A ready to assemble structural system comprises support members with slots, and bases with grooves. The slots allow various support members to be interconnected in rigid alignment. The grooves in the bases receive the upper or lower edges of the support members, providing further structural rigidity. Embodiments allow for the construction of real or toy chairs, tables, bookshelves, chests, houses, and other structures with internal storage capacity or the ability to support a person or objects. Particular embodiments can be vertically stacked or laterally joined to form extended structures.
Fig. 59

Fig. 60
READY TO ASSEMBLE STRUCTURAL SYSTEM

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 61/196,129 filed Oct. 14, 2008, the content of all of which is incorporated by this reference in its entirety for all purposes as if fully set forth herein.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not applicable.

INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISK


BACKGROUND OF THE INVENTION

[0004] 1. Field of the Invention

[0005] The present invention relates generally to the assembly of structures using modular components. More particularly, the invention concerns the assembly of structures and objects using planar, interlocking components.

[0006] 2. Description of Related Art including Information Disclosed under 37 CFR 1.97 and 1.98

[0007] Toys, furniture, housing and other structures benefit from the use of components which are inexpensive to produce, and which can be used interchangeably to construct a variety of forms. Those skilled in the art recognize a continued need to find more efficient ways to achieve these benefits, particularly ways that leverage less complex means of manufacturing individual structural components, and the use of conventional fasteners.

BRIEF SUMMARY OF THE INVENTION

[0008] By way of summary, the present invention concerns design methods and construction techniques using sheets or slabs of any construction material, man-made or natural, to manufacture and assemble many objects and structures. This invention uses closed and open style support, or structural members with interlocking slots inserted into grooves located in bases of various geometrical forms. The closed and open style support members are interchangeable and many bases are also interchangeable. This produces modules which can be stacked vertically and expanded horizontally. All pieces of the modules can have decorative cuts forming their shape as well as decorative cuts and designs on their surfaces producing a large number of objects and structures. These include, for example, a toy protector, furniture, toy furniture, dollhouses, playhouses, walls, floors, ceiling and the roof of a structure.

[0009] The present invention may have one or more advantages over prior inventions, including the fact that it is easy to design, manufacture, assemble and disassemble more objects and structures, it allows more styles and sets of furniture, and children can assemble their own toy furniture, doll houses, playhouses, toys, and construction games.

[0010] Some prior inventions have used locking devices to provide rigidity to the furniture articles. The present invention addresses the fact that the need for extra stability or rigidity in an object is generally determined by the manufacturer and is dependent on parameters which include the precision of cuts for the grooves and slots, the type of material being used, the size of the individual pieces, the weight of the pieces, and the particular application of the structure.

[0011] Some objects, when made in accordance with the present invention, may not require extra rigidity. These objects may include most tables made of heavy pieces of granite, marble or wood, a toe protector, most children's objects or structures, some structures in some places due to overlying weight or needing flexibility in case of earthquakes, and most objects made of foam.

[0012] Some tables and most chairs constructed in accordance with the present invention may require fasteners. The fastener of choice in such cases is a thumb screw which is ¼ or one turn, and which is readily available at, for example, local hardware stores or Internet fastener supply sources. The Figures herein show the preferred locations of use. A method of holding children's toys together is also illustrated in the present Figures.

[0013] One form of the ready to assemble system of the invention concerns a toe protector. The toe protector is placed at the foot end of a bed for supporting bed covers above a person's toes. This is important for people with arthritis or injury. It is also useful for a person who paints their toenails at night and would have to wait an hour for them to dry before retiring; or purchase a heater which cost a lot more than the toe protector. The toe protector can be made from inexpensive stiff foam. It can be assembled and disassembled in less than a minute. Another use of the module is as a desk or as a bookcase, providing that shelves are added to the module. Each module stacked vertically may serve as another shelf in the bookcase. Further, drawers can be added to form a chest of drawers or a desk with drawers.

[0014] Another form of the system of the invention concerns the provision of a storage or toy chest, any kind of table, a footstool, a low work chair, a bench, as a module in a structure, a storage shed, a wall and a floor. The module can also be used as a playhouse for children by increasing the physical dimensions of all pieces and removing the bottom base and providing cut-outs for doors and windows to produce a large outdoor playhouse. A hallway can be assembled to connect two rooms of playhouse by using two structural members inserted into up facing slots of the walls of each room with doorways between the slots. The playhouse can be constructed from thick, soft foam pieces for small children who would enjoy falling into the walls and seeing the house move. Stiff foam and other materials can also be used for older children. They can build their own playhouses and furniture and toys using the simple repeatable assembly techniques illustrated and explained in this disclosure. A large number of toys can be designed and manufactured, especially with the use of injection molding. The outside surfaces of the support members and bases can have the shape of a train locomotive and cars, trucks, etc. The bottom base could have means for attaching wheels. Construction game puzzles are yet another use of this method of design and construction techniques.

[0015] The module bases can be of any geometrical shape such as, round, rectangular, square, octahedron and triangle shaped. Also, the module bases can have groove patterns of many geometrical shapes.

[0016] Still another form of the system of the invention concerns the provision of chairs of various sizes and construc-
tions. A loveseat, settee or bed can also be provided by chang-
ing the physical dimensions of the parts of the chairs.

Yet another form of the system of the invention con-
cerns the provision of a dollhouse, playhouse or two story
structure of any type for children. The system of the invention
may be used to produce very long structures such as seen in
European towns. Using the structural members, a model vil-

dge could be assembled by children. A mobile home could be
constructed using some of the methods of this invention
which could be assembled on site mostly by unskilled labor
and then disassembled if one wished to move the structure.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

Further advantages of the present invention may
become apparent to those skilled in the art with the benefit of
the following detailed description of the preferred embodi-
ments and upon reference to the accompanying drawings in
which:

FIG. 1 is a plan view of a support member in accor-
dance with the present invention including a down facing slot;

FIG. 2 is a plan view of a further support member in
accordance with the present invention including a down fac-
ing slot and an up facing slot;

FIG. 3 is a plan view of a further support member in
accordance with the present invention including two up fac-
ing slots;

FIG. 4 is a plan view of a further support member in
accordance with the present invention including two leg seg-
ments, one leg segment having an up facing slot and the other
having a down facing slot;

FIG. 5 is a plan view of a further support member in
accordance with the present invention including two leg seg-
ments, each leg segment having an up facing slot;

FIG. 6 is a plan view of a further support member in
accordance with the present invention, including two leg seg-
ments, each leg segment having a down facing slot;

FIG. 7 is a bottom view of a base in accordance with
the present invention including two laterally opposed grooves
intersecting one longitudinal groove;

FIG. 8 is a front view of the base of FIG. 7;

FIG. 9 is a front view of a further base in accordance
with the present invention having a similar groove pattern as
shown in FIG. 7, but on both the top and bottom faces of the
base;

FIG. 10 is a bottom view of another base in accor-
dance with the present invention having two laterally opposed
grooves intersecting two longitudinally opposed grooves;

FIG. 11 is a bottom view of a base similar to, but
more elongated than the base of FIG. 10;

FIG. 12 is a top view of another base in accordance
with the present invention having two centrally intersecting
grooves, the ends of each groove being exposed laterally;

FIG. 13 is a side view of the base shown in FIG. 12;

FIG. 14 is a top view of another base in accordance
with the present invention having two centrally intersecting
grooves, each groove terminating within the base perimeter
edge;

FIG. 15 is a side view of the base shown in FIG. 14;

FIG. 16 is a top view of another base in accordance
with the present invention similar in configuration to that of
FIG. 12, but wherein the centrally intersecting grooves are V
shaped to aid in alignment during assembly;

FIG. 17 is a side view of the base shown in FIG. 16;

FIG. 18 is another base in accordance with the
present invention similar to that shown in FIG. 10, but larger,
making it more suitable for tabletop applications;

FIG. 19 is another base of the present invention
similar to that shown in FIG. 18, but wherein each groove
terminates inboard of the base perimeter edge, and is thereby
hidden when the structure is viewed laterally;

FIG. 20 is a bracket in accordance with the present
invention, which may be used along with fasteners to provide
additional structural rigidity for a number of structures of the
present invention where necessary or desirable;

FIG. 20B is a fragmentary enlarged view of a clear-
hole within a structure in accordance with the present
invention;

FIG. 21 is a bottom view of a base in accordance
with the present invention with a similar groove pattern as the
base of FIG. 18, but wherein the two lateral grooves are wider
to interface with a thicker structural member;

FIG. 22 is a side view of a base similar to that shown
in FIG. 21, but wherein the two lateral grooves are cut in a V
shaped pattern to help guide the respective support member
into the groove;

FIG. 23 is a bottom view of another base in accor-
dance with the present invention which is particularly suited
to form a center base of a multiple base structure;

FIG. 24 is an exploded perspective view of a toe
protector structure in accordance with the present invention;

FIG. 25 is a perspective view of the toe protector of
FIG. 24, in assembled form;

FIG. 26 is an exploded perspective view of a further
structure in accordance with the present invention, which is
particularly suitable as a coffee table or other enclosed object;

FIG. 27 is a perspective view of the structure of FIG.
26, in assembled form;

FIG. 28 is an exploded perspective view of a table
structure in accordance with the present invention, where the
ends of each groove in the base are laterally exposed at the
periphery of the base;

FIG. 29 is a perspective view of the structure of FIG.
28, in assembled form;

FIG. 30 is an exploded perspective view of a further
table structure in accordance with the present invention, where
each groove terminates inboard of the base perimeter edge,
and is thereby hidden when the structure is viewed laterally;

FIG. 31 is a perspective view of the structure of FIG.
30, in assembled form;

FIG. 32 is a bottom view of a further base which is
particularly adapted for use as a component of a chair struc-
ture in accordance with the present invention;

FIG. 33 is a top view of the base shown in FIG. 32;

FIG. 34 is a plan view of a further support member
which is particularly adapted for use as a chair back compo-
nent of a chair structure in accordance with the present inven-
tion, in association with the base of FIG. 32;

FIG. 35 is an exploded perspective view of a chair
structure in accordance with the present invention;

FIG. 36 is a perspective view of the chair structure of
FIG. 35, in assembled form;

FIG. 37 is a bottom view of a further base which is
particularly adapted for use as a component of a chair struc-
ture including arm rests in accordance with the present inven-
tion;
FIG. 39 is a plan view of a further support member which is particularly adapted for use as a chair back component of a chair structure in accordance with the present invention, in association with the base of FIG. 37;

FIG. 40 is a plan view of an arm rest which is particularly adapted for use as a component of a chair structure in accordance with the present invention in association with the base of FIG. 37 and the support structure of FIG. 39;

FIG. 41 is an exploded perspective view of a further chair structure in accordance with the present invention incorporating the base of FIG. 37, the support structure of FIG. 39 and the arm rest of FIG. 40;

FIG. 42 is a perspective view of the chair structure depicted in FIG. 41, in assembled form;

FIG. 43 is a plan view of a further support member with two leg segments, each with down facing slots, and which is particularly adapted for use as a chair back and a portion of two legs of a chair structure in accordance with the present invention;

FIG. 44 is a side view of the support member shown in FIG. 43 which also illustrates the assembled positioning of two attached blocks to the support member;

FIG. 45 is a plan view a support structure with two leg segments, one down facing slot and one up facing slot, and which is particularly adapted for use as an arm rest and as a portion of two legs of a chair structure in accordance with the present invention;

FIG. 46 is a plan view of a further support structure with two leg segments and two up facing slots, and which is particularly adapted for use as a front portion of a chair structure in accordance with the present invention;

FIG. 47 is a bottom view of a further base which is particularly adapted for use as a component of a chair structure in accordance with the present invention in which component interconnections are reinforced using attached blocks and fasteners;

FIG. 48 is a top view of the base of FIG. 47, further depicting four clearance holes to be axially aligned with the holes positioned in respective attached blocks;

FIG. 49 is a plan view of an attached block with a clearance bore by which support members are secured to a base in particular structures according to the present invention;

FIG. 50 is a plan view of a further attached block with a clearance bore by which support members are secured to a base in particular structures according to the present invention;

FIG. 51 is an exploded perspective view of a further chair structure in accordance with the present invention incorporating the base of FIG. 47, the support structures of FIGS. 43, 45 and 46 and the attached blocks of FIGS. 49 and 50, and four of the base members of FIG. 12 as feet;

FIG. 52 is a perspective view of the chair structure of FIG. 51, in assembled form;

FIG. 53 is a front view of a two story dollhouse structure in accordance with the present invention;

FIG. 54 is a front view of a roof section of the dollhouse structure depicted in FIG. 53;

FIG. 55 is a side view of a triangle roof piece of the dollhouse structure depicted in FIG. 53;

FIG. 56 is a plan view of a bracket for use in securing adjacent bases and support members of particular structures in accordance with the present invention;

FIG. 57 is a partial side view depicting the intersection of a wall section and a support member secured together with a bracket;

FIG. 58 is a side view of a further base which can be used as a roof in association with a dollhouse structure in accordance with the present invention if an attic is not desired;

FIG. 59 is an exploded perspective view of a dollhouse structure in accordance with the present invention incorporating a triangle roof piece and two roof sections;

FIG. 60 is a perspective view of a dollhouse structure depicted in FIG. 59, in assembled form;

FIG. 61 is a bottom view of three further bases each adapted to be combined with other base portions to form a structure in accordance with the present invention;

FIG. 62 is a front view of a further structure in accordance with the present invention which involves the interconnection of three bases, and a bracket securing adjacent support members together;

FIG. 63 depicts plan views of various groove and support member interface features, each of which is adapted to improve the rigidity of a structure assembled in accordance with the present invention;

FIG. 64 depicts three further support members with slots in accordance with the present invention;

FIG. 65 is a top view of a further structure in accordance with the present invention, and incorporating the support members depicted in FIG. 64;

FIG. 66 is a plan view of the triangular roof structure depicted in FIG. 55, and

FIG. 67 is a bottom view of a round base in accordance with the present invention, showing how each groove terminates inboard of the base perimeter edge, and is thereby hidden when the structure is viewed laterally.

DETAILED DESCRIPTION OF THE INVENTION

Definitions—As used herein the following terms mean:

Table: An article of furniture supported by one or more vertical legs and having a flat horizontal surface.

Chair: A piece of furniture consisting of a seat, legs, back, and often arms, designed to accommodate one person.

Desk: A piece of furniture usually with a flat top for writing and drawers or compartments.

Chest: A small closet or cabinet with shelves for storing supplies.

Stool: A backless and armless single seat supported on legs or a pedestal; a low bench or support for the feet or knees in sitting or kneeling, as a footrest.

Referring to the drawings and particularly to FIGS. 1, 3, 7, 8, 24 and 25 one form of the structural furniture system of the present invention is there shown and generally designated in FIGS. 24 and 25 by the numeral 102. This form of the invention and its assembled form can be used for various purposes including a toe protector that can be placed with the front side open at the foot of the bed for supporting bedcovers above a person’s toes. This is important for people with arthritis or injury. It is also useful for people who paint their toenails at night and without this device would have to wait a substantial length of time for them to dry before retiring. The toe protector can be made from various materials such as wood, foam and various composites and can be assembled and disassembled in a very short period of time. Another use for this form of the invention is as a desk or as a bookcase.
In the present form of the invention, the structure identified by the numeral 102 comprises a first generally planar, substantially rectangular member 104 having an upper edge 106, a lower edge 108, spaced apart lateral edges 110 and first slots 112 formed proximate each of the lateral edges 110. Second and third generally planar rectangular members 114 and 116 respectively, which are adapted to be connected to first member 104, have an upper edge 118, a lower edge 120, spaced apart lateral edges 122 and second connector slots 124 formed proximate each of the lateral edges 122. As indicated in FIGS. 24 and 25, second connector slots 124 are uniquely constructed and arranged to mateably engage the first connector slots 112 of first member 104 to join together the first, second and third members to form a first precursor structure 126. Connected to the upper edges 118 and lower edges 120 of the second and third members 114 and 116 to form structure 112 is a generally planar, substantially rectangular top, or fourth member 130. As best seen in FIGS. 7 and 8 of the drawings, member 130 is provided with a plurality of grooves 131 with grooves 131a being constructed and arranged to mateably engage the upper edges of second and third members 114 and 116.

FIGS. 9 through 17 of the drawings illustrate various alternate forms of top and bottom members of the invention. More particularly, FIG. 9 is a front view of an alternate top member 134 having a similar groove pattern to the top member shown in FIG. 7, but having grooves provided on both the top and bottom faces of the member. Similarly, FIG. 10 is a bottom view of still another top member 136 having two laterally opposed grooves 136a intersecting two longitudinally opposed grooves 136b. In FIG. 11 there is depicted in bottom view yet another top member 138 that is similar to, but more elongated than top member 130. FIG. 12 is a top view of a bottom member 140 having two centrally intersecting grooves 140a, the ends of each groove being exposed laterally. FIG. 13 is a side view of the bottom member shown in FIG. 12. FIG. 14 is a top view of yet another bottom member 142 having two centrally intersecting grooves 142a, each groove terminating within the perimeter of the top member. FIG. 15 is a side view of the bottom member 142. FIG. 16 is a top view of another bottom member 144 that is somewhat similar in configuration to that of FIG. 12, but wherein the central intersecting grooves 144a are “V” shaped to aid in alignment during assembly. FIG. 17 is a side view of the bottom member 144.

Turning now to FIGS. 26 and 27, an alternate form of the structural furniture system of the present invention is there shown and generally designated by the numeral 150. This form of the invention is similar in many respects to the system illustrated in FIGS. 24 and 25 and like numerals are used in FIGS. 26 and 27 to identify like components. In its assembled form, furniture system 150 can be used for various purposes including a storage chest, a toy chest, a table, a low work chair, a bench and the like.

Furniture system 150 here comprises a first generally planar, substantially rectangular member 104 having an upper edge 106, a lower edge 108, spaced apart lateral edges 110 and first slots 112, formed proximate each of the lateral edges 110. Second and third generally planar rectangular members 152 and 154 respectively, which are adapted to be connected to first member 104, have an upper edge 156, a lower edge 158, spaced apart lateral edges 122 and first and second connector slots 160 and 162 formed proximate each of the lateral edges 122 (see also FIG. 2). As indicated in FIGS. 24 and 25, first connector slots 160 are uniquely constructed and arranged to mateably engage the first connector slots 112 of first member 104 to join together the first, second and third members to form a first precursor structure 164. In a manner presently to be described, a fourth, or top member is interconnected with the first precursor structure 164. A generally planar, substantially rectangular fifth, or back member 166 is also adapted to be interconnected with first and second members 152 and 154 in a manner illustrated in FIGS. 26 and 27 of the drawings. Member 166 has an upper edge 168, a lower edge 170, spaced apart lateral edges 172 and downwardly extending slots 174 formed proximate each of the lateral edges 172. As indicated in FIGS. 26 and 27, downwardly extending connector slots 174 are uniquely constructed and arranged to mateably engage the second connector slots 162 of members 152 and 154 to join together member 166 with members 152 and 154 to form a precursor structure 176.

As previously mentioned, a generally planar, substantially rectangular fourth, or top member, such as the top member 138 illustrated in FIG. 11, is connected to the upper edges of members 104, 152, 154 and 166 to form a table, or workbench-like structure. Member 138 is provided with a plurality of grooves 138a that are constructed and arranged to mateably engage the upper edges of members 104, 152, 154 and 166.

Connected to the lower edges of members 104, 152, 154 and 166 to form chest structure 150 is a generally planar, substantially rectangular bottom member 178, which is similar to the member 138 illustrated in FIG. 11. Bottom member 178 is provided with a plurality of grooves 178a that are constructed and arranged to mateably engage the lower edges of members 104, 152, 154 and 166.

Turning next to FIGS. 28 and 29 of the drawings, another form of the structural furniture system of the invention is there shown and generally identified by the numeral 180. Structural furniture system 180 here comprises a table construction that includes a first generally planar “U” shaped member 182 having an upper edge 184, spaced apart lateral edges 186 and first slots 188 formed proximate each of the lateral edges (see also FIG. 5). Furniture system 180 also includes second and third generally planar “U” shaped members 190 and 192 that are adapted to be connected to first member 182. Each of the second and third members 190 and 192 has an upper edge 194, lower edges 196, spaced apart lateral edges 198 and connector slots 200 and 202 formed proximate each of the lateral edges (see also FIG. 4). As indicated in FIG. 30, connector slots 202 are constructed and arranged to mateably engage first connector slots 188 of first member 182 to join together the first, second and third members 182, 190 and 192 to form a first precursor structure. In a manner presently to be described, a fourth, or top member 212 is interconnected with first, second and third members to form a second precursor structure.

Also connected to second and third members 190 and 192 is a “U” shaped fifth member 204. Fifth “U” shaped member 204 has an upper edge 206, spaced apart lateral edges 208 and downwardly extending slots 210 formed proximate each of the lateral edges (see also FIG. 6). As indicated in FIG. 30, connector slots 210 are constructed and arranged to mateably engage connector slots 200 of members 190 and 192 to join together members 190 and 192 and 204.

Connected to the upper edges of members 182, 190, 192 and 204 to form the small end table like structure 180 is the previously mentioned, generally planar, substantially
rectangular top, or a fourth member 212. Top member 212 is provided with a plurality of grooves 212a that are constructed and arranged to receive the top edges of members 182, 190, 192 and 204. As illustrated in FIG. 67 of the drawings, top member 212 can be circular as well as various other geometric shapes.

[0103] Referring now to FIGS. 30 and 31 of the drawings, yet another form of the structural furniture system of the invention is there shown and generally identified by the numeral 220. Structural furniture system 220, which also comprises a table system, is similar in many respects to the system shown in FIGS. 28 and 29 and like numerals are used in FIGS. 30 and 31 to identify like components. The primary difference between the embodiment of the invention shown in FIGS. 28 and 29 and this latest form of the invention resides in the provision of differently configured top member 222. More particularly, top member 222 is provided with a plurality of grooves 222a that terminate inboard of the perimeter of the top member and, accordingly, are hidden when the structure is viewed from the side (see also FIG. 19).

[0104] Turning next to FIGS. 32 through 52, various other forms of the structural furniture system of the invention are shown. These forms of the structural furniture system, which comprise chairs of several different configurations, function to illustrate the unique flexibility of the system of the invention. As best seen in FIG. 35 of the drawings, seat portion 226a of the chair construction 226 there shown is similar to that of the table construction illustrated in FIGS. 30 and 31 and like numerals are used in FIGS. 35 and 36 to identify like components. More particularly, the seat portion 226a of the chair construction shown in FIG. 35 comprises a first generally planar “U” shaped member 182 having an upper edge, spaced apart lateral edges and first slots formed proximate each of the lateral edges (see also FIG. 8). Seat portion 226a also includes second and third generally planar “U” shaped members 190 and 192 that are adapted to be connected to first member 182. Each of the second and third members 190 and 192 has an upper edge, lower edges, spaced apart lateral edges and connector slots formed proximate each of the lateral edges (see also FIG. 4). As earlier discussed, the various connector slots are constructed and arranged so that the first, second and third members 182, 190 and 192 can be readily interconnected to form a first precursor structure.

[0105] Also connected to second and third members 190 and 192 is a “U” shaped back member 204 having an upper edge, spaced apart lateral edges and downwardly extending slots formed proximate each of the lateral edges (see also FIG. 6). As previously discussed, the various connector slots are constructed and arranged so that members 190 and 192 and 204 can be interconnected to form a second precursor structure.

[0106] Connected to the upper edges of members 182, 190, 192 and 204 to form the seat construction 226a is a generally planar substantially rectangular seat, or top member 230. Member 230 is provided with a plurality of grooves 230a that are constructed and arranged to receive the upper edges of members 182, 190, 192 and 204. Connected to the table like, or seat construction 226a to form the chair construction 226 is a back member 232. Back member 232 is received within a groove 234 formed in seat member 230 and is provided with a plurality of transversely spaced apart bores 236, each generally having a threaded insert (not shown). Bores 236 align with a plurality of transversely spaced apart bores 238 formed in member 230 that are adapted to receive complimentary fasteners such as thumb screws (not shown); a function to provide a stable interconnection between member 232 and seat member 230.

[0107] Turning next to FIGS. 37 through 42 of the drawings, another form of chair construction of the present invention is there illustrated. This chair construction, which is generally identified as 240 is similar in many respects to the previously described chair construction and includes a seat construction 240a that is made up of the earlier identified members 182, 190, 192 and 204 that are assembled in the manner previously discussed. Affixed to the upper edges of members 182, 190, 192 and 204 is a generally rectangular shaped top, or seat member 242 that is provided on its lower surface with a plurality of grooves 243 (FIG. 37) that receive the upper edges of members 182, 190, 192 and 204. Provided on the upper surface of the seat member is a pair of transversely spaced grooves 244 that are adapted to receive pair of side arm members 246. Each of the side arm members 246 is provided with a slot 246a. Interconnected with side arm members 246 is a back member 248 provided with a pair of transversely spaced slots 248a.

[0108] Slots 248a are constructed and arranged to mateably engage connector slots 246a formed in side arms 246 to form the chair construction illustrated in FIG. 42 of the drawings.

[0109] Back member 248 is provided with a plurality of transversely spaced apart bores 249. Bores 249 each generally contain a threaded insert (not shown) and align with a plurality of transversely spaced apart bores 245 formed in member 242 that are adapted to receive complimentary fasteners such as thumb screws (not shown); a function to provide a stable interconnection between member 248 and seat member 242. Similarly, each of the side arms 246 is provided with bores 246b that align with a plurality of spaced apart bores 242a formed in member 242. Bores 242a and bores 246b are adapted to receive dowels or other fasteners (not shown); a function to provide a stable interconnection between members 246 and seat member 242.

[0110] Referring to FIGS. 43 through 52 of the drawings, still another form of chair construction of the present invention is there illustrated. This chair construction, which is generally identified in FIGS. 51 and 52 as 250 includes a seat construction 250a that comprises a first generally planar “U” shaped member 252 having an upper edge 254, spaced apart lateral edges 256 and first slots 258 formed proximate each of the lateral edges. Chair construction 250 also includes second and third generally planar “U” shaped members 260 and 262 that are adapted to be connected to first member 252. Each of the second and third members 260 and 262 has an upper edge 264, lower edges 266, spaced apart lateral edges 268 and connector slots 270 and 272, formed proximate each of the lateral edges. As indicated in FIG. 51, connector slots 270 are constructed and arranged to mateably engage first connector slots 258 of first member 252 to join together the first, second and third members 252, 260 and 262 to form a first precursor structure. In a manner presently to be described, a fourth, or seat member is interconnected with a first second and third member to form a second precursor structure.

[0111] Also connected to second and third members 260 and 262 is a “U” shaped fifth member 274. Fifth “U” shaped member 274 has an upper seat back portion 276 and spaced apart leg portions 278 each having downwardly extending slots 280. As indicated in FIG. 51, connector slots 280 are
constructed and arranged to mateably engage connector slots 272 of members 260 and 262 to join together members 260 and 262 and 274.

[0112] Connected to members 256, 260, 262 and 274 by presently to be identified connector brackets to form the chair structure 250 is the previously mentioned, generally planar, substantially rectangular seat, or a fourth member 282.

[0113] To provide attachment points and support for member 282, support blocks 286 and 287 (FIGS. 49 and 50) are affixed to members 260 and 274 at locations indicated in FIGS. 43, 44 and 45 of the drawings. Additionally, as illustrated in the drawings, clearance bores are strategically located to allow conventional fasteners to be used to provide additional structural rigidity for the chair. Threaded inserts can be securely positioned within the bore of one member, for example by press fit or adhesive, such that the member may receive a bolt, a thumb screw, or similar complimentary threaded fastener through the clearance bore associated with an adjoining member, thereby rigidly fastening the two members together. In chair structure 250 (shown in FIGS. 51 and 52), for example, the four bores in member 282 each have such a threaded insert placed within them (not shown), and member 252 and support blocks 286 and 287 each include a corresponding clearance bore through which a thumb screw fastener (not shown) can be introduced and mated with the respective threaded insert in member 252. FIG. 20A of the drawings illustrates another type of bracket 289 that can be used along with the conventional fasteners to provide additional structural rigidity. FIG. 20B is a fragmentary enlarged view of a typical clearance bore. Further, foot bases 288 are affixed to the legs of the chair to provide additional protection for the floor surface upon which the chair will be used. These foot bases can be used in a similar fashion in connection with other structures of the present invention.

[0114] FIG. 21 is a bottom view of a slightly differently configured seat 291 showing a similar groove pattern to that shown in FIG. 18, but wherein the two lateral grooves are wider to interface with a thicker structural member.

[0115] FIG. 22 is a side view of a seat 293 similar to that shown in FIG. 21, but wherein the two lateral grooves are cut in a “V” shaped pattern to help guide the respective support members into the groove.

[0116] FIG. 23 is a bottom view of a base 295 of still a different configuration.

[0117] Referring now to FIGS. 53 through 67, still another form of the structural system of the invention is there shown and generally designated in FIGS. 59 and 60 by the numeral 300. Structural system 300, which is in the form of a doll house, comprises a first floor member 302 having a plurality of spaced apart grooves 304 and first and second spaced apart side members 306 and 308 that are connected to the first floor member 302 in the manner shown in the drawings. As shown in FIG. 59, first and second side members 306 and 308 each have an upper edge 310 and a lower edge 312, the lower edge being received within selected ones of the plurality of spaced apart grooves 304 of the first floor member 302.

[0118] Connected to the top edges of the first and second spaced apart side members 306 and 308 is a ceiling member 314 having a plurality of spaced apart grooves 316 (FIG. 59). As illustrated in FIGS. 53 and 63, the upper edges of the side members are received within selected ones of the grooves 316 formed in ceiling member 314.

[0119] Connected to ceiling member 314 is a slanted roof structure 318 having edges 318a receivable within selected ones of the grooves 316 formed in the ceiling member. Slanted roof structure 318 comprises interconnected side panels 320 and an end panel 322 that is interconnected with the side panels and with the ceiling member 314. End panel 322 includes a long edge piece 327 which is receivable by a groove in ceiling member 314, and two short edge pieces 333 which are receivable by two opposing grooves in ceiling member 314 (see FIGS. 55, 58 and 59).

[0120] As illustrated in FIG. 59, structural system 300 further includes a second floor member 324 having a plurality of grooves 325 and third and fourth side members 326 and 328. Side members are connected to and disposed between the first and second floor members in a manner illustrated in the drawings.

[0121] FIG. 56 is a plan view of a bracket 329 for use in securing adjacent structural members of particular structures in accordance with the present invention.

[0122] FIG. 57 is a partial side view depicting the intersection of a typical wall section and a typical structural member secured together with a bracket.

[0123] FIGS. 61 and 62 illustrate various ways in which the various structural members of the present invention can be laterally interconnected to expand the length and width of a given structure as may desired for a particular application. For example, base 332 can be joined between two bases 331, and base 335 (shown in FIG. 23) can be joined between two bases 330. For example, such bases can be fastened together rigidly or semi-rigidly using the previously-mentioned threaded inserts in association with base 332 at positions indicated in FIG. 61 by dotted lines. When base 332 and 331 are mated, the joint may be secured by way of a bolt, thumb screw or other complimentary threaded fastener placed through a bore located in each of the two opposing lateral sides of base 331 in axial alignment with the threaded inserts of base 332. Ultimately, placement of support members into the respective grooves of the bases will also contribute to maintaining the interconnection of the bases. Bracket 340 can also be used to provide additional structural rigidity when needed. FIGS. 64 and 65 illustrate how the support members 342, 344, and 346 can be used to create multi-room or multi-cell structures.

[0124] The material used for manufacture of the structural members of the present invention can be anything from plastic to metal. Items 334 and 336 represent the interlocking slots of two structural members. The curved area of item 334 rides up over and centers on top of the raised area on item 336. The curved area of item 334 can be formed by drilling a hole before cutting the slot. The raised area of item 336 could be the head of a pin or a small smooth rivet. Item 338 represents the edge of a support member which is inserted into a slot. Item 338 has four rivets, two on each end near the two ends of the support member. Two holes are drilled in each end of the base before the groove is cut. The amount of rigidity obtained is dependent on the thickness of the support members, the size of the rivets and the mating curvature. Alternatively injection molding could form these areas in the plastic or material. The mating areas could then cover a large area end to end or side to side.

[0125] The various structural members can have decorative cuts for their shapes and cuts and designs on the surfaces. By adding drawers to the bookcase, it becomes a chest of drawers. Support members can also feature cut-outs for doors and windows to produce, for example, a large outdoor playhouse. A hallway can be assembled to connect two rooms of playhouse by using two structural members inserted into up facing
slots of the walls of each room with doorways between the slots. The playhouse could be made of thick, soft foam pieces for small children who would enjoy falling into the walls and seeing the house move. Stiff foam and other materials could be used for older children.

[0126] The components of the present invention can be injection molded. The outside surfaces of the structural members can have the shape of a train locomotive and cars, trucks, etc. The bottom base could have means for attaching wheels. Construction game puzzles are yet another use of this method of design and construction techniques. The bases can have groove patterns of any geometrical shape. Also the structural members could have no grooves at all. They could be like a cover or lid with a perimeter which fits on the outside of the structural members. Also, the base could be flat with a center section that fits inside the structural members.

[0127] Some or all of the grooves in the structural members may, in some instances, be V-shaped. This shape is self-centering and helps in locating the grooves. All the grooves could be V-shaped or any other of many possible shapes. All sharp edges can be rounded for ease of assembly. There are applications when tables or other objects need to be moved on smooth floors, or kept off of delicate surfaces. In such cases, bottom members 140, 142 or 144 (see FIGS. 12-17) can be applied to the bottom or feet of the object to be moved to protect the surface.

[0128] Construction according to the present invention can be used to make, for example, a loveseat or settee just by changing the physical dimensions of the parts of the chair structures described herein. Using the same process one can design a bed.

[0129] The foregoing detailed description of the invention is intended to be illustrative and is not intended to limit the scope of the invention. Changes and modifications are possible with respect to the embodiments detailed in the foregoing description, and it is understood that the invention may be practiced otherwise than that specifically described herein and still be within the scope of the appended claims.

1. A structural system comprising:
   (a) a first member having an upper edge, spaced apart lateral edges and first slots formed proximate each of said lateral edges;
   (b) second and third members configured to be connected to said first member, each of said second and third members having an upper edge, a lower edge, spaced apart lateral edges and second connector slots formed proximate each of said lateral edges, said second connector slots being constructed and arranged to mateably engage said first connector slots of said first member to join together said first, second and third members to form a first precursor structure; and
   (c) a fourth member connected to said upper edges of said second and third members to form a second precursor structure.

2. The structural system as defined in claim 1, in which said second precursor comprises a toe protector structure.

3. The structural system as defined in claim 1, in which said second precursor is a desk structure.

4. The structural system as defined in claim 1, in which said first, second and third members are generally "U" shaped.

5. The structural system as defined in claim 1, further including a fifth member connected to said second and third members, a top member connected to said first, second, third and fourth members, a bottom member connected to said second and third members and an eight member connected to the lower edges of said first, second, third and fifth members to form a chest structure.

6. The structural system as defined in claim 1, further including a back member connected to said second and third members and a top member connected to said first, second, third and fourth members to form a table structure.

7. The structural system as defined in claim 6, further including a back member connected to said table structure to form a chair structure.

8. A structural furniture system comprising:
   (a) a first generally planar, substantially rectangular member having an upper edge, spaced apart lateral edges and first slots formed proximate each of said lateral edges;
   (b) second and third generally planar rectangular members connected to said first member, each of said second and third members having an upper edge, a lower edge, spaced apart lateral edges and second connector slots formed proximate each of said lateral edges, said second connector slots being constructed and arranged to mateably engage said first connector slots of said first member to join together said first, second and third members to form a first precursor structure; and
   (c) a top member connected to said upper edges of said second and third members to form a second precursor structure.

9. The structural furniture system as defined in claim 8 in which said top member is substantially rectangular and is provided with grooves constructed and arranged to mateably engage said second and third members.

10. The structural furniture system as defined in claim 8 further including a back member connected to said second and third members and a bottom member connected to the lower edges of said first second, third and back members to form a chest structure.

11. The structural furniture system as defined in claim 8 in which said bottom member is substantially rectangular and is provided with grooves constructed and arranged to mateably engage first, second, third and back members.

12. A structural furniture system comprising:
   (a) a first generally planar, "U" shaped member having an upper edge, spaced apart lateral edges and first slots formed proximate each of said lateral edges;
   (b) second and third generally planar, "U" shaped members connected to said first member, each of said second and third members having an upper edge, a lower edge, spaced apart lateral edges and second connector slots formed proximate each of said lateral edges, said second connector slots being constructed and arranged to mateably engage said first connector slots of said first member to join together said first, second and third members to form a first precursor structure; and
   (c) a fourth "U" shaped member connected to said first and second members to form a second precursor structure; and
   (d) a top member connected to said first, second, third and fourth members to form a table structure.

13. The structural system as defined in claim 12, further including a back member connected to said table structure to form a chair structure.

14. The structural system as defined in claim 13 in which said top member comprises a generally planar, substantially
rectangular member having a plurality of grooves constructed and arranged to receive said first, second, third and fourth members.

15. The structural system as defined in claim 14, further including a pair of side arm members connected to said top member.

16. The structural system as defined in claim 15, in which said back member is rectangular shaped.

17. The structural system as defined in claim 15, in which said pair of side arm members are received within selected grooves of said plurality of grooves formed in said top member.

18. A structural system comprising:
(a) a first floor member having a plurality of spaced apart grooves;
(b) first and second spaced apart side members connected to said first floor member, said first and second side members each having an upper edge and a lower edge, said lower edges being received within selected ones of said plurality of spaced apart grooves of said first floor member;
(c) a ceiling member connected to said first and second spaced apart side members, said ceiling member having a plurality of spaced apart grooves, said upper edges of said side members being receivable within selected ones of said grooves formed in said ceiling members; and
(d) a roof structure connected to said ceiling member, said roof structure having edges receivable within selected ones of said grooves formed in said ceiling member.

19. The structural system as defined in claim 18 further including a second floor member and third and fourth side members, said side members being connected to and disposed between said first and second floor members.

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