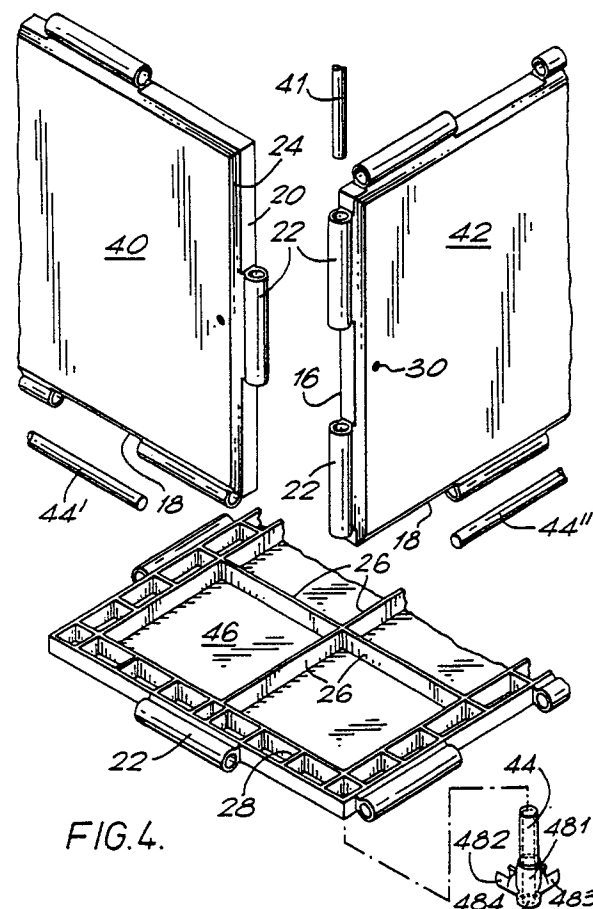


FIG. 4.

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PANELS

DESCRIPTION

The invention relates to panels, more particularly panels which may be used to form structures, methods of linking them together and structures made from them.

The invention is particularly, but not exclusively, concerned with panels for use in forming demountable structures such as children's toy boxes and playhouses, storage boxes and cartons used generally in a domestic and/or commercial environment.

One drawback of the many different structures presently found in domestic and commercial environments is that if the structure is not purpose designed and built by (or for) its intended user it is unlikely to fit within the confines of the space available for them (e.g. within a cupboard).

Another drawback of such structures is that generally each of them has a single purpose which limits their usefulness in the long term. The usefulness of a playhouse, for example, is slight (if it has any) when the child for whom it was erected grows and it becomes too small to be readily entered. Again, a child's interest in a purpose designed and built structure may pass or be lost as the child grows older and the utility of the structure is then lost, or at least substantially reduced. Similarly, storage boxes and cartons specifically bought for location in a particular situation (e.g. in a cupboard or under a desk) will be of little use if the owner decides to dispose of the desk or to move to a building that does not have a suitable cupboard.

One object of the invention is the provision of a method and means for making structures which enables a user to tailor the structures to his requirements much more readily than has heretofore been the case.

A second object of the invention is to provide a method and means for making demountable structures the form and/or size of which may readily be altered by a user as and when desired.

In one aspect the invention provides a panel for use with other similar panels to make structures, the panel being formed with means enabling its interengagement with said other panels, the panel having a central section bounded by edge members upon which said means enabling interengagement of the panels are carried.

The means enabling interengagement of the panels may comprise one or more extensions carried by each said edge member and lying substantially in the plane of the panel, said extensions

being positioned at a predetermined spacing one from another such that the extensions of a first panel may lie between the extensions of a second panel when respective edges of the first and second panels are brought into register with one another.

Preferably the extensions carried on each said edge member comprise one or more hollow open ended cylinders each with its axis in parallel with the outer peripheral edge of the edge member and at a predetermined spacing therefrom.

The central section of each panel may be generally flat and the edge members be U-shaped in cross section.

The central section is preferably ribbed to increase the strength of the panel, and for the same reason the U-shaped cross section edge members may be webbed.

Desirably the panel is of a moulded plastics material such as polypropylene.

The extensions are with advantage of equal length.

In a preferred arrangement the panel is rectangular and the distance between the axes of the extensions on the shorter sides of the panel is an integer multiple of the distance between the axes of the extensions on the longer sides thereof, a first shorter side of the panel carries a plurality of extensions mutually spaced apart by a distance equal to or greater than their length, whilst the opposed second shorter side of the panel carries extensions located such that a projection of the mid point of each extension of the second shorter side along the panel falls mid way between extensions on the said first shorter side, and wherein alternate sections of the longer sides of the panel have extensions thereon disposed in the manner of the extensions on the first and the second shorter sides with the extensions on opposed sections of the longer sides positioned corresponding to the said first and the said second shorter sides respectively.

The distance between the axes of the extensions on the shorter sides thereof may be twice the distance between the axes of the extensions on the longer sides thereof and the first shorter side of the panel be provided with two extensions the innermost ends of which are spaced to either side of the mid point of said second shorter side by an amount substantially equal to half their length, whilst the opposed second shorter side of the panel carries a single extension located centrally thereof, and wherein alternate sections of the longer sides of the panel have two or one extensions formed thereon in the manner of the extensions on

the first and the second shorter sides respectively and wherein opposed sections of the longer sides have one and two extensions formed thereon respectively.

A second aspect of the invention provides apparatus for making structures including a number of panels as defined above and further including one or more pin members adapted to pass through and be received in hollow cylindrical extensions of panels which are in register and are to be connected.

The apparatus may further comprise closure members having arms for receiving an end of a pin member coupling panels together.

In a third aspect the invention provides a method of making a structure with the said apparatus which comprises the steps of placing edges of panels in register with one another such that the extensions of one panel lie between, and with their axes coincident with, the extensions of the second panel and then passing through the extensions of both panels a pin member so as to couple the two panels together.

Embodiments of the invention will now be described with reference to the accompanying drawings in which:-

Figures 1, 2 and 3 are, respectively, front, rear and side views of an panel embodying the invention,

Figure 4 is a partial, exploded isometric view showing how three of the panels of Figures 1 to 3, may be joined to one another,

Figure 5 is a schematic view of a toy box embodying the invention made from the panels of Figures 1 to 3,

Figure 6 illustrates various type of closure member which may be used with the apparatus, and

Figure 7 highly schematically illustrates another structure made from the panels of Figures 1 to 3 in accordance with the method of the invention.

Figures 1 to 3 of the drawings show a rectangular panel 10 embodying the invention to comprise a flat centre section 12 bounded by four U-shape cross section edge members 14, 16, 18 and 20. The edges of panel 10 - the outermost surfaces of the channel members - are formed with extensions in the form of hollow open ended cylinders 22 each of length V arranged as shown on the edge members 14, 16, 18 and 20. The axes of the extensions 22 are at a fixed spacing R from the edge members on which they are formed, and as can be seen the overall dimensions of the panel (measured between the axes of the extensions 22 on opposed edges of the panel) are such that it is twice as long as it is wide.

The extensions 22 carried by the edge mem-

bers lie substantially in the plane of the panel and are positioned at predetermined positions on the panel - in particular at predetermined spacings one from another.

A single extension 22 is located centrally on a first shorter edge member 20 and two extensions 22 are provided equi-spaced to either side of the mid point of the second, opposed shorter edge member 16. The innermost end of each extension 22 on edge member 16 is spaced from the mid point of that edge substantially by a distance $V/2$ (half their length) and their outermost ends are offset from the ends of the member 16 by an amount C.

Three extensions 22 are provided on longer edge member 14 of panel 10 and these are located as shown with the first, moving in a direction away from the member 16, spaced from that end of member 14 by the amount of the offset C, the second spaced from the first by the length of the extensions V, and the third spaced from the second by a distance equal the length of the extensions plus twice the amounts C and R; that is to say the third extension is spaced from the second by a distance $V + 2x(C + R)$.

The three extensions 22 on longer edge member 18 are similarly spaced apart on that member - moving in a direction away from edge member 20 as shown.

Because of this particular arrangement extensions 22 of a first panel may be positioned between extensions of a second, identical, panel when respective edges of the first and second panels are brought into register with one another, that is to say the extensions on each side of the panel 10 may readily pass between the extensions of an identical panel allowing an edge member 16 (or 14) of a first panel to abut an edge 20 (or 18) of a second panel.

Furthermore, the particular arrangement enables two panels to be positioned with their longer edges 14 (or 18) in abutment and with the shorter edges 16 and 20 side-by-side so that those edges 16 and 20 may then be brought into abutment with and coupled to an edge 14 (or 18) of a third panel.

The front corner of each edge member is cut away or bevelled as shown at 24.

To increase the stability, strength and versatility of the panels (and ultimately of a structure made from them) the centre section 12 has ribs 26 formed integrally on one or other surface thereof and the box edge members has cross webs 28 as shown.

Apertures are provided in the panels as indicated at 30, the purpose of which will be described below.

The panel 10 is preferably moulded in one from a suitable plastics material such as poly-

propylene.

Although described as being rectangular it will be appreciated that the panel may have other shapes e.g square, triangular, octagonal etc., if desired.

The formation of a demountable structure will now be described with reference to the other Figures of the drawings.

Figure 4 illustrates how three panels each as described above may be joined to make a first part - a corner section - of such a structure.

A user takes a first panel 40 and arranges it relative to a second panel 42 such that the edge member 20 of panel 40 is adjacent and in register with the edge member 16 of the other panel 42. The user then passes the extension 22 on edge 20 of panel 40 between the extensions 22 on the edge 16 of panel 42 and holds the two panels with their extensions coaxially aligned whilst he passes a pin member 44 into and along the hollow extensions - pin 44 passing first through one extension 22 of panel 42 then the extension 22 of panel 40 and finally through the other extension 22 of panel 42.

Pin 44 is sized to fit within the hollow cylindrical extensions 22 and acts in the manner of a hinge pin to link the two panels 40 and 42 and whilst only the two panels are so linked they can rotate, relative to one another, from the position shown in Figure 4 through more than 180° due to the provision of the cut away portions 24 on the front corners of the edge members.

The user then links the panels 40 and 42 to the third panel 46 shown in Figure 4 by laying the third panel 46 on a flat surface and arranging the two linked panels 40 and 42 generally at right angles to one another and repeats the process already described - that is to say he brings the lower edge member 18 of the panel 42 to a position in which the extensions thereon lie between the extensions on an edge member of the panel 46 and inserts a pin 44 through those extensions. Similarly the extensions on the lower edge member 18 of the panel 42 are passed between the extensions on the other edge member of the panel 46 and linked with a pin 44 as shown.

Once the pins 44, 44' and 44'' have been positioned the three panels are rigidly fixed one to the other.

To complete the assembly of the corner piece a closure 48 is provided having three arms, the first 481 rises vertically as viewed in Figure 4 whilst the other two arms 482 and 483 extend mutually at right angles in the horizontal plane of that Figure.

Arm 481 has an outer diameter over its lower length equal to the diameter (2xR) of the extensions 22 and rises as shown to a shoulder at which its outer diameter decreases to match the inner diameter of the extensions 22 (e.g. to match the

diameter of the pins 44). The uppermost end of the arm 481 passes into the extension 22 shown immediately above it in the Figure until the lower end of that extension rests on the shoulder of the arm.

The three arms of the member 48 include central bores, those in the arms 482 and 483 being sized to receive the ends of the pins 44' and 44'' and that in the arm 481 being sized to receive - via a bottom hole 484 in the member - a pin for a caster wheel (see Figure 5 below).

As can be seen the arms 482 and 483 do not have a continuous outer surface - sections of them are removed to allow pins to be "press-fitted" into them when linking several panels together.

The three panel corner piece shown in Figure 4 may be extended by joining more panels to it to form any desired structure and one of these, a child's toy box, is illustrated in Figure 5.

To form the box illustrated in Figure 5, the three panel corner piece shown in Figure 4, has been extended by adding - in the way already described - further identical panels 50 to form the bottom, sides and ends of box.

Each longer side 54 and the bottom wall (not seen) of the box comprises four panels joined together in the way described - the free ends of the horizontal pins 44 at the bottom corners of the box being received in closures 48 of the form shown in Figure 4 whilst the free ends of the pins at the upper corners of the box are received in closures 55 substantially as shown in Figure 6A, that is to say having three arms extending in the three dimensions.

The vertical arms 551 of the closures 55 receive the ends of pins 44, and the horizontal arms 552 of the closures 55 at the end of the box at which the lid is hinged receive the ends of a pin 44 which acts as the pivot for the lid. However, no pins 44 are provided along the tops of the sides of the box or along the top of the end spaced from the lid hinge and the horizontal arms 552 of the closures 55 at the end of the box spaced from the lid hinge therefore do not receive the end of a pin.

The mid points of the upper edges of the sides 54 include closures 56 (see Figure 6B) in the form of T-members only the vertically extending arms 561 of which receive the ends of vertically extending pins 44 - as noted above no pins are provided running along the tops of the side edges 54 of the box.

The mid points of the vertical corners of the box include closures 57 having a vertically extending arm 571 (as seen in Figure 6C) - through which pass pins 44 - and two horizontally extending arms 572 running mutually at right angles to one another and to the arm 571, which receive the ends of pins 44 running horizontally in the centre of the sides of the box. Similar closures are provided at the lower

mid points of the longer sides of the box to receive pins running horizontally along the lower edge of the box side, vertically down the side and horizontally across the base of the box.

The centre of the side 54 include closures 58 (see Figure 6D) in the form of X-members the four arms of which lie in the plane of the side. Of these arms an opposed pair 581 (the horizontal or vertically extending arms) receive the ends of pins 44; whilst the other opposed pair 582 (the vertically of horizontally extending arms) are joined by a passage passing through the closure so that the closure surrounds a pin extending the height (or length) of the side 54.

The shorter sides 60 of the toy box are made by linking together two panels - one above the other - which are then linked to the sides 54 by the pins 44 as already described.

The lid 62 of the toy box is formed of four of the panels described which are rigidly linked one to the other and which are linked to the main body of the box solely along a single, upper edge of one of the shorter sides 60 of the box, so that the lid 62 can rotate about that single edge - around the pin linking the lid 62 to the side 60.

The closures 48 at the lower corners of the box receive, via the holes in their bottom arms 484, pins upon which are mounted castor wheels 64, it will be seen that the pin of the castor wheel passes into the extension receiving the arm 481 of the closure 48 and that such an arrangement adds to stability of the box.

It will be appreciated that the absence of the pins along the top edges of the box (save that forming the hinge pin for the lid enables the extensions on the edges of the top to enter between the extensions on the top edges of the box and therefore close onto the box.

One of the apertures 30 in the panels forming the lid may be arranged to receive a handle or knob 66 by which the lid 62 may be lifted and rotated.

Apertures 30 in the panels forming the shorter side 60 spaced from the lid 62 may receive a device 68 by which the box may be pulled along.

The device 68 may take the form of handle, an eye member as shown to which a cord or string 70 may be attached or a link member enabling a plurality of similarly formed boxes to be joined to form a "train".

It will be readily seen that the panels described may be used to make any desired shape and one of these is illustrated highly schematically in Figure 7 in which a plurality of panels 10 have been arranged - making use of the methods described to take the form of a play house having long walls 100, end walls 102 and roof sections 104. The long wall shown includes a door formed by linking four

panels together and then hinging them to an edge of a gap in the wall and the walls have further panels hinged to edges of gaps in the wall to form opening windows.

The gable ends of the playhouse each comprise a single triangular section the edges of which are formed with extensions at the appropriate spacing to match that of the extensions 22 on the panels used to form the walls and adapted to be linked therewith along the top edge of end wall 102 and the panels forming the roof 104. If desired (by a user) the playhouse may have a "flat roof" and the need for special sections for forming the gable ends is removed - the whole structure may be made with identical panels.

Panels may be omitted to form "windows" and, as can be seen a door may be provided in the manner of the lid 62 described above with reference to Figure 5.

The panels now described may be interlinked to form not just the structures shown but other structures as desired by the user, such as, for example, climbing frames, cars, shelving, tool- and work-boxes.

It will be seen that there are many modifications which can be made to the described arrangements without departing from the scope of the invention. For example the form, number, positioning and spacing of the extensions may be different to that shown, the only constraint on their number and positioning being that the extensions on an edge of the panel be configured to pass between extensions on another edge of the panel to allow the pins to be passed through them to link the panels together.

It is envisaged that the ribbing shown on the generally flat central section of each panel may be provided on the other surface of the panel or even omitted if desired. The areas of the panels bounded by the strengthening ribs 28 (if provided) may be embellished with pictures of cartoon and other characters of interest to a possible user. If desired these areas may be left blank and adorned by a user (if they so desire).

It will also be seen that a structure once made may be (if desired) demounted or taken apart and its panels reassembled in another shape simply by pulling out the pins 44 realigning the panels and reinserting the same pins (or pins of different lengths) to join the panels to form the newly desired shapes.

For example the various closures described may each be formed with slots in the manner described for the closure 48 to enable the ready fitment of pins to them, the closures may further be modified such that each arm of each is arranged to receive the end of a pin 44 and thus all the pins used to form a structure may be of the same

length.

Again, the closures may comprise single moulded members enabling more than two panels (or groups of panels) to be linked together - that is to say a closure may be provided which can be used to link the parallel edges of three or more panels (or groups of panels). Such a closure may be formed for example by combining side-by-side in a single moulding two of the closures described above.

Another variation included within the scope of the invention is the use of other elements coupled to the panels to complete a desired structure; e.g. the gable ends in the arrangement of Figure 7 are preferably provided as panels linked to panels forming the walls and roof of the house but may be provided as simple infill elements in the same or another material (e.g. plywood, chipboard or the like).

The panels, pins and closures forming the system now described are preferably moulded from a plastics material which is non-toxic, and to a large extent weather resistant.

It will be appreciated that the arrangements now disclosed provide method and means for making structures which enables a user to tailor the structures to his requirements much more readily than has heretofore been the case, and that they also provide method and means for making demountable structures the form and/or size of which may readily be altered by a user as and when desired.

Claims

1. A panel for use with other similar panels to make structures the panel being formed with means enabling its interengagement with said other panels, the panel having a central section bounded by edge members upon which said means enabling interengagement of the panels are carried.

2. A panel as claimed in Claim 1 wherein said means enabling interengagement of the panels comprises one or more extensions carried by each said edge member and lying substantially in the plane of the panel, said extensions being positioned at a predetermined spacing one from another such that the extensions of a first panel may lie between the extensions of a second panel when respective edges of the first and second panels are brought into register with one another.

3. A panel as Claimed in Claim 1 or Claim 2, wherein the extensions comprise hollow open ended cylinders each carried on a respective edge member with its axis in parallel with the outer peripheral edge of the edge member and at a predetermined spacing therefrom.

4. A panel as claimed in any one of Claims 1 to 3, wherein the central section is generally flat and the edge members are U-shaped in cross section.

5. A panel as claimed Claim 4, wherein the central section is ribbed.

6. A panel as claimed in Claim 4 or Claim 5, wherein the U-shaped cross section edge members are webbed.

7. A panel as claimed in any one of the preceding Claims which is of a moulded plastics material.

8. A panel as claimed in any one of the preceding Claims wherein the extensions are of equal length.

9. A panel as claimed in any one of the preceding Claims which is rectangular, wherein the distance between the axes of the extensions on the shorter sides of the panel is an integer multiple of the the distance between the axes of the extensions on the longer sides thereof, wherein a first shorter side of the panel carries a plurality of extensions mutually spaced apart by a distance equal to or greater than their length, wherein the opposed second shorter side of the panel carries extensions located such that a projection of the mid point of each extension of the second shorter side along the panel falls mid way between extensions on the said first shorter side, and wherein alternate sections of the longer sides of the panel have extensions thereon disposed in the manner of the extensions on the first and the second shorter sides with the extensions on opposed sections of the longer sides positioned corresponding to the said first and the said second shorter sides respectively.

10. A panel as claimed in Claim 9, wherein the distance between the axes of the extensions on the shorter sides thereof is twice the distance between the axes of the extensions on the longer sides thereof, wherein a first shorter side of the panel is provided with two extensions the innermost ends of which are spaced to either side of the mid point of said second shorter side by an amount substantially equal to half their length, whilst the opposed second shorter side of the panel carries a single extension located centrally thereof, wherein alternate sections of the longer sides of the panel have two or one extensions formed thereon in the manner of the extensions on the first and the second shorter sides respectively and wherein opposed sections of the longer sides have one and two extensions formed thereon respectively.

11. Apparatus for making structures including a number of panels as claimed Claim 3 and any one of Claims 4 to 10, and further including one or

more pin members adapted to pass through and be received in hollow cylindrical extensions of panels which are in register and are to be connected.

12. Apparatus as claimed Claim 10, further comprising a closure member having arms for receiving a pin member coupling panels together.

13. A method of making a structure with the apparatus of Claim 10 comprising the steps of placing edges of panels in register with one another such that the extensions of one panel lie between and with their axes coincident with the extensions of the second panel and then passing through the extensions of both panels a pin member so as to couple the two panels together.

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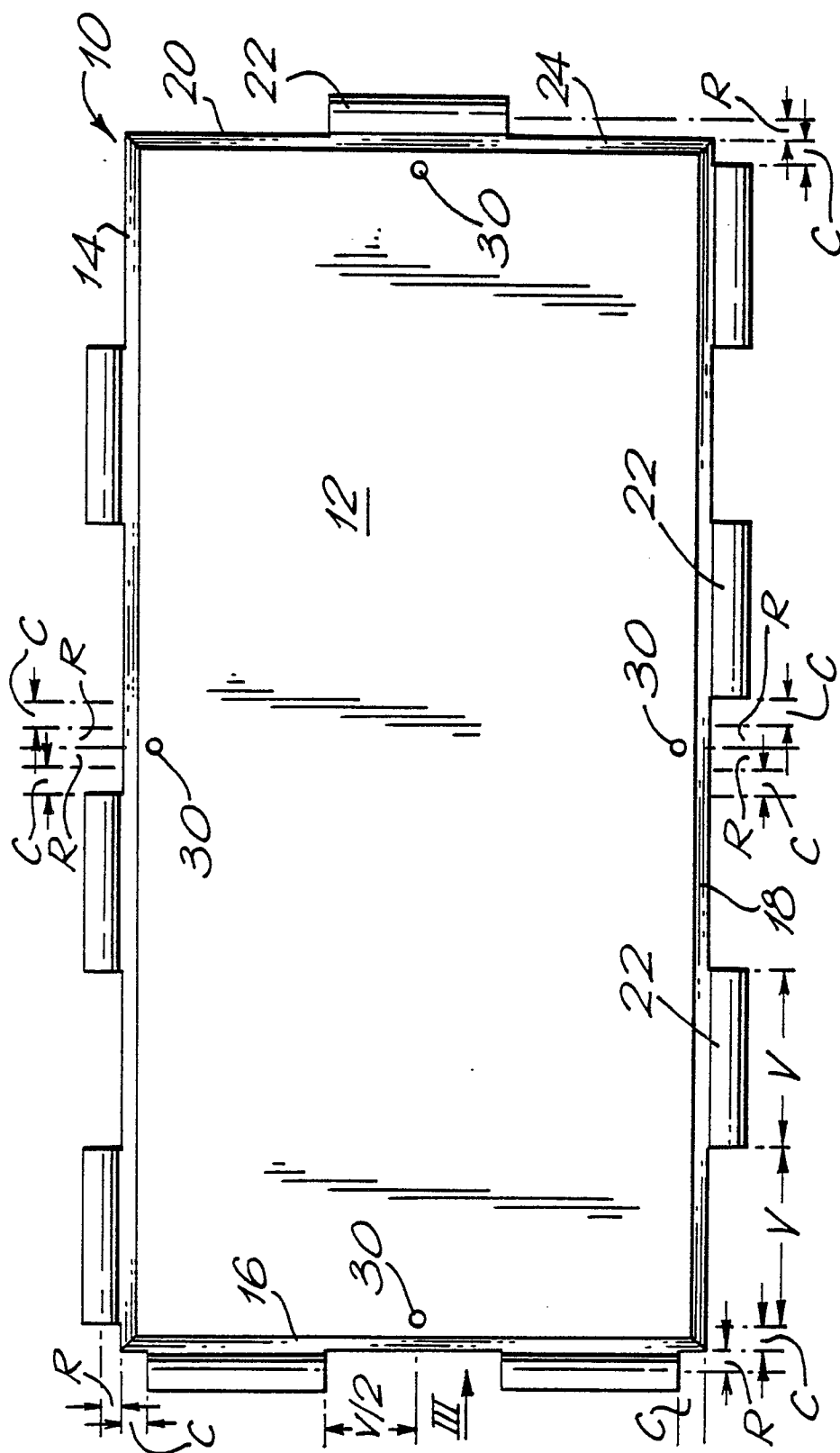


FIG.1.

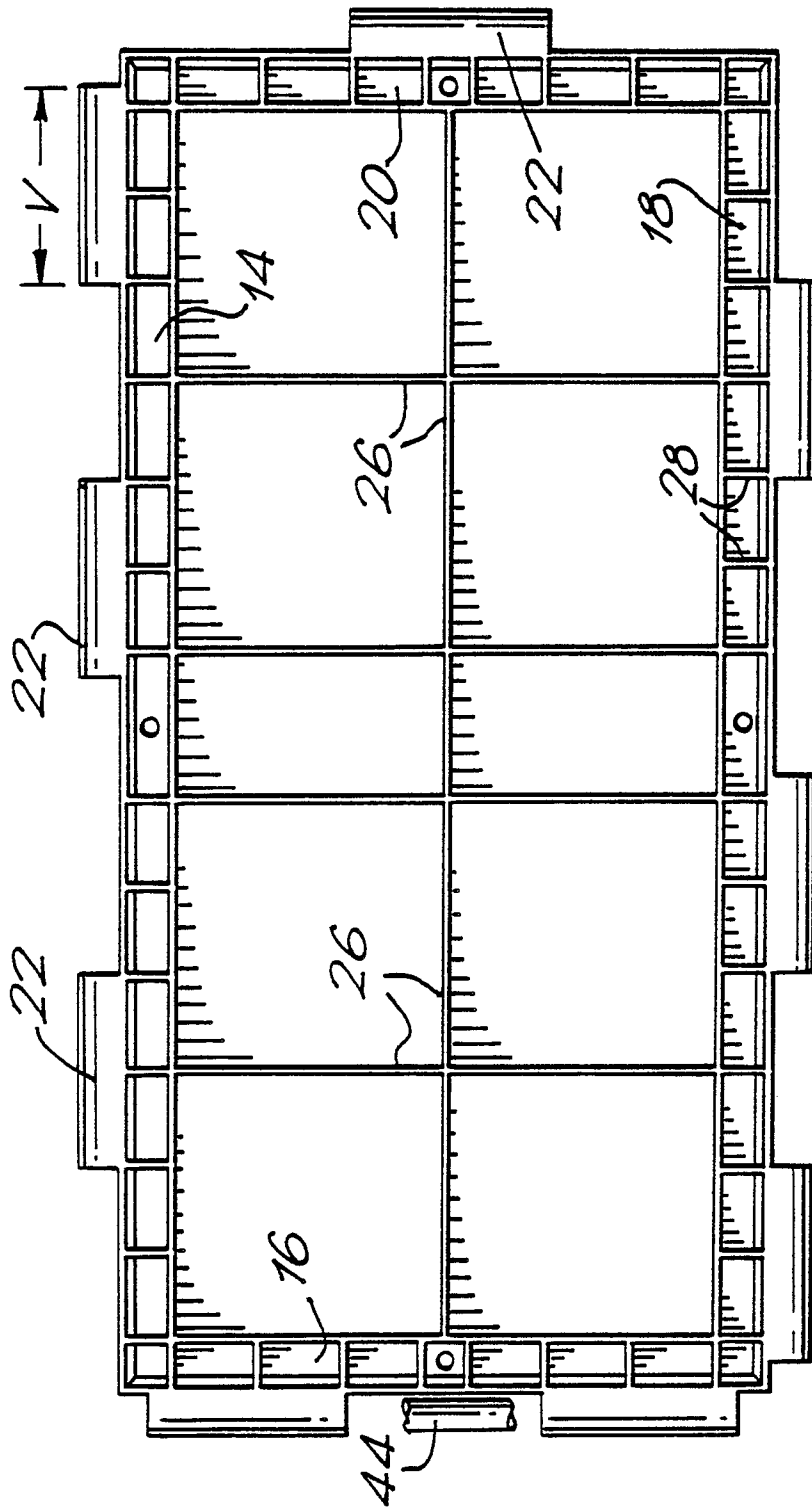


FIG. 2.

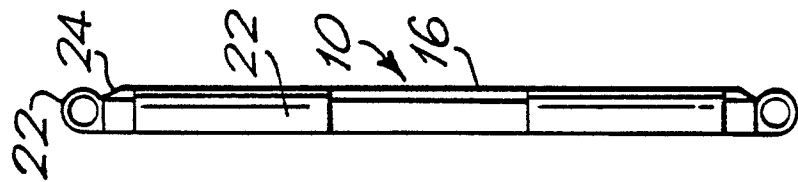
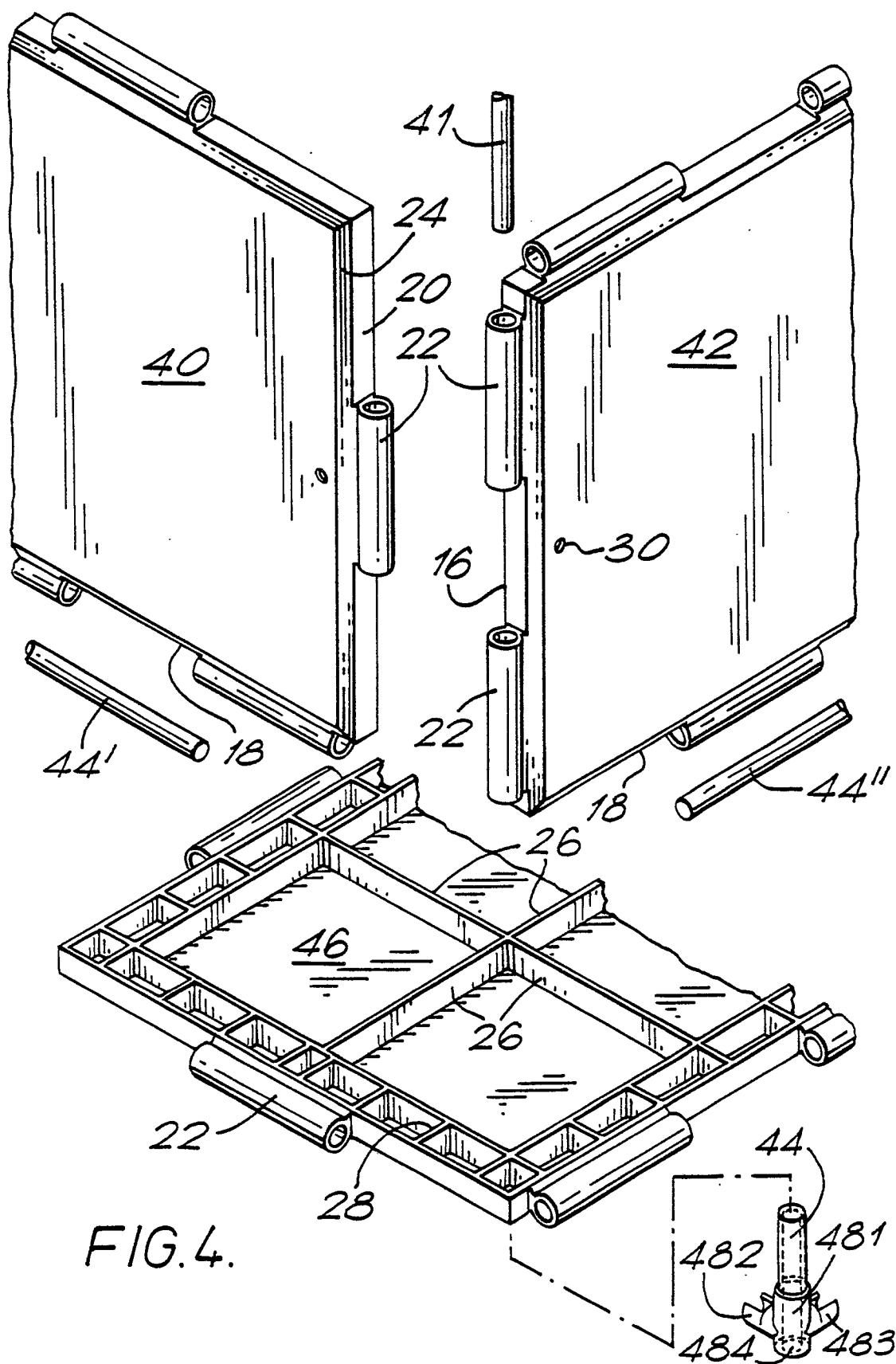


FIG. 3.



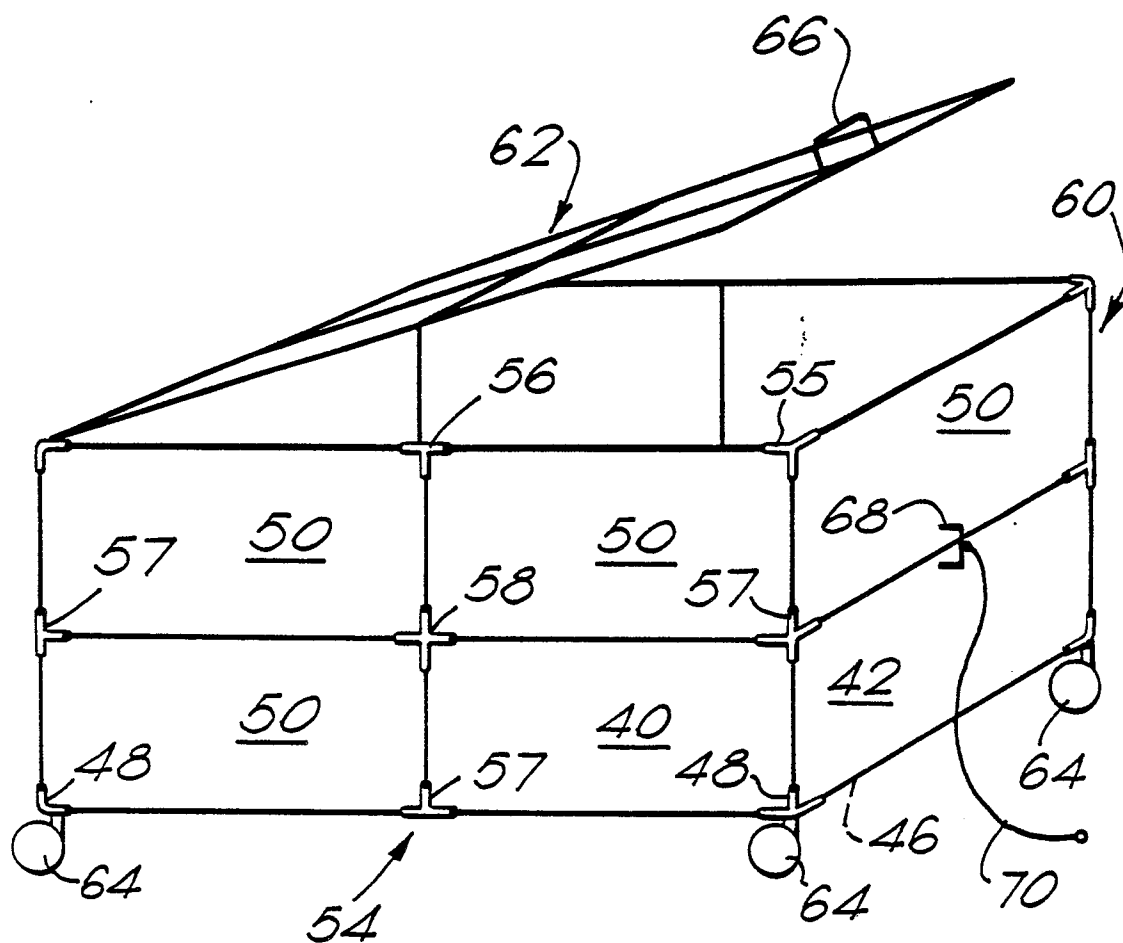


FIG. 5.

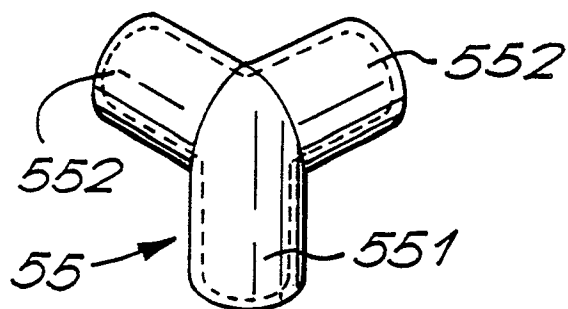


FIG. 6A.

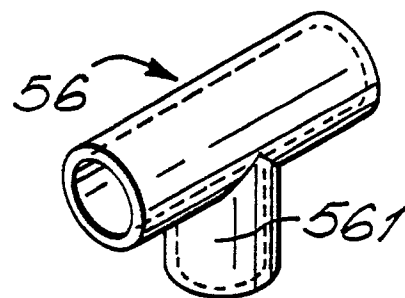


FIG. 6B.

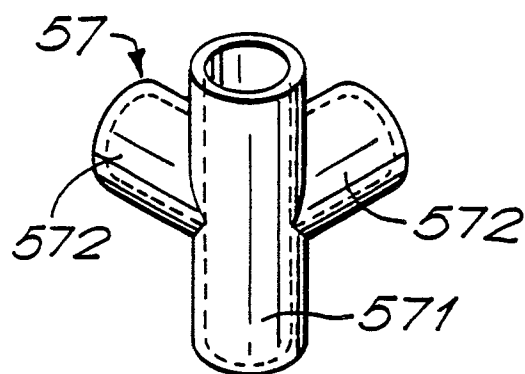


FIG. 6C.

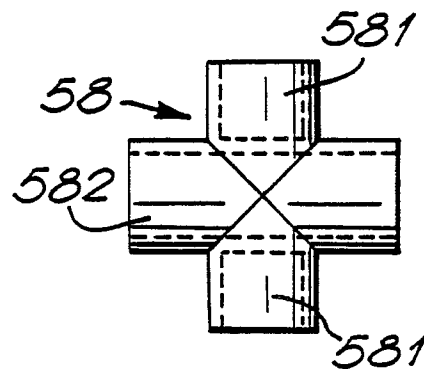


FIG. 6D.

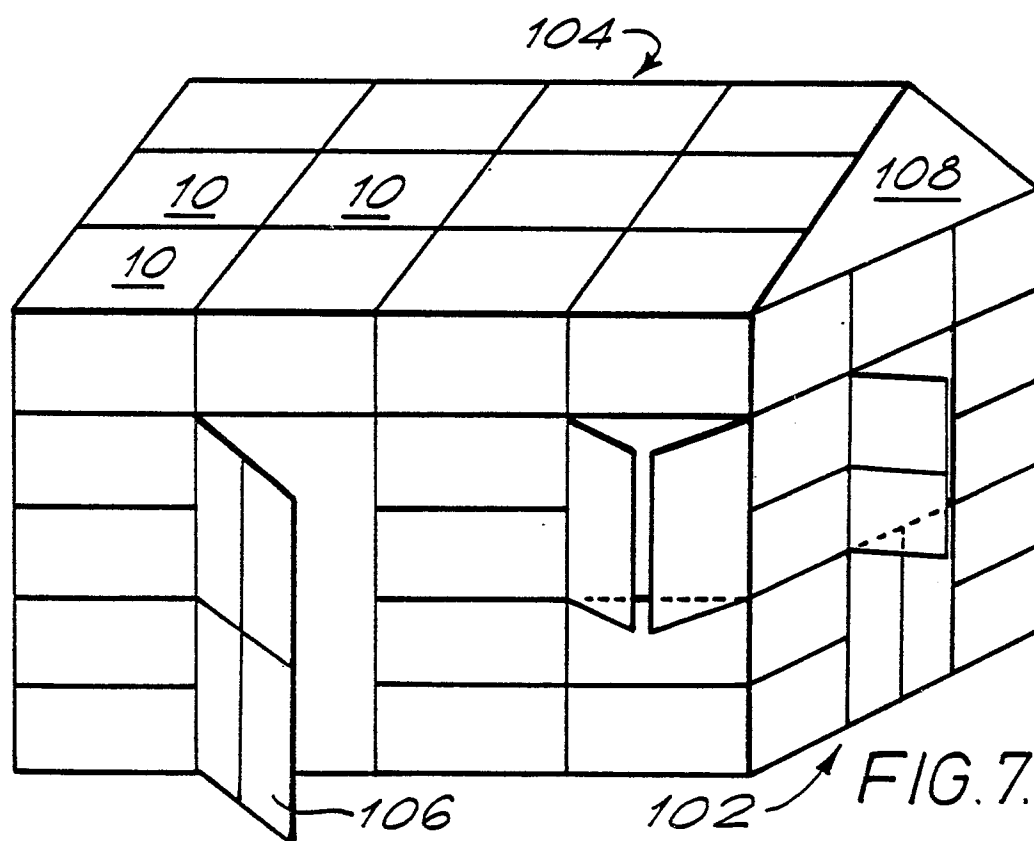


FIG. 7.