A modular shed that is comprised of a floor frame, side frames, a back frame, a front frame, and a roof frame. The connections between the individual component frames is designed to self-registering, or substantially orthogonal upon connection. The roof frame may be configured to provide the shed structure a slanted roof or a gabled roof. The modular shed provides a strong, durable structure that is also easy to assemble, disassemble, transport, and store.
SELF-REGISTERING, MODULAR OUTBUILDING APPARATUS AND METHOD

RELATED APPLICATIONS

[0001] This patent application claims the benefit of U.S. Provisional Patent Application Ser No. 61/407,364, filed Oct. 27, 2010 and entitled SELF-REGISTERING, MODULAR OUTBUILDING APPARATUS AND METHOD, which is incorporated herein by reference in its entirety.

BACKGROUND

[0002] The Field of the Invention

[0003] This invention relates to buildings, such as a outbuildings or utility sheds, and, more particularly, to kits for building outbuildings from modular structures.

[0004] Background

[0005] The use of outbuildings, and especially small, readily erected utility buildings such as mini-barns, shops, garages, garden sheds, storage sheds, and the like is utilitarian, and very traditional. They have traditionally been used as space for storage, various specialized work, and hobby functions. Smokehouses, granaries, sheds, barns, coops, and the like have been used for centuries. Small housing lots, apartments, industrial sites, barns, and so forth all need storage space. Every activity that uses equipment such as tools, toys, vehicles, or the like needs storage for that equipment when not in use.

[0006] Builders and do-it-yourself individuals alike put up outbuildings as work space, storage, or both. The resulting buildings are used for storage of tools, sports equipment, patio and pool furniture, lawn care, and equipment. Sheds are even used as additional garage space, and to receive what would otherwise clutter garages in order to preserve garage space for vehicles. Separation of storage or function may dictate multiple building structures. As a general proposition, then storage is at a premium, as is reliable protection from weather, regardless of acreage.

[0007] The present structures of sheds are generally of three types. Wood structures after the pattern of conventional buildings are the most common. They are typically based on conventional building construction and require numerous proper tools for construction and more for dismantling. Corrugated sheet metal covered sheds are popular, whether undulating, other shaped cross section, or irregular, and whether made from cast off materials or included in a storage shed kit available at a modern hardware retailer. In more recent years, garden and storage shed kits of pre-fabricated, blow molded panels have boosted their market presence.

[0008] All require tools and skill to assemble, careful instructions, and so forth. “Surveying in” a pad, lot, or foundation is typically required in order to render such a building squared up and stable.

[0009] Wood buildings cannot be taken down, moved, and re-used without substantial damage. Sheet metal buildings are either immovable without destruction, or are so temenuous in their construction that they are literally incapable of self support short of careful instructions and complete construction. Plastic panel buildings are substantially likewise. Sheet metal and plastic require substantial time to erect, typically with multiple people, various tools, and no small amount of instruction and care, lest the building be destroyed before it is up. That is, the materials of which such are constructed are typically not sufficiently strong to support themselves permanently (often not even temporarily) until completely erected.

[0010] Moreover, such outbuildings are not designed to be knocked down, moved, and re-used, and even then are often dismantled by destruction, with great difficulty and substantial damage resulting due to their inability to self support when not fully erected. Such buildings often cannot be taken down, except by destruction. None can provide a modified configuration from a single structure. For example, opening a side by removing that corresponding wall is unheard of and antithetical to the structural design thereof.

[0011] Although a general consensus may not necessarily appear in the outbuilding construction industry, convenience is a valuable feature. The proliferation of kit buildings illustrates that people who would like to add some storage or work space are not keen to go to all the expense and complexity of building a structure according to conventional construction techniques, costs, and codes.

[0012] Likewise, shipping costs usually dictate small components that stack into a compact package or set of packages. This means that any kit that is de-constructed to be re-used elsewhere will involve a long and complex dismantling, and re-construction later, almost certainly without any written instructions still extant. Thus the order and manner of dismantling and re-construction are not clear, intuitive, or without risk of damage during one or the other process.

[0013] Finally, framing only exists in conventional construction for outbuildings, and is tied together by the skin or sheathing acting as a shear plate. This results in permanent structures that cannot be dismantled and re-used. In contrast, the typical kit building is specifically designed not to have an internal frame. The lack of a frame structure, (independent from the skin or wall material itself) is typically a central element of the engineering and assembly of a kit-type outbuilding.

[0014] What is needed then, whether recognized or not in the construction industry or the outbuilding kit industry, is a comparatively inexpensive outbuilding (e.g., shed) structure that is easily erected, self-standing, modular for multiple configurations, durable, and readily knocked down and reusable, substantially without damage. A self-supporting, internal frame would be a benefit. It would be a further advantage if such an outbuilding were self-squaring, its parts were self-registering, or both. It would be a further advantage to have a frame, internal thereto and formed of individual, modular frames, assembled and providing support independent from the enclosure or wall material, which could then be arbitrary, and not a structural limitation of the outbuilding.

[0015] Thus a building that does not rely on its “skin” for its principal strength, but its frame, would be suitable for various configurations at any time. It would likewise be useful to be easily and quickly constructed or erected by a single person. Also, what is needed is a shed structure that can be easily dismantled, its parts readily and intuitively fitted together, transported, stored and re-erected from undamaged, original components.

BRIEF SUMMARY OF THE INVENTION

[0016] In accordance with the foregoing, certain embodiments of an apparatus and method in accordance with the invention provide a modular outbuilding (e.g., shed, hereinafter a word that will be used to represent all outbuildings in accordance with the invention) have a frame, self-standing, with key framing components that are broadly integrated,
monolithic panels or frames, which are already squared up individually and self-supporting, self-registering and self-squaring with one another during construction.

[0017] The floor, the walls, and the roof are all pre-fabricated as separate pieces. Upon construction, the resulting sturdy, reliable, convenient shed may be very predictably sized, fitted, assembled, dismantled, and re-used, because of its self-registering abilities. Moreover, the individual components of the shed are made in such a manner as to be light and strong and easily transportable and storable individually and as a complete kit of unassembled components.

[0018] The overall building frame is actually formed of component frames (e.g., modules, modular frames, or simply frames) for each wall or other expanse. The skin may act as a shear plate to its own frame, but typically does not provide any shear connection between adjacent frames or frame modules.

[0019] The manner in which the individual components are put together allows each component to be connected to the other respective components in a way that self-registers, or allows the resulting structure to be substantially orthogonal without any additional work or tools such as from the user. Also, the floor and walls of the structure are substantially flat and can be stored or stacked in a relatively small, compact volume and footprint area.

[0020] One embodiment of the outbuilding or modular shed has a slanted roof. One embodiment of the modular shed has a gabled roof. Both embodiments can be used with the same housing, or body, of the modular shed. This allows the user to decide which variation would be most appropriate for their intended uses for the modular shed at any time.

[0021] Unlike a conventional wood building, or even a wood outbuilding kit, it can be taken down, moved, and re-used without substantial damage. Carelessness may damage components, but the system is best constructed as a building that does not have parts that must be destroyed to be dismantled. Visual cues provide simple dismantling without instructions being necessary.

[0022] The outbuilding can rely on almost any skin material from plywood, wafer board, or chip board, to sheet metal or the like, and yet be knocked down and movable without destruction or removal of the skin from its corresponding frame. Its construction is not so tenuous as to put its structural integrity in doubt when un-enclosed, when half erected, or otherwise in a state of modification, partial construction or dis-assembly. If sized to be fit on a trailer for moving, such a building has sufficient structural integrity to survive transport between locations without being dismantled.

[0023] The framing is completely and literally capable of self support almost as soon as two vertical components are connected by a single well-placed fastener. It needs only short, simple instructions, and is itself almost visibly instructive of its own complete construction. With largely integrated sub-assemblies, it requires little time to erect, typically a single person with a single hand tool, a nut driver. Little or no instruction and care are required by the robust framing structures, with little risk that they could be destroyed during setup or takedown. Materials are sufficiently strong to support themselves, even across long spans, during all stages of construction until completely erected.

[0024] These outbuildings are designed to be knocked down, moved, and re-used, and even then are quickly and easily dismantled, with the skin actually being optionally removable, but not needing to be removed from any particular panel (e.g., wall, floor, roof). No destruction thereof is required, with no great difficulty or significant damage resulting. All structural components are able to self support in virtually any stage from fully dismantled to fully erected.

[0025] Outbuildings in accord with the invention can actually be taken down quickly and often. They can provide a modified configuration from a single structure. For example, opening a side by removing that corresponding wall is already engineered into the design, and accommodated by the structural design thereof. A few fasteners, easily removed, are all that is required to remove a wall and make a booth of it. Optionally, a short wall and counter can be added back in place of the wall. In one embodiment, a side wall may be made in two sections, the upper one of which can be removed and be replaced by a counter fitted over the lower half of the wall framing.

[0026] The result is a comparatively inexpensive outbuilding (e.g., shed) structure that is easily erected, self-standing, modular for multiple configurations, durable, and readily knocked down and re-usable. The outbuilding is self-squaring, its parts are self-registering, and the frame provides support independent from the enclosure skin or wall material. Thus the building does not have to rely on its “skin” for its principle shear strength, and certainly not for vertical support or buckling stability. Its frame is suitable for various configurations at any time. It is easily and quickly constructed or erected by a single person, can be easily dismantled. Its parts are readily and intuitively fitted together, transported, stored and re-erected from undamaged, original components.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] The foregoing features of the present invention will become more fully apparent from the following description and appended claims, taken in conjunction with the accompanying drawings. Understanding that these drawings depict only typical embodiments of the invention and are, therefore, not to be considered limiting of its scope, the invention will be described with additional specificity and detail through use of the accompanying drawings in which:

[0028] FIG. 1 is a perspective view of one embodiment of an outbuilding, of modular construction in accordance with the invention, having a flat, slanted roof;

[0029] FIG. 2 is a perspective view of an outbuilding, of modular construction in accordance with the invention, having a gabled roof;

[0030] FIG. 3 is a perspective view of an outbuilding, of modular construction in accordance with the invention, having a gabled roof and open doors;

[0031] FIG. 4A is a partially cut-away, perspective view of one end of an outbuilding, of modular construction in accordance with the invention, having a gabled roof;

[0032] FIG. 4B is a perspective view of one embodiment of a top corner of an outbuilding in accordance with the invention;

[0033] FIG. 4C is a partially cut-away, perspective view of a side of the slanted roof frame;

[0034] FIG. 4D is a partially cut-away, perspective view of a side of the slanted roof frame;

[0035] FIG. 4E is a partially cut-away, perspective view of the gabled roof frame;

[0036] FIG. 5 is a perspective view of a top corner of an outbuilding, of modular construction in accordance with the invention;
FIG. 6 is a partially cut-away, perspective view of a corner of the slanted roof frame;
FIG. 7 is an exploded, perspective view of the modular components of an outbuilding, of modular construction in accordance with the invention, having a slanted roof;
FIG. 8 is a perspective view of alternative embodiments of flat, slanted roof structure and gabled roof structure with the outbuilding, of modular construction in accordance with the invention;
FIG. 9 is a perspective view of a floor frame;
FIG. 11 is a top view of one embodiment of a seam cover connection for trimming out the skin of an outbuilding, of modular construction in accordance with the invention; and
FIG. 12 is a top view of one embodiment of a corner seam cover trim an outbuilding, of modular construction in accordance with the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

It will be readily understood that the components of the present invention, as generally described and illustrated in the drawings herein, could be arranged and designed in a wide variety of different configurations. Thus, the following more detailed description of the embodiments of the system and method of the present invention, as represented in the drawings, is not intended to limit the scope of the invention, as claimed, but is merely representative of various embodiments of the invention. The illustrated embodiments of the invention will be best understood by reference to the drawings, wherein like parts are designated by like numerals throughout.

Referring to FIGS. 1-3, a modular outbuilding structure (e.g., shed) 10 in accordance with the invention may include a floor frame 20, at least two side frames 30, a back frame 40, a front frame 50, and a roof frame 60. These individual components are pre-fabricated as integrated, monolithic panels, to be assembled together by a user at the location where the user would like the modular shed 10 placed.

Generally, the modular shed 10 is constructed by placing the floor frame 20 on a supporting surface, blocks, cribbing, frame, foundation, or the like wherever the modular shed 10 is to be erected. The back frame 40 and the front frame 50 are connected to the floor frame 20 such the end wall panels or frames 40, 50 are substantially parallel to each other and orthogonal to the floor frame 20. Here, these end frames 40, 50 or end panels 40, 50 are considered to be those under the gable or tilted framing of the roof frame 60.

Although the order of connection of end frames 40, 50 and side frames 30 may be reversed, with respect to one another, a benefit is obtained by having the ends 40, 50 first assembled to the floor frame 20 and roof frame 60. For example, some may desire to have one or both sides 30 removed for a more open or accessible shelter. Thus guzzets 75 or gusset plates 75 (shown dotted as optional reinforcement in FIG. 5) may be connected to triangulate the end wall frames 40, 50 with respect to the roof frame 60, floor frame 20, or both, instead of or in addition to connection of the side walls 30 or side frames 30 as shear load supports for the building 10.

The side frames 30 are connected by fasteners to the floor frame 20 and to the back frame 40 and the front frame 50. The structure resulting from the connection of the floor frame 20, the side frames 30, the back frame 40 and the front frame 50 may be referred to as the housing frame 80 (see also FIG. 8).

In one embodiment, fastening is done by securing fasteners, such as bolts, through the factory, pre-drilled apertures provided in or on the fastened frame member, into pre-fabricated anchor nuts already carefully measured and fixed, such as by welding, to the corresponding fastening or anchoring frame member. Manufacturing jigs are typically used for sizing, positioning, spacing, angular orientation, holding, and drilling.

Thus, the apertures, whether drilled or otherwise penetrated directly through structural members or through tabs welded or otherwise secured thereto, may be repeatably and reliably located. Similarly, apertures for receiving the nut inserts, and the nut inserts themselves, may be repeatably and reliably located and finalized for ready assembly at the positions and angular orientation desired. Thus, framing is positioned, squared, and completed precisely at any tolerance desired and as specified in the manufacturing process.

Once the housing frame 80 is constructed, the roof frame 60 is set onto the side frames 30 and end frames 40, 50. The registration nails extending around the roof frame 60 may be formed of angle iron, having one leg of the angle iron welded to the bottom surface of a section of tubing extending horizontally along the roof frame 60. The other leg of the angle iron extends downward to become a register for the side frames 30 and end frames 40, 50 (back frame 40, and front frame 50).

Referring to FIG. 7 one may see a depiction of the modular shed 10 and its individual component frames 20, 30, 40, 50. The floor frame 20 will typically have a generally rectangular shape, although any suitable polygon may be made, and curvature is not prohibited though difficult to execute. The floor frame 20 may be constructed of any suitable material, for example, aluminum, steel, wood, etc. The floor frame 20 is usually and generally constructed of a metal, tubular material, such as rectangular, and in the illustrated embodiment a specifically square cross section, tubing.

Square, rectangular cross sections may be very useful in providing a greater section modulus for the floor “joist” members in the floor frame 20, permitting longer free spans, and so forth. Steel tubes may be used, and in certain embodiments, every tube may have exactly the same square cross section. Aluminum tubes also serve well, being lighter than steel but not as strong, absent increased size and cross section. All joints and corners of frames 20, 30, 40, 50, 60 are best fabricated by welding. Welding provides rigidity providing permanent orientation of parts and structural stability to assure squaring up the building 10.

The tubes of the floor frame 20 generally have a square cross-section, although other cross-sections are contemplated. The floor frame 20 also has a length 100 and a width 102. The floor frame 20 may also include locking apertures 70 usually perpendicular to the floor frame 20 and positioned to provide connecting points to the side frames 30, back frame 40, and front frame 50. The resulting connections are designed to be self-registering, or provide substantially orthogonal connections, typically by snugging the flat outer surfaces of tubing together by the fasteners in the nut inserts as described aboveinabove.

The floor frame 20 may also include floor joists 22. The floor joists 22 are spaced along the length of the floor frame 20 such that one or more floor panels may be placed on
the floor frame 20 and supported by at least two floor joists 22. Conventional 16-inch or 24-inch centers may be used, depending on the strength and stiffness of the flooring material (e.g., plywood) covering the floor joists 22.

[0055] The floor joists 22, typically run parallel to each other (but could be arranged otherwise) and are spaced such that an outermost or end floor joist 22 is positioned at the edge of the floor frame 20, extending along the floor width 102. Thus, the end of a flooring plate, panel, or sheet is not cantilevered, nor are complex supports required. The frame 20 forms or contains the end joists 22 that will both connect to the appropriate end wall 40, 50 and support the floor panel or sheet at such wall 40, 50.

[0056] The floor joists 22 will each support a floor panel placed on the floor frame 20. The floor frame is depicted in FIG. 9. The floor panel used to cover the floor frame 20 has a generally rectangular shape to fit the floor frame 20 and may be composed of any suitable material, for example, aluminum, steel, wood, fiberglass, other composite, or the like. Generally, the floor panels may be of plywood sized to fit appropriately on the floor frame 20. Typically the grain of the plywood will cross the joists 22 to improve stiffness of the floor layer.

[0057] A modular outbuilding 10 or shed 10 in accordance with the invention typically has at least two side frames 30. Any floor shape may serve. A hexagonal floor shape, for example, may have more than two side frames 30. Likewise, a very wide opening is desired, with or without a selectively openable door, an entire side frame 30 may be absent.

[0058] A side frame 30 has a generally rectangular shape and is constructed of any suitable material, such as, for example, aluminum, steel, wood, etc., in a configuration suitable to aid construction and stability. A side frame 30 is generally constructed of metal tubes and all the corners are welded. The tubes of the side frame 30 generally have a square cross-section, although other cross-sections may be suitable and are contemplated.

[0059] The side frame 30 also has a length 104 selected to extend between the end walls 40, 50, and a height 106 selected to extend from the floor frame 20 to the roof frame 60. However, shorter length 104, height 106, or both are feasible and reasonable for special functions. Moreover, although less strong, stiff, and stable, any wall frame 30, 40, 50, 60 may be made by the same techniques as an assembly of smaller panels 30, 40, 50 abutted edge to edge in order to provide some architectural flexibility in the arrangement of openings by leaving out or removing a panel. However, for small outbuildings 10, a standardized full panel provides ease of construction, suitable structural strength and stiffness, and can be removed to provide an open side.

[0060] The side frame 30 may also include locking apertures 70, usually parallel to the side frame 30 and positioned to provide connecting points to the floor frame 30, back frame 40, front frame 50, and roof frame 60. The resulting connections are designed to be self-registering, providing substantially orthogonal stability by connection of the tubular members flush against one another in the various frames 20, 30, 40, 50, 60.

[0061] The side frame 30 may also include internal angle bracing in the form of additional tubes welded within the frame, or thinner gusset plates 75 fastened by any suitable means, from welding to rivets, bolts, or the like, to provide additional support. Additional tubes may be welded in a vertical and/or horizontal fashion (as shown in FIGS. 1-3), although additional tubes may be welded in a diagonal orientation.

[0062] A skin, cover, panel, or the like used to cover the side frame 30 has a shape to fit the portion of the outbuilding 10 frame portion 20, 30, 40, 50, 60 in question. That is generally a rectangular shape when fitting the side frame 30, and may be composed of any suitable material. Wood sheet products serve adequately, but sheet metal, such as textured aluminum sheet has been found to require minimal maintenance. Generally, the side panels may be or include plywood, sheet metal, composites such as fiber reinforced polymers or coated, reinforced wood products, or the like. The skin panels may be sized to fit appropriately on the side frame 30.

[0063] As shown in Appendix A, the skin may be formed of textured sheet metal fitted to the frames 30, 40, 50, 60 or frame panels 30, 40, 50, 60, and may include decorative trim as well as decorative seam covers. The seam covers may be easily removed leaving a particular panel, such as a side panel 30 ready removable without even removing the skin thereon, nor releasing the skin on adjacent frame panels 20, 30, 40, 50, 60.

[0064] The back frame 40 has a generally rectangular shape and is constructed of any suitable material, for example, aluminum, steel, wood, etc., as described hereinabove. The back frame 40 is generally constructed of metal tubes, and all the corners are welded. The tubes of the back frame 40 generally have a square cross-section, since the gable portion is part of the roof frame 60. Nevertheless other cross-sections are optional and currently contemplated. The back frame 40 also has a width 108 and a height 110. The back frame 40 may also include locking apertures 70 (e.g., the apertures 70, open on the bolt-receiving side and fitted with a nut insert on the corresponding member to be fastened thereto).

[0065] These apertures, and thus the fasteners and nut inserts are typically aligned with the central axis of the fastener and aperture proceeding perpendicular to the plane of the back frame 40, and distributed along its height 110. The axis of other fasteners and apertures are oriented to extend parallel to the back frame 40 and are distributed along its width 108, thus positioned to provide connecting points to the side frames 30, floor frame 20, and roof frame 60. The resulting connections thus render the frame elements 20, 30, 40 self-registering, orienting the frame elements 20, 30, 40.

[0066] The back frame 40 may also include internal bracing in the form of additional plates, sheets, or tubes, welded or otherwise secured within the frame to provide additional support. These additional stiffening members or gusset members 75 may be welded in a vertical and/or horizontal fashion (as shown in FIGS. 1-3), but may be oriented on a longer base and secured in a diagonal orientation across corners or any particular frame 20, 30, 40, 50, 60, or as plates or sheets across a face thereof.

[0067] A back skin panel used to cover the back frame 40 has a generally rectangular shape to fit the back frame 40 and may be composed of any suitable material, such as, for example, aluminum, steel, wood, as discussed hereinabove. Generally, the back panels are aluminum sheet metal, secured to the frame 40.

[0068] The sheet material forming the skin of the roof should typically be formed to overhang, overlap, or the like in order to provide a drip edge. Corners of the building 10 may be fitted with corner covers, and may use sealing materials between overlapping trim pieces or the skins on adjacent,
abutting frames 20, 30, 60 in order to resist penetration by moisture. Seals may typically be formed of glues, putties, polymers, or the like. Meanwhile, such covering trip sheets for corner covers, joint cover trim, bottom drip edges, and so forth may be appropriate, regardless of skin materials. Such trim pieces, effectively covering or shingling joints, may be formed of a material the same as or different from that of the underlying skin materials whose joinder may be protected thereunder.

[0069] The front frame 50 has a generally rectangular shape and is constructed of any suitable material, as discussed for other frames 20, 30, 40, 60, to cover the frame 50 similarly formed of the same materials thereof, and of rectangular cross section, having all connecting corners welded. The tubular members of the front frame 50 generally have the same cross section as corresponding tubular members throughout the outbuilding 10.

[0070] The front frame 50 width 112 and a height 114 extend between the sides 30 and between the floor frame 20 and roof frame 60, respectively. The fasteners and corresponding apertures 70 or locking apertures 70 are again best aligned perpendicular to the plane of the front frame 50, being distributed along its height 114. The remaining apertures 70 distributed along its width 112 to receive fasteners are typically best oriented vertically, parallel to the plane of the front frame 50 to provide connecting locations for fasteners, such as the bolts and nut inserts discussed hereinabove.

[0071] Thus, securing the side frames 30, floor frame 40, and roof frame 50, all connections are designed to be self-registering, providing linear registration along the length, lateral alignment across the width, and transversely normal to the contacting surface of the joined tubular members. Thus alignment is provided in all orthogonal directions of the connections. The self aligning raling of the roof frame provides initial alignment, and likewise provides additional strength of structure beyond the holding power of bolts or other fasteners axially or in lateral shear.

[0072] The front frame 50 is so designated primarily because it is the one to include a doorway, typically having one or more doors 52 suitable to provide access. Any wall frame 20, 30, 40, 60 or frame 20, 30, 40, 50, 60 could be best fitted with a doorway or window frame. The door 52 may be described as a second panel within the front frame 50 and may have a generally rectangular shape, constructed of the same material and in the same manner as the front frame 50.

[0073] The door 52 is connected to the front frame 50 by at least one hinge 54. The door 52 may also include a handle 56 to allow for opening and closing the door 52. In one embodiment, the front frame 50 may have two doors 52, or door panels 52, each connected to the front frame 50 with hinges 54, as shown in FIGS. 2 and 3. The front cover panel or skin used to cover the front frame 50 has a shape to fit, generally rectangular, and fitted the front frame 50 and may be composed of any suitable material, for example, sheet aluminum, steel, wood, or the like.

[0074] Generally, the front skin panels may be a textured sheet metal fit flush against the frame 50, but may instead be formed of any suitable material, such as plywood, sized to fit appropriately on the front frame 50. Sheet metals, appropriately selected, treated, or both often provide the best weather protection with minimum maintenance. Similarly, the skin panels used to cover the door 52 have a generally rectangular shape to fit the door 52 and may be composed of any suitable material as discussed hereinabove. Generally, the door skin panels rely on the same material as the front skin panels used to cover the front frame 50.

[0075] The roof frame 60 has a generally rectangular shape from the top view and is constructed of any suitable material as described hereinabove. The roof frame 60 is generally constructed of metal tubes and all the corners are welded. The tubes of the roof frame 60 generally have a square cross-section, although other cross-sections are contemplated. The roof frame has a length 116 and a width 118. The roof frame 60 may also include locking apertures 70 usually perpendicular to the roof frame 60 and positioned to provide connecting points to the side frames 30, back frame 40, and front frame 50, using fastening systems as described hereinabove, designed to be self-registering to provide and maintain substantially orthogonal connections, squaring up the framing system. The roof frame 60 may also come in various configurations, for example, a “flat” by slightly slanted roof 82 and a gabled roof 84.

[0076] The flat but slanted roof 82 has a roof frame 60 comprised of a ridge tube 62 or ridge pole 62, actually configured as one or more ridge tubes 62. The double ridge tube 62 design provides some manufacturing benefits such as alignments, welding fabrication, and strength. For example, the ridge tube 62 is typically welded to purlins 65, two end rails 66, at least two spacers 67, and a rafter 68. The end rails 66 are found along the length 116 of the roof frame 60. The end rails 66 are attached to the tops of the side frames 30, as is generally shown in FIG. 4B.

[0077] Along one end rail 66 are placed spacers 67 at approximately even intervals and a rafter 68 is welded to the end rail 66 sitting on top of the spacers 67, as depicted in FIG. 4C. The ridge tube 62 is parallel to the end rails 66 and at (if single) or near (if double as in the gabled design described hereinbelow) the ridge line, approximately midway between the end rails 66. The rafters 68 are connected to one end rail 66 and are extending longitudinally perpendicular to the end rails 66, the ridge tube 62. As the rafters 68 travel from one end rail 66, over the ridge tube 62 (which with the flat roof is not really at a ridge or high point), to the opposite end rail 66, a slight incline is produced providing the slant in the flat (but not level), slanted roof 82.

[0078] Referring to FIG. 4, FIGS. 4C and 4D particularly, while continuing to refer generally to FIGS. 1-12 as well as Appendix A, the end rails 66 may also include a registration rail 74. This is typically an angle iron rail 74, which is an elongate, L-shaped piece attached (usually by welding) to the end rail 66. The horizontal leg of the “L” is welded to the end rail 66 of the roof frame 60. The vertical leg of the “L” extends vertically downward to extend along and provide registration for the side frame 30 with respect to the roof frame 60, something like a shoe box lid, as depicted in FIGS. 4C and 4D. The slanted roof 82 roof frame 60 is generally composed of metal and all connections within the slanted roof 82 roof frame 60 are welded together.

[0079] The roof skin, or skin panels, that may cover the roof frame 60 are generally rectangular and fitted to the roof frame 60 to overhang, providing a drip edge (see Appendix A). The roof skin may be made in one or more parts, and may be composed of any suitable material as discussed above. However, sheet aluminum has been found particularly well suited.

[0080] The gabled roof 84 has a roof frame 60 comprised of a ridge tube 62, purlins 65, end rails 66, rafters 68, and roof supports 69. The end rails 66 extend along the length 116 of
the roof frame 60. The end rails 66 are registered by the registration rails 74, and attached to the tops of the side frames 30 by fasteners as described above.

[0081] Rafters 68 are connected perpendicular to the end rails 66 along the width 118 of the roof frame 60 and these rafters 68 may be attached to the tops of the front frame 50 and the back frame 40. One or more roof supports 69 may be connected to the joint 64 at approximately midway between the end rails 66 and perpendicular to the joint 64 or joists, as depicted in FIG. 4A. Two more rafters 68 are connected to the end rails 66 and continue at an angle between the end rails 66 and over the top of the roof support 69, as depicted in FIGS. 4A and 4E.

[0082] The ridge tubes 62 are connected slightly away from the ridge when used in the double ridge tube 62 configuration. This is helpful in keeping a flat profile on each side of the gabled roof for attaching a sheet metal skin. If using a single ridge tube 62, it is connected to the one or more two roof supports 69 and travels longitudinally along the building 10, parallel to the end rails 66 and perpendicular to the rafters 68.

[0083] The ridge tube 62 may actually be two ridge tubes 62, serving to add strength and improve the alignment issues for the connections to various tubing members as well as the skin of the roof. Here it is assumed that the weight and complexity of shingling is not desirable nor warranted. This is usually the case, but need not be the configuration. A sub-roof material covered with shingles is another optional configuration.

[0084] At least two purlins 65 are connected to the slanted rafters 68 approximately midway between the end rails 66 and the ridge tube 62, as depicted in FIG. 4A. Again, the language here may be modified according to conventional construction to include joists 64, rafters 68, purlins 65, stringers 65, trusses and so forth to convey their orientations. However, inasmuch as a certain benefit arises as a result of designing the building 10 to be framed of a single size of tubular stock, the naming convention is not so important here.

[0085] The end rails 66 may typically also include an angle iron 74 or registration piece 74 attached to the end rail 66, such as with the horizontal leg of the “L” welded thereto, and the other leg of the “L” extending down as a registration member 70 over the side frame 30. This aids in construction when the roof frame 60 is connected, as depicted in FIGS. 4C and 4D.

[0086] The gabled roof 84 roof frame 60 is generally composed of metal and all connections within the gabled roof 84 roof frame 60 are best operable to maintain the orientation, stiffness, and strength to render and maintain the building “squared up” if welded together at all joints. This simplifies construction, contributes to ready assembly, and enables simplified dismantling for removal and re-use.

[0087] The roof cover panels, sheets, skin, or the like may cover the roof frame 60 in whatever shape and pitch it may have. It may be composed of any suitable material, as discussed hereinabove. The roof cover panels or skin for a gabled roof 84 may also include a ridge cap, such as one or more elongate pieces folded in an inverted “V” shape fit to the angle of the gable. The material and suitable fasteners may be designed or selected to attach to the ridge or apex of the gabled roof 84. Thus, the ridge joint is covered to assure that moisture does not penetrate the roof frame.

[0088] There are at least two types of connections that have proven particularly useful in the manufacture and construction of the modular shed 10 described herein, perhaps three. They are permanent (e.g., welding) and temporary types, including rapid (larger bolts and insert nuts for connecting frames 20, 30, 40, 50, 60) and comparatively slow (small metal screws for connecting skin materials to the frames 20, 30, 40, 50, 60, to each other, or to both). Generally, permanent connections are used within the individual components of the modular shed.

[0089] For example, all the connections within the floor frame 20, the side frames 30, the back frame 40, the front frame 50, and the roof frame 60 serve best if made rigid, strong, and permanent connections, not easily broken. Usually, these connections are accomplished by welding the respective pieces or each individual component. Since metal is a commonly available material in tubular stock, it may be used to construct the respective frame components. Welding is a suitable method of permanently connecting the pieces of the frames 20, 30, 40, 50, 60.

[0090] If the pieces of the respective components of the frames 20, 30, 40, 50, 60 were to be made of wood, nails or screws may be used to provide a similar, permanent connection between the pieces. However, even then, metal receivers, angle braces, and fittings may be needed to provide the rigidity and dimensional stability desired.

[0091] Fast, temporary connections are used between the individual frames 20, 30, 40, 50, 60 of the modular shed 10. For example, the connections between the floor frame 20 and the side frames 30 are temporary connections that are secure, but more comparatively few in number and easily disconnected to allow for modifying the building 10 by removing a wall or moving, storing, and transporting the building 10 (modular shed 10). These temporary connections are generally accomplished by having locking apertures 70 one empty and one fitted with a fixed (e.g., welded) nut insert, in the respective individual tubular structures of the respective frame 20, 30, 40, 50, 60 that can be aligned and secured with a bolt 72 running through the respective locking apertures into the corresponding nut insert.

[0092] As is shown more particularly in FIGS. 4B and 5, and as an example, the front frame 50 may include locking apertures 70 perpendicular to the front frame 50 and parallel to a side frame 30. The corresponding side frame 30 may have locking apertures 70 that are also perpendicular to the front frame 50, parallel to a side frame 30, with nut inserts aligned in the terminal locking apertures in the front frame 50, or possibly the frame 30 attaching to it (although the former has proven more convenient and useful).

[0093] A bolt 72 may then be inserted into the aligned locking apertures 70, thus connecting the respective front frame 50 and side frame 30. Similar configurations may be utilized throughout the modular shed 10 to connect the side frames 30 to the floor frame 20 and the back frame 40 and the roof frame 60.

[0094] As can be seen in the illustrated embodiments, this configuration can be repeated for all the connections between the individual components of the modular shed 10, i.e., the floor frame 20, the side frames 30, the back frame 40, the front frame 50, and the roof frame 60. All these connections are also designed to produce connections that are self-registering, to provide alignment in all three orthogonal directions. As can also be appreciated, any temporary connection may be used in this configuration, for example, a bolt with a winged nut, a bolt with a cotter pin, or the like. Nevertheless, a tight fitting is permitted by the bolt and nut combination unlike most other fasteners, with all tolerances taken up in the resulting loading.
The skin may be secured by self-tapping metal screws. These are temporary, but numerous. In the illustrated embodiments, the skin need never be removed to effectively dismantle, stack, move, and re-erect the building. Thus these comparatively slower temporary fastening locations may be treated as permanent, but may be removed for maintenance, repair, or renovation periodically.

As depicted in FIGS. 11 and 12, additional weather protection may be provided to the joint formed by frames 20, 30, 40, 50, 60 at their connections by covering the joint with a form of trim 76 or trimming material 76. Trim 76 can be in flat configuration (as seen in FIG. 11), or in L-shaped configurations (as seen in FIG. 12), or both. Either can be used to support or protect a joint at a “fast, temporary” connection between the individual components of the modular shed, depending on which configuration will best suit the particular joint.

FIG. 7 also depicts the modular shed and its individual component frames. Generally, the floor frame 20 is connected to the side frames 30, the back frame 40, and the front frame 50. Then, the roof frame 60 is connected to the tops of the side frames 30, the back frame 40, and the front frame 50. FIG. 8 depicts how the roof frame 60 may include a flat, single-pitch, slanted roof or a double-pitched, gabled roof configuration.

The present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative, and not restrictive. The scope of the invention is, therefore, indicated by the appended claims, rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed and desired to be secured by United States Letters Patent is:

1. A method of using a knock-down, re-usable, modular outbuilding having frames, each formed to be substantially monolithic, the method comprising:
   - providing a floor frame, monolithically formed as a substantially indivisible unit having a length, width orthogonal thereto, inner surface, and outer surface opposite thereto;
   - providing side frames, monolithically formed as substantially indivisible units, each having a length, height, inner surface, and outer surface;
   - providing fasteners;
   - providing a back frame, monolithically formed as a substantially indivisible unit;
   - providing a front frame, having an outer portion formed as a substantially indivisible unit;
   - providing a roof frame, monolithically formed as a substantially indivisible unit comprising a registration rail extending along a periphery of the roof frame having a portion thereof extending downward to engage at least one of the front, back, and side frames;
   - selecting a first set, second set, third set, fourth set, fifth set, sixth set, seventh set, eighth set, ninth set, tenth set, eleventh set, and twelfth set of fasteners;
   - registering the floor frame with respect to the back frame by the first set of the fasteners extending into both the floor frame and the back frame;
   - securing the floor frame and front frame together in fixed, orthogonal relation by the first set of fasteners;
   - registering the floor frame with respect to the front frame by the second set of the fasteners extending into both the floor frame and the back frame;
   - securing the floor frame and front frame together in fixed, orthogonal relation by the second set of fasteners;
   - registering the registration rail on and with respect to at least two of the front, back, and side frames;
   - securing the roof frame to the front and back frames by operation of the third and fourth sets;
   - dismantling, non-destructively, the floor frame, roof frame, front frame, and back frame from one another by operation of the first, second, third, and fourth sets; and
   - reconstituting the outbuilding by registering and securing again the floor frame to the front and back frame and the roof frame to the front and back frames.

2. The method of claim 1, further comprising:
   - registering the side frames, opposite one another, with respect to the floor frame, the back frame, and the front frame by operation, respectively, of the fifth and sixth, the seventh and eighth, and the ninth and tenth sets.

3. The method of claim 2, further comprising securing the side frames to the roof frame by operation of the eleventh and twelfth sets.

4. The method of claim 1, further comprising obtaining a skin material.

5. The method of claim 4, further comprising obtaining a first panel, formed of the skin material and sized to correspond to at least one of the back frame, the front frame, and the roof frame, and the side frames.

6. The method of claim 5, further comprising:
   - aligning the first panel with the frame corresponding thereto; and
   - securing the first panel to the corresponding frame.

7. The method of claim 6, further comprising:
   - the dismantling, excluding removing the first panel from the corresponding frame.

8. The method of claim 6, further comprising transporting the frames in their dismantled condition without removal of the first panel.

9. The method of claim 1, further comprising:
   - obtaining a skin material;
   - obtaining at least one panel, formed of the skin material and sized to correspond to a corresponding at least one of the frames;
   - aligning the at least one panel with the at least one frame corresponding thereto;
   - securing the first panel to the corresponding frame;
   - completing the dismantling without removing the at least one panel from the corresponding at least one frame;
   - transporting the frames;
   - reassembling the outbuilding by re-registering the frames and securing the frames to one another without removal of the at least one panel.

10. The method of claim 1, further comprising:
    - providing inserts permanently secured to at least some of the frames;
    - providing apertures through each of the frames;
    - passing at least some of the fasteners through the apertures;
    - threading the at least some of the fasteners into the at least some of the frames; and
    - securing alignments of the frames with respect to one another by tightening the at least some of the fasteners with respect to the inserts.
11. The method of claim 1, further comprising:
registering the side frames with respect to the floor frame, 
back frame, front frame, and roof frame;
securing, in alignment therewith, the side frames with 
respect to the floor frame, back frame, front frame, and 
roof frame;
removing at least one of the side frames from the outbuilding;
operating the outbuilding absent the at least one of the side 
frames.
12. An apparatus, forming an outbuilding, the apparatus 
comprising:
a floor frame, monolithically formed as a substantially 
indivisible unit having a length, width orthogonal 
thereo, inner surface, and outer surface opposite 
thereo;
side frames, monolithically formed as substantially indivisible units, each having a length, height, inner surface, 
and outer surface;
fasteners, comprising a first set, second set, third set, fourth 
set, fifth set, sixth set, seventh set, eighth set, ninth set, 
tenth set, eleventh set, and twelfth set thereof;
a back frame, monolithically formed as a substantially indivisible unit;
a front frame, having an outer portion formed as a substantially indivisible unit;
a roof frame, monolithically formed as a substantially indivisible unit comprising a registration rail extending 
along a periphery thereof and having a portion extending downward to engage at least one of the front, back, and 
side frames;
the floor frame registered with respect to the back frame by 
the first set of the fasteners extending into both the floor 
frame and the back frame;
the floor frame and back frame fixed together in orthogonal 
relation by the first set of fasteners;
the floor frame, further registered with respect to the front 
frame by the second set of the fasteners extending into 
both the floor frame and the back frame;
the floor frame and front frame secured together in fixed, 
orthogonal relation by the second set of fasteners; and 
the registration rail, positioned on and registering in a 
horizontal direction the front and back frames by overhanging the front and back frames.
13. The apparatus of claim 12, further comprising:
the side frames, opposite one another, and registered with 
respect to the floor frame, the back frame, and the front 
frame by operation, respectively, of the fifth and sixth, 
the seventh and eighth, and the ninth and tenth sets.
14. The apparatus of claim 13, further comprising:
first panel, formed of the skin material and sized to corre- 
spond to at least one of the back frame, the front frame, 
the roof frame, and the side frames; and 
the first panel, aligned with the frame corresponding 
thereo and secured thereto.
15. The apparatus of claim 14, further comprising:
the frames, formed to stock stably by having a substantially 
constant, common thickness shared by the floor frame, 
back frame, front frame, and side frames.
16. The apparatus of claim 12, further comprising:
inserts, comprising threads and permanently secured to at 
least some of the frames;
the frames, each provided with apertures sized to receive 
the fasteners and oriented to provide access to the inserts 
by the fasteners;
17. The apparatus of claim 16, wherein the frames are fixed 
to one another in rigid and registered orthogonal relation by 
the fasteners, passing through at least some of the apertures 
and threaded into the inserts.
18. The apparatus of claim 12, wherein the roof frame is 
selectable between a flat, slanted roof and a gabled roof.
19. The apparatus of claim 12, further comprising a skin, 
formed as panels modularly fitted, respectively, to each of 
back, front, and roof frames.
20. The apparatus of claim 19, further comprising trim 
covering seams between the panels of skin on adjacent 
frames.

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