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(54) **MODULAR CUPOLA ASSEMBLY**

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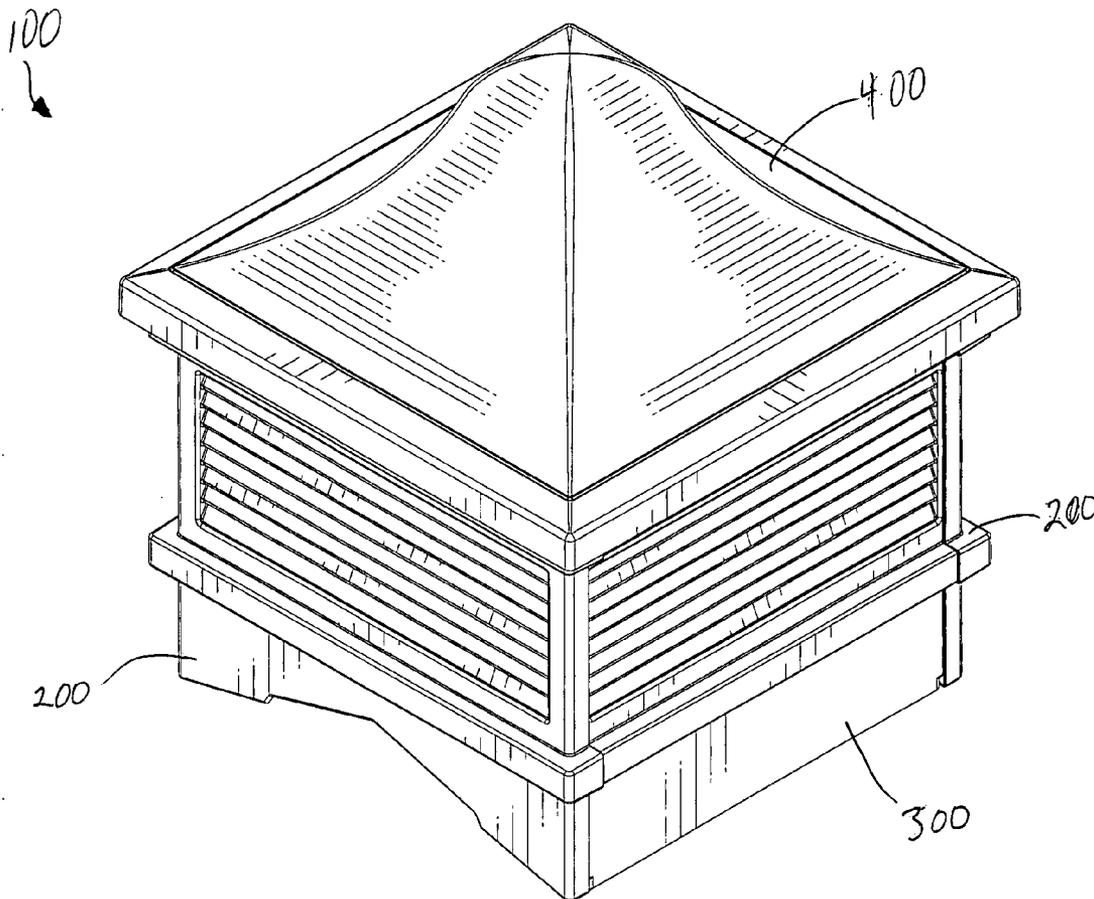
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(57) **ABSTRACT**

The present invention relates to kit for a cupola assembly. The cupola assembly utilizes injection molded plastic panels having integrally formed connectors. The cupola is capable of being packaged and shipped in a knocked-down state and constructed into a secure cupola.

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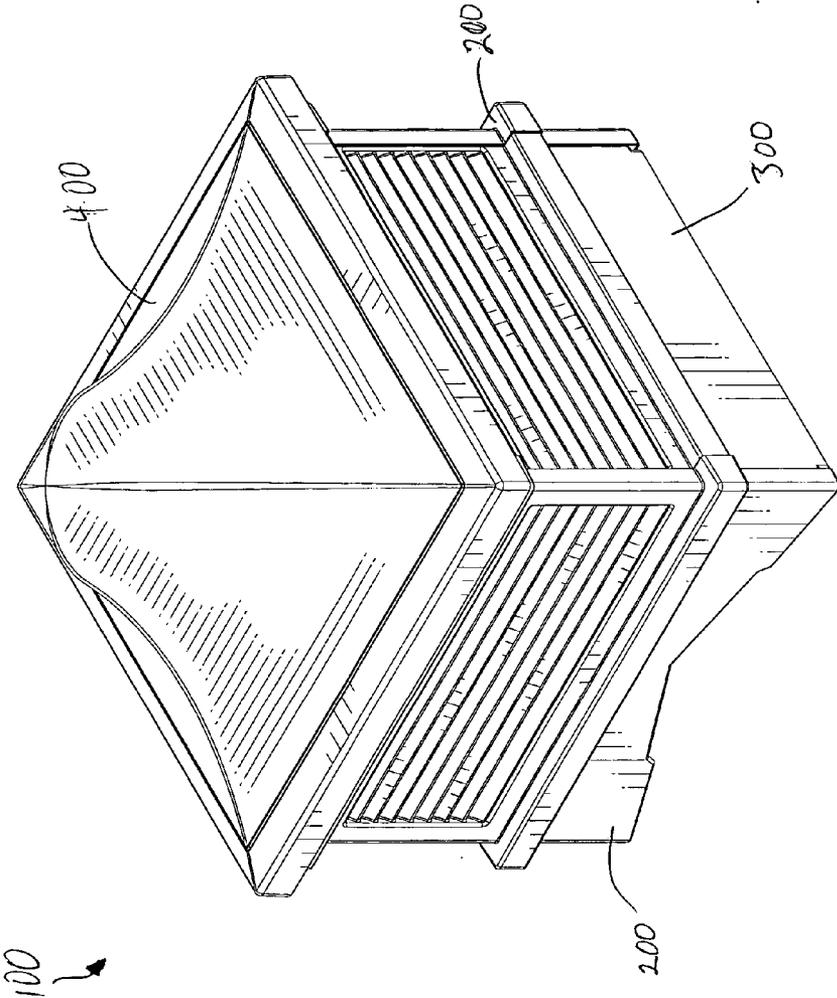


FIGURE 1

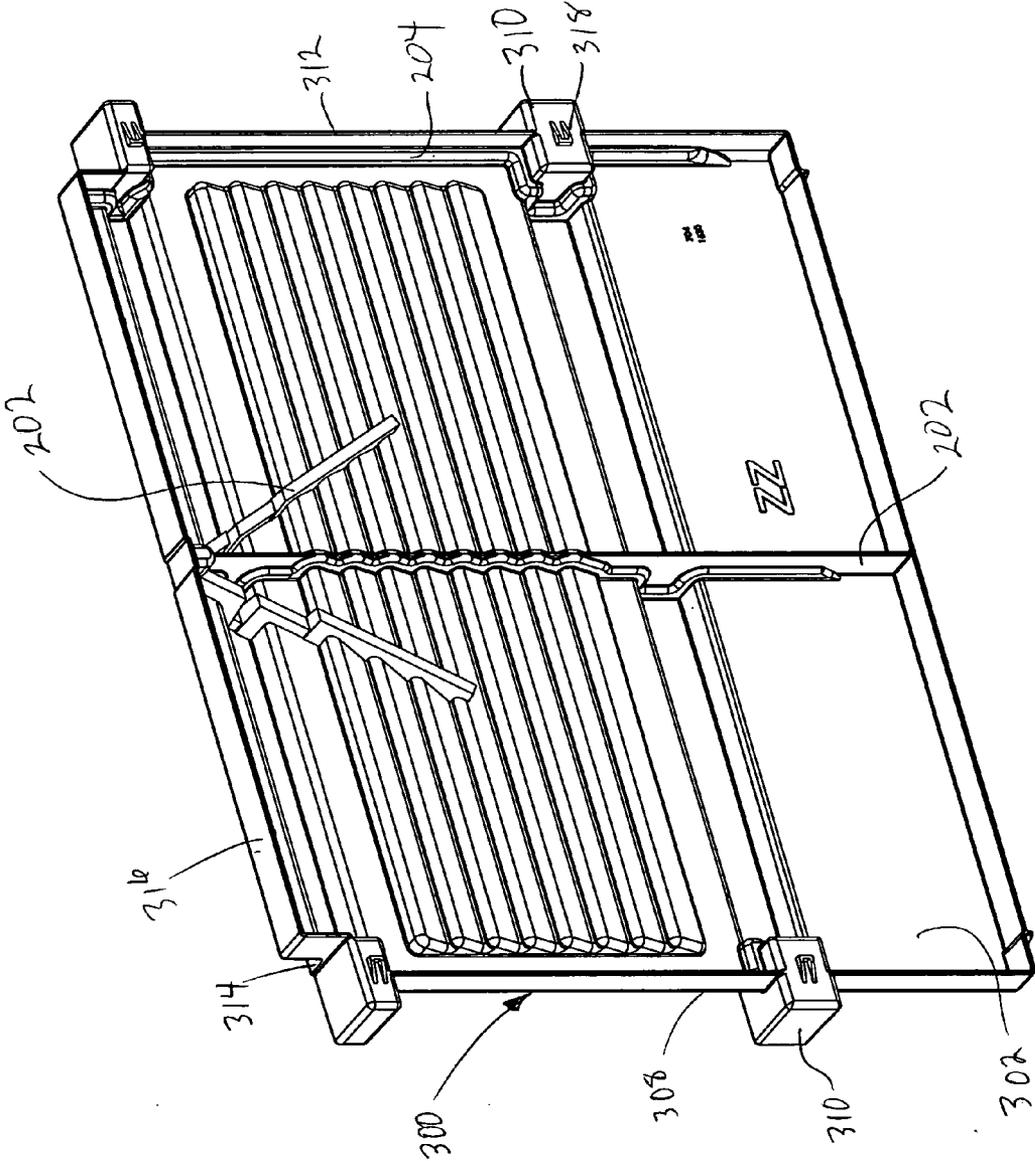


Figure 2

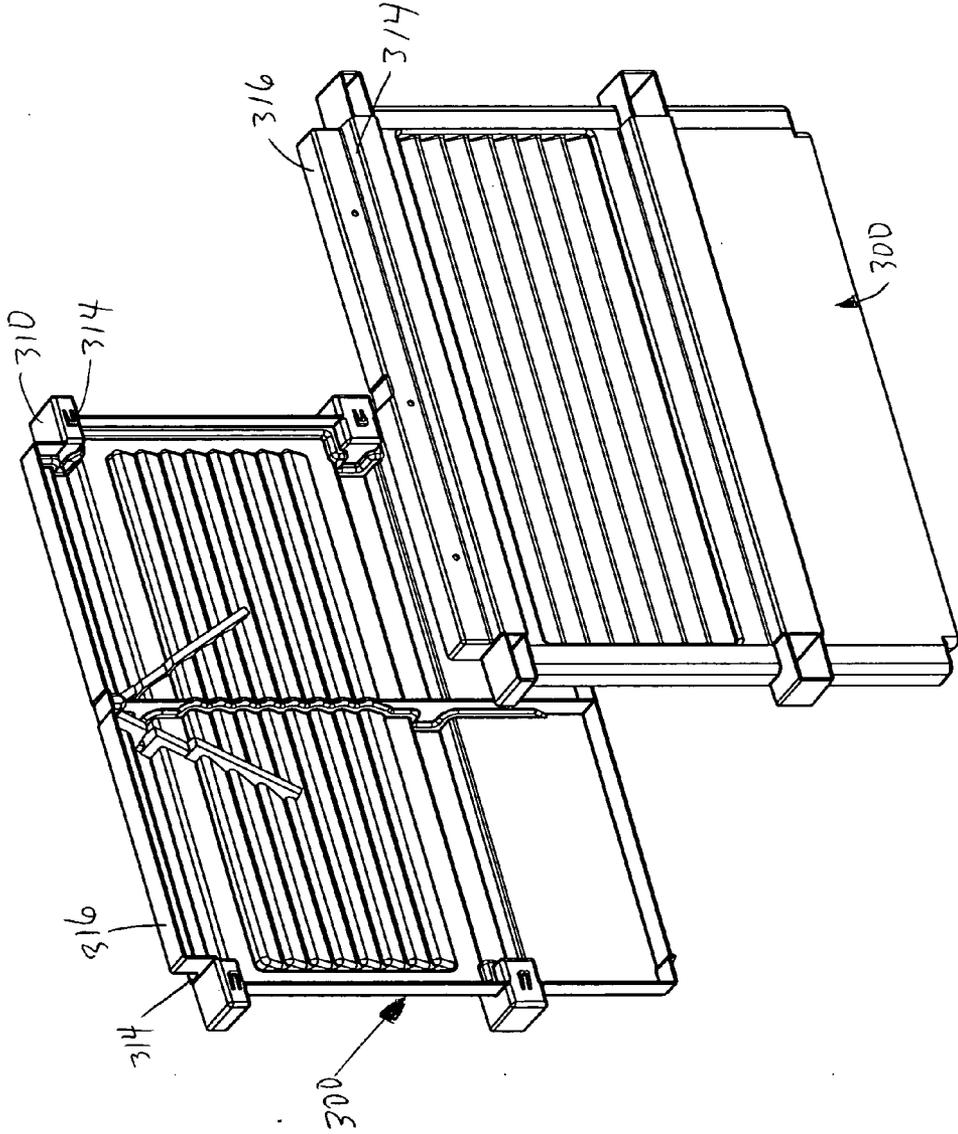


Figure 3

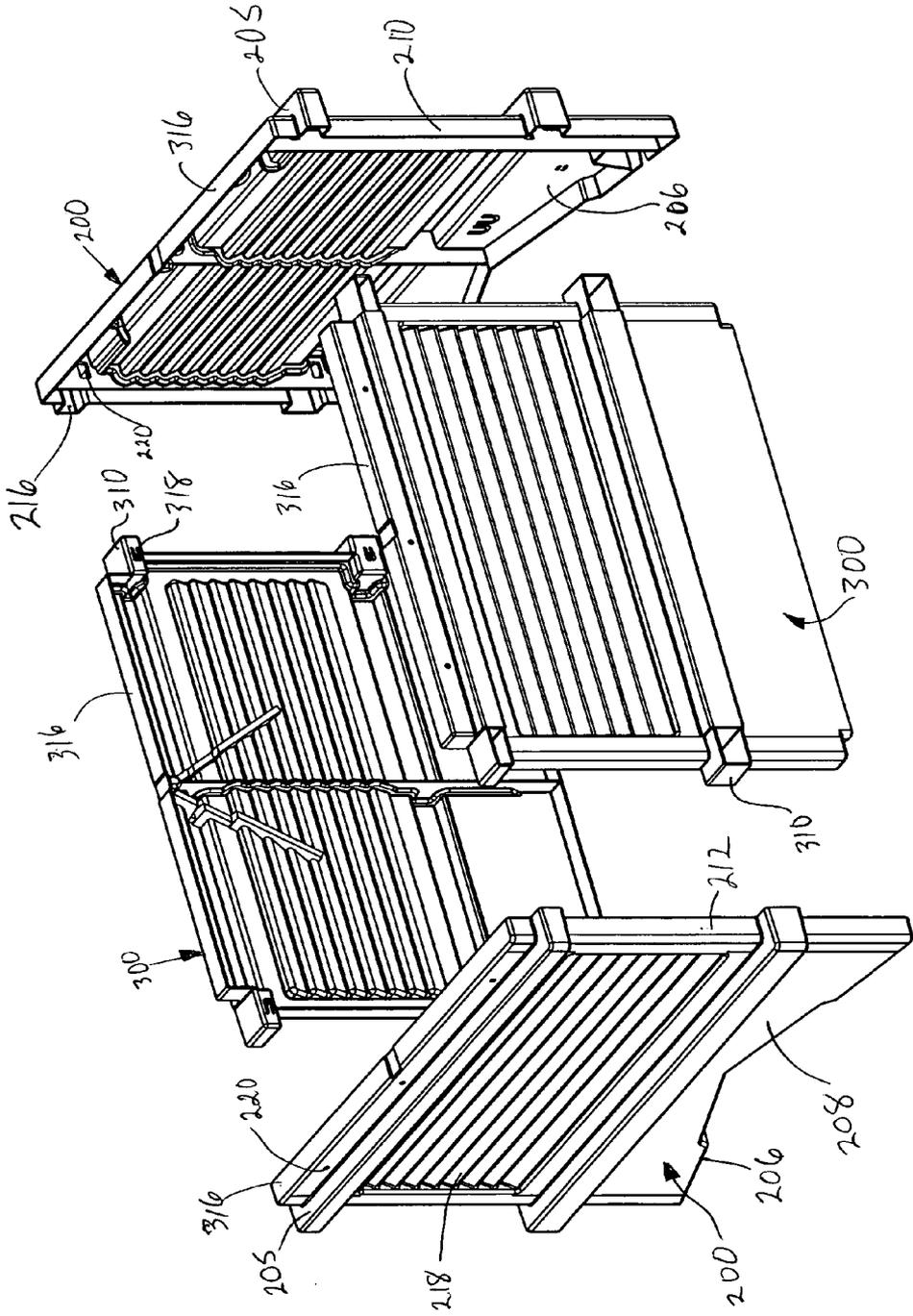


Figure 4

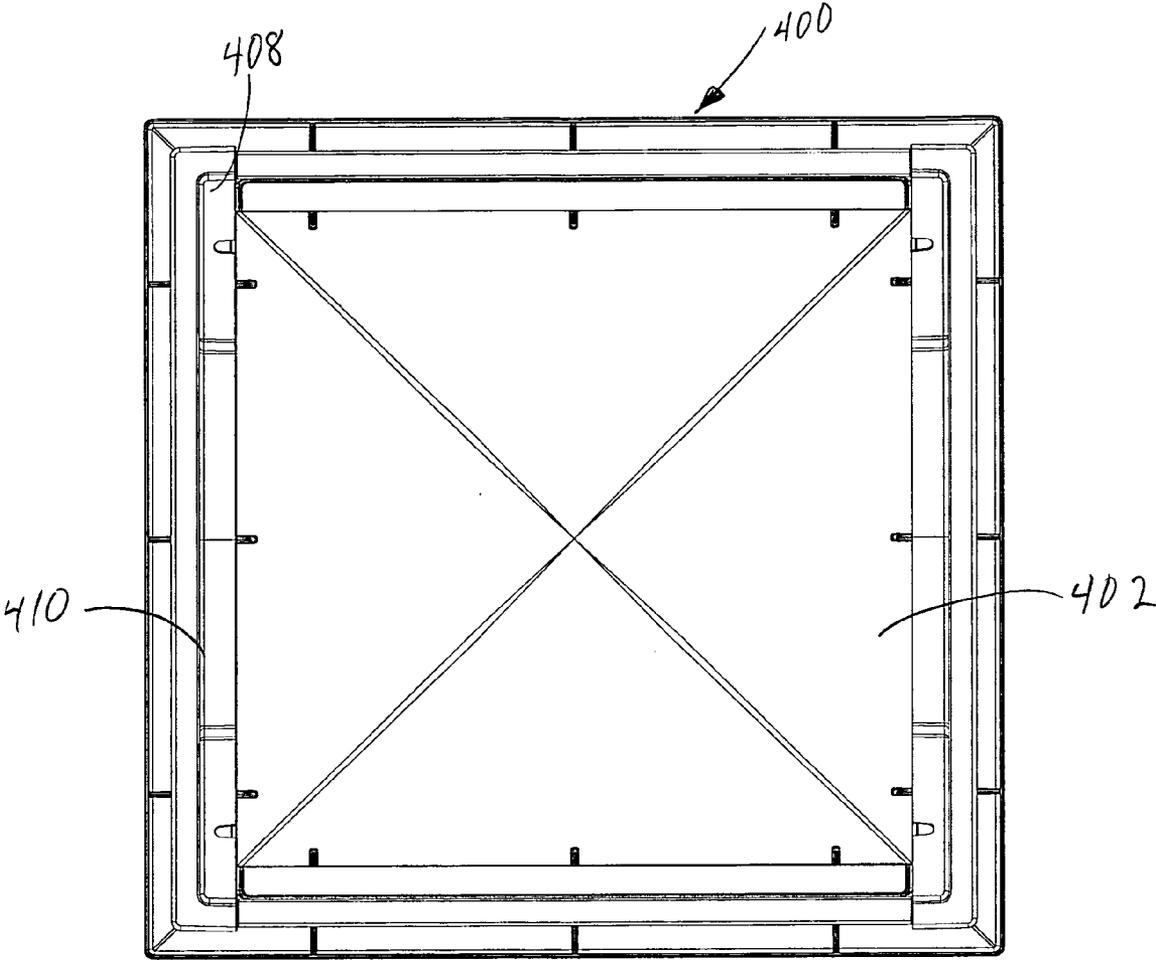


Figure 5

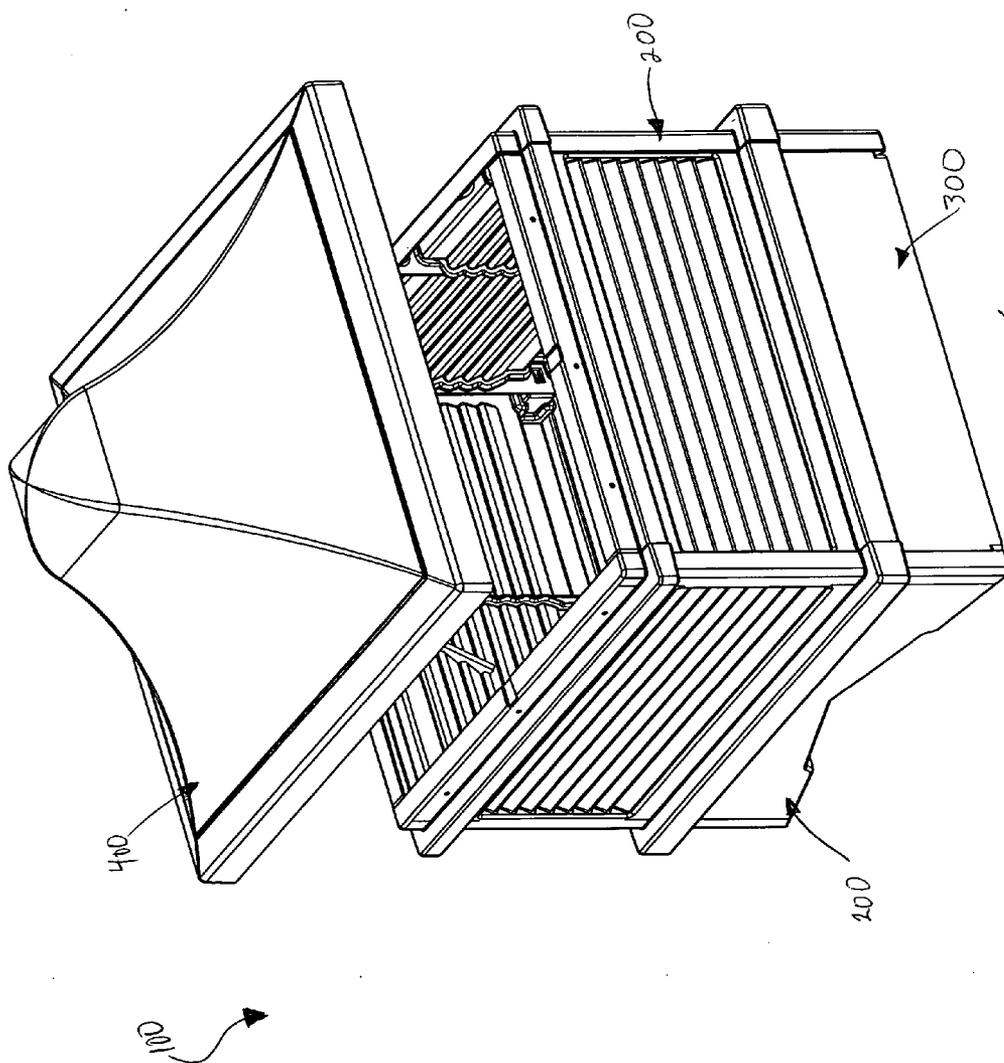


Figure 6

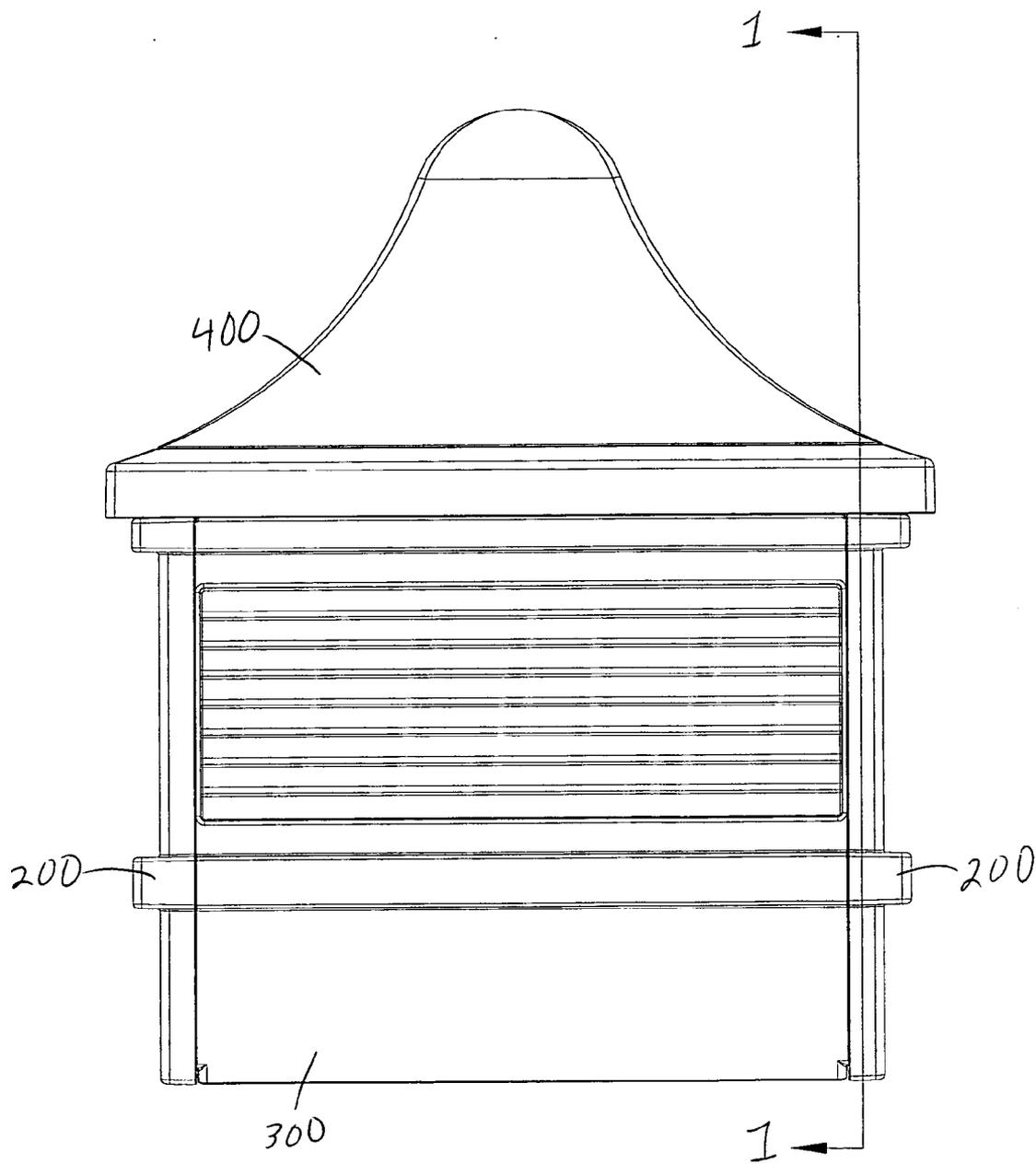


Figure 7

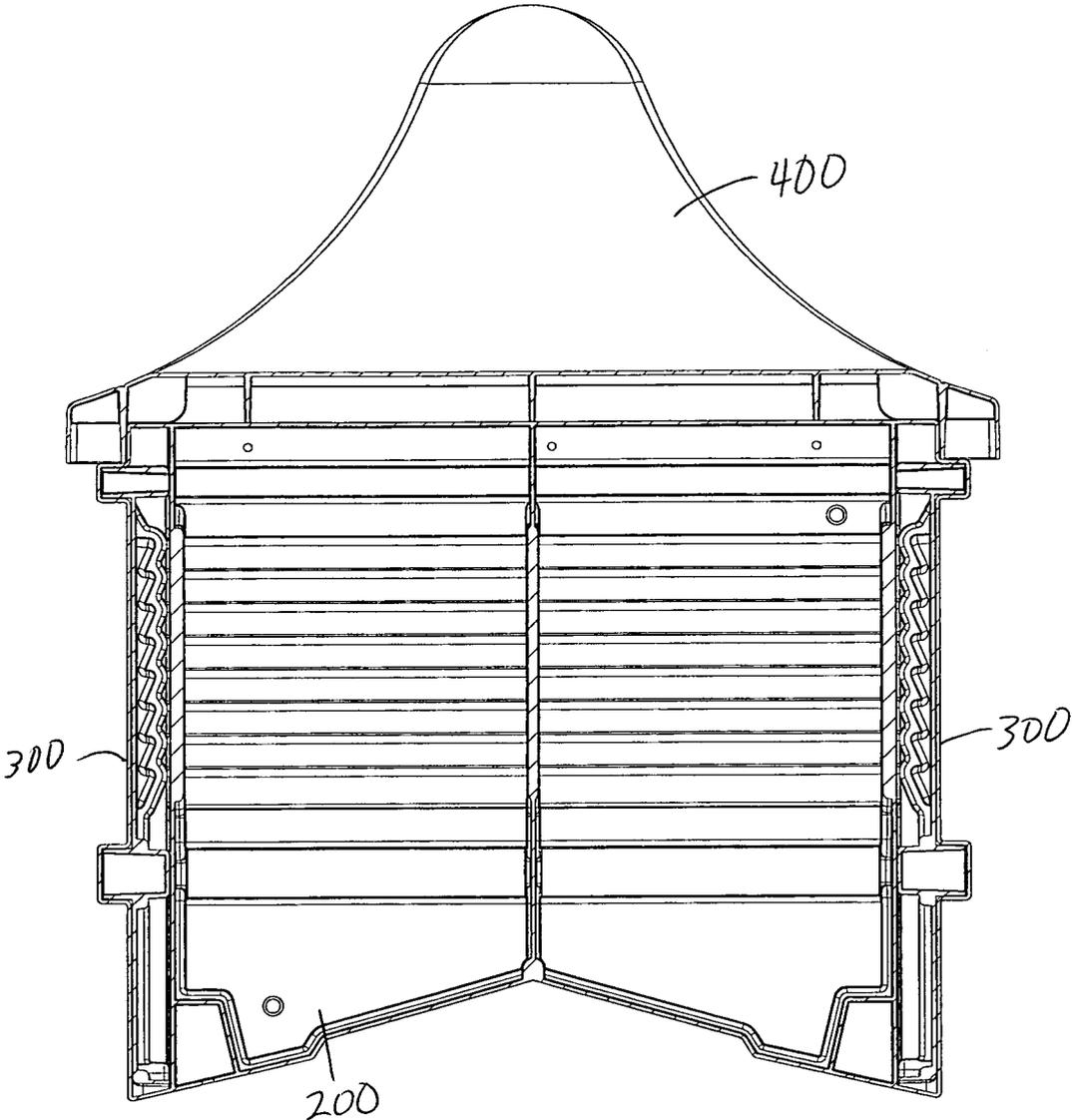


Figure 8

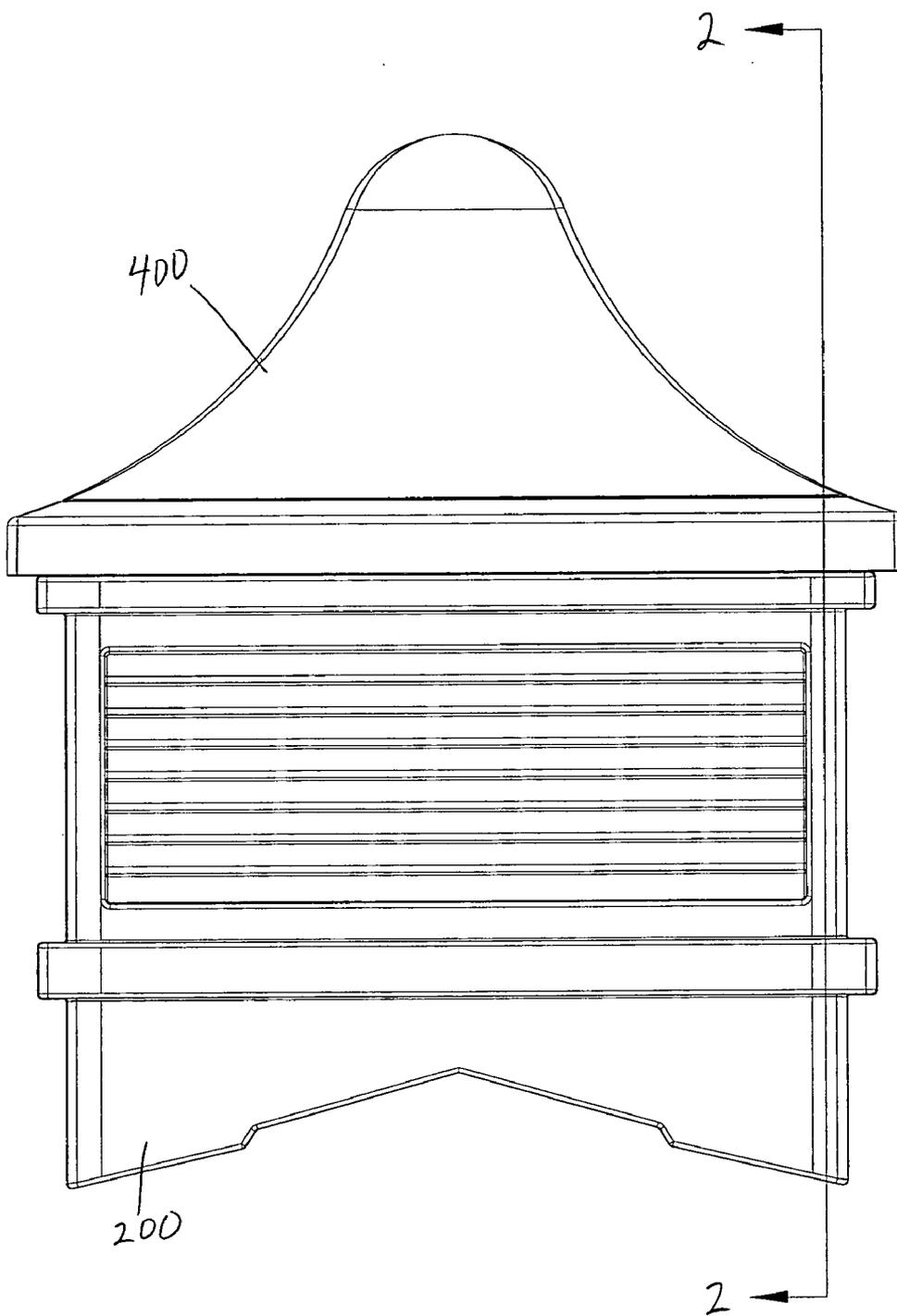


Figure 9

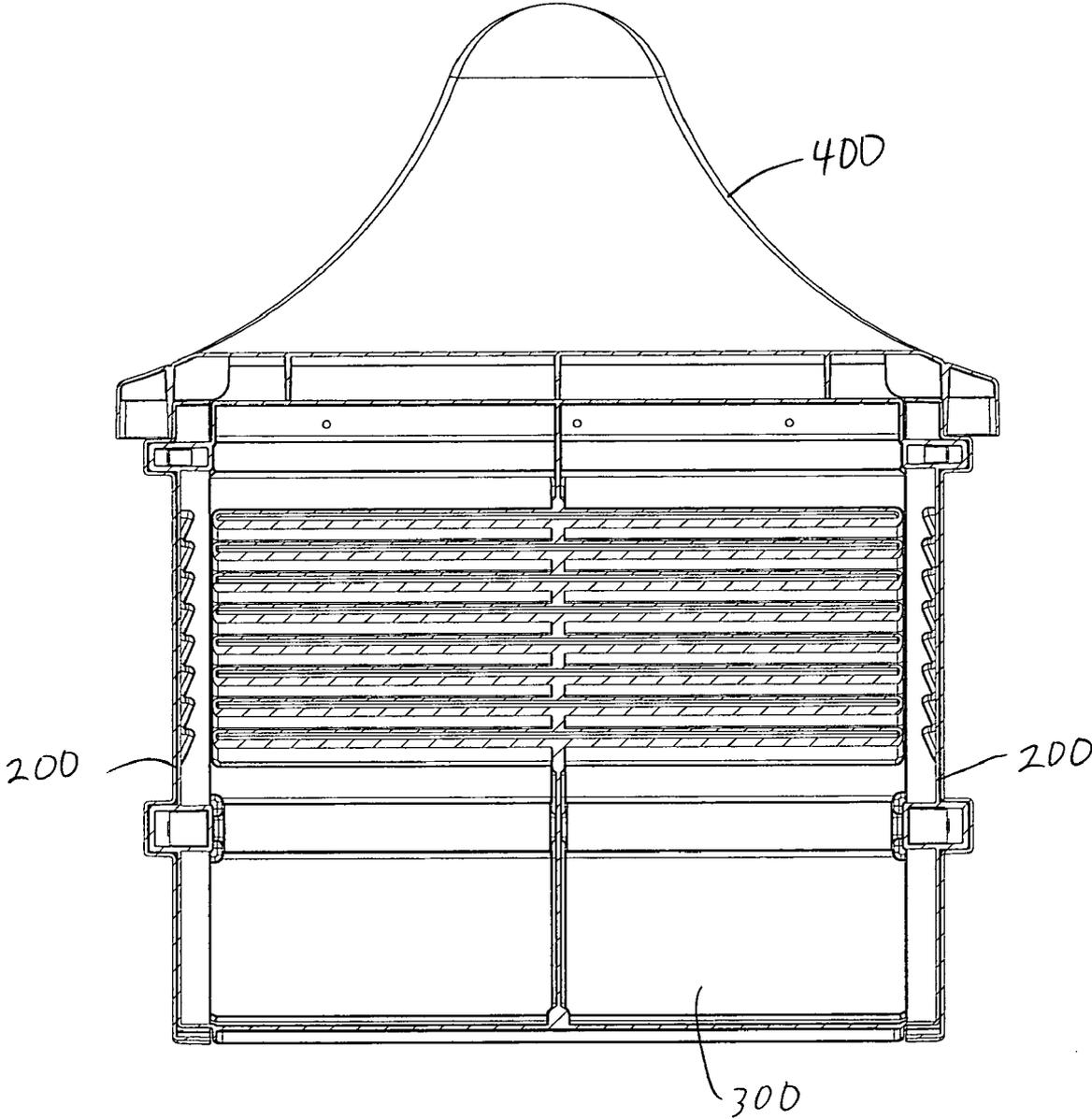


Figure 10

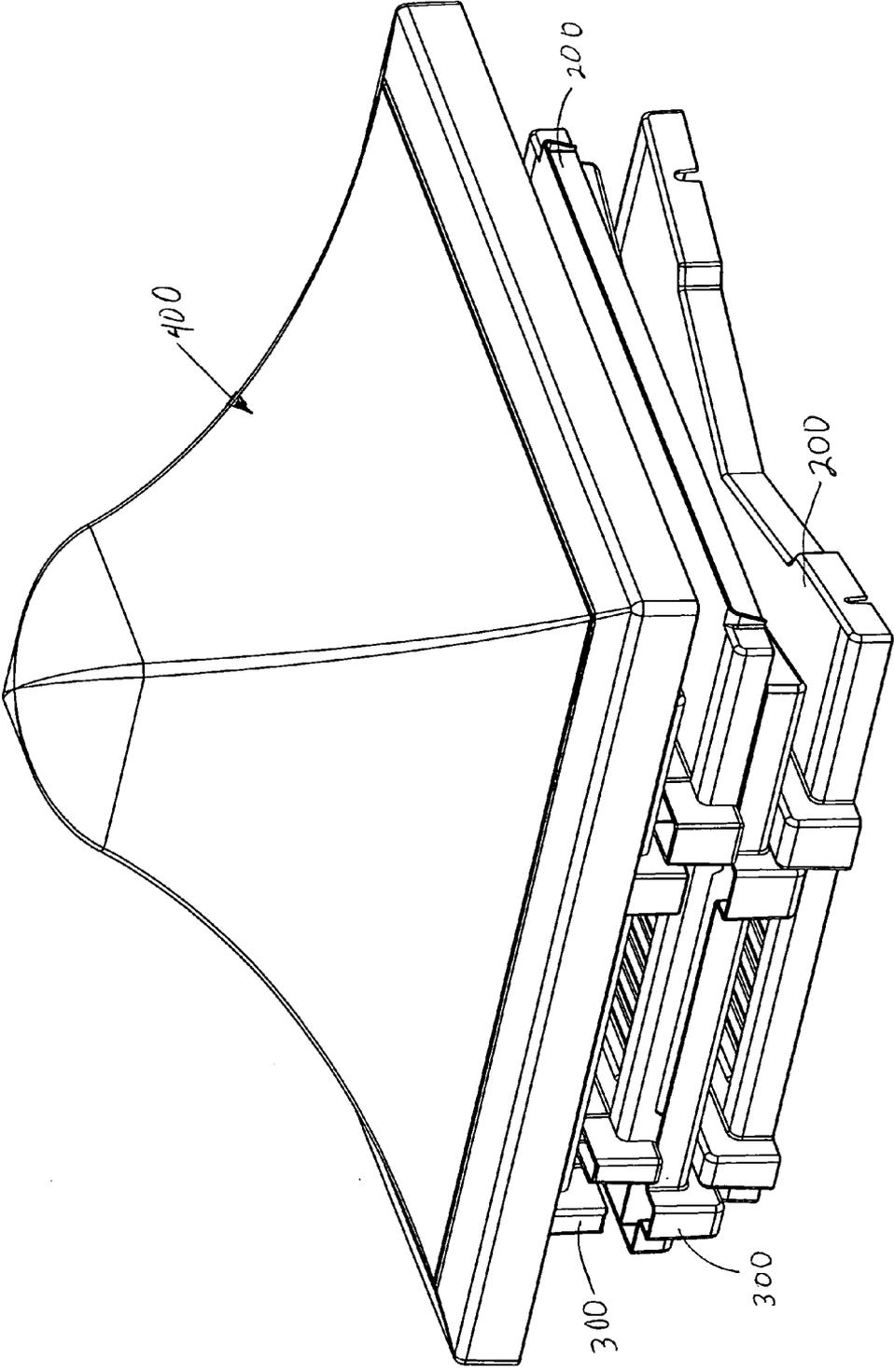


Figure 11

MODULAR CUPOLA ASSEMBLY

FIELD OF THE INVENTION

[0001] This invention relates generally to a cupola device constructed of plastic structural panels. More specifically, the present invention relates to a cupola kit utilizing modular injection molded plastic panels. The cupola kit is capable of being packaged and shipped in a knocked-down state and constructed into a secure cupola assembly upon a desired site.

BACKGROUND INFORMATION

[0002] Permanent structures such as utility sheds or garages are often utilized for storage of household items such as gardening tools, children's toys, barbeque accessories and the like. A common addition to the roof of such structures is the cupola. Cupolas have been part of architectural design for many years. Most cupolas are constructed of wood, with metal or shingle roofs, and may include windows to admit light or louvers to vent hot air out of the structure to which they are attached.

[0003] Wooden cupolas are generally custom made for a particular roof and thus assembly and installation require a great deal of time and expertise. Because these structures are made of wood they also require a great deal of maintenance to prevent degradation during the life of the structure to which they are attached.

[0004] Metal cupolas are also known in the art. Metal cupolas generally include a plurality of metal panels having turned up edges that are assembled by aligning the turned up edges and thereafter sliding a U-shaped retainer over the joint to hold the panels in position. For example, Nystrom U.S. Pat. No. D413,170 discloses an ornamental design for a metal cupola. Post Jr. Discloses a pre-fabricated cupola and mounting bracket. Forsman et al. Discloses a cupola having and adjustable mount.

[0005] Also known in the art of metal cupolas are panels with snap-fit edges. For example, Coolman U.S. Pat. No. 6,170,206 discloses a cupola roof having panels with snap-fit edges. Each combination cupola roof panel has a female snap-fit edge on one side and a female snap-fit edge on the other side.

[0006] It is also known to combine metal panels and plastic panels into a cupola structure. For example, Wilhelmson discloses a satellite dish housing and roof ventilation device. The device includes panels constructed of radio-frequency transparent material so that television reception is not impaired.

[0007] Another cupola construction known in the art utilizes a roto-molded construction wherein all four sides of the cupola are formed as a single piece. See Van Gilst et al. U.S. Pat. No. 6,422,936.

[0008] Such prior art systems, while working well, have not met all of the needs of manufacturers to provide a product that can be easily manufactured, packaged and shipped or the needs of consumers requiring structural integrity combined with modularity and aesthetic appearance.

[0009] For example, the metal structures of the prior art include numerous sharp edges and are difficult to assemble.

In addition, the thin sheet metal panels are easily bend during shipping and assembly. The combination plastic and metal structures do not include any integrated fasteners and thus require substantial skill as well as numerous tools to assemble. The roto-molded structures do not break down into small components and thus are expensive and difficult to ship.

[0010] In addition, due to the nature of the manufacturing processes utilized for constructing the prior art cupolas, the panel components cannot be formed with the intricate shapes and/or cross sections required for integrated connectors. Therefore, these systems require a substantial number of fasteners in combination with connector members having a specific cross-sectional geometry that facilitate an engagement between the panels to complete the structure.

[0011] Therefore, what is needed in the art is an injection molded modular cupola assembly. The modular cupola assembly should achieve objectives such as lightweight single walled panel construction. The construction of the panels should eliminate the need for additional connectors to create a cupola assembly which resists panel separation, buckling, and racking. The cupola assembly should be capable of withstanding the snow and wind loads typically associated with enclosures. Also, from a convenience standpoint, the cupola assembly should include features constructed to cooperate with lighting and/or fans or other enhancements. In addition, the cupola assembly should include convenience features that allow the cupola to be easily attached to an enclosure.

[0012] There are also commercial considerations that must be satisfied by any viable cupola assembly or kit; considerations which are not entirely satisfied by state of the art products. The cupola assembly must be formed of relatively few component parts that are inexpensive to manufacture by conventional techniques, such as injection molding. The cupola assembly must also be capable of being packaged and shipped in a knocked-down state. In addition, the cupola assembly must be modular and facilitate the creation of a family of cupola assemblies for enclosures that vary in size but which share common, interchangeable components.

[0013] Finally, there are ergonomic needs that a cupola assembly must satisfy in order to achieve acceptance by the end user. The cupola assembly must be easily and quickly assembled using minimal hardware and requiring a minimal number of tools. Further, the cupola assembly must not require excessive strength to assemble or include heavy component parts. Moreover, the cupola assembly must assemble together in such a way so as not to detract from the appearance or function of the resulting enclosure, or otherwise negatively affect the utility of the structure.

[0014] The assignee of the instant invention is also the assignee of various other plastic enclosure systems, U.S. Pat. No. 6,892,497 entitled Plastic Panel Enclosure System, U.S. patent application Ser. No. 10/729,689 filed Dec. 5, 2003, entitled Low Profile Plastic Panel Enclosure, and U.S. patent application Ser. No. 10/674,103 filed Aug. 29, 2003, entitled Plastic Expandable Utility Shed, the contents of which are incorporated herein in their entirety.

BRIEF DESCRIPTION OF THE INVENTION

[0015] The present invention provides a system, or kit, of injection molded panels having integrated connectors which

combine to form a roof mountable cupola. The panels are formed of injection molded plastic to interlock with one another without the need for separate fasteners or connectors. The system incorporates a minimum number of components to construct a cupola by integrally forming the connectors into the injection molded panels. This minimizes the need for separate extruded or molded connectors to assemble the cupola. The integrated connection of the side walls and cover components also simplifies cupola construction. Injection molding allows the panels to be formed with integral cross-bracing, ribs and gussets for increased rigidity when compared to blow molded or extruded panels. The same side wall and cover panel components may be used to create a variety of cupolas and the assembly thereof requires minimal hardware and a minimum number of hand tools.

[0016] The front and rear wall panels have outwardly projecting locking posts for interlocking cooperative engagement with sockets in the left and right side wall panels. The engagement between the locking posts and the sockets serve to rigidly connect the components together. The system further includes a cover which slides into place after the front, rear, left and right wall panels have been fully assembled. The cover may include spring locks for engagement with the side panels or alternatively may be held in place with suitable fasteners. The system is constructed to allow various cover panels to be utilized further increasing the utility of the assembled cupola.

[0017] Accordingly, it is an objective of the present invention to provide a modular cupola assembly having integrated connectors for creating various cupolas using common components.

[0018] A further objective is to provide a modular cupola assembly wherein the panels include integrated connectors accommodated by injection molding plastic formation for increased structural integrity.

[0019] Yet a further objective is to provide a modular cupola assembly in which the side walls and cover panels are integrally interlocked without separate connectors or fasteners.

[0020] Another objective is to provide an cupola assembly constructed of modular panels having a cover panel which allows interchangeability after all other parts are assembled.

[0021] Yet another objective is to provide a kit for a cupola that is capable of being packaged and shipped in a knocked-down state and constructed into a secure cupola upon a desired site.

[0022] Other objectives and advantages of this invention will become apparent from the following description taken in conjunction with the accompanying drawings wherein are set forth, by way of illustration and example, certain embodiments of this invention. The drawings constitute a part of this specification and include exemplary embodiments of the present invention and illustrate various objects and features thereof.

BRIEF DESCRIPTION OF THE FIGURES

[0023] FIG. 1 is a perspective view of one embodiment of the cupola assembly;

[0024] FIG. 2 is a perspective view of the inner surface of a wall panel utilized in the instant invention;

[0025] FIG. 3 is a perspective view of the front and rear panels of embodiment shown in FIG. 1;

[0026] FIG. 4 is a perspective exploded view of the wall panels utilized in the instant invention;

[0027] FIG. 5 is a bottom view of one embodiment of the top panel utilized in the instant invention;

[0028] FIG. 6 is a perspective view illustrating assembly of the top panel;

[0029] FIG. 7 is front plan view of the instant invention;

[0030] FIG. 8 is a section view taken along line 1-1 of the cupola embodiment shown in FIG. 7 illustrating the cooperative engagement between the side panels and cover panel;

[0031] FIG. 9 is a side plan view of the instant invention;

[0032] FIG. 10 is a section view taken along line 2-2 of the cupola embodiment shown in FIG. 9 illustrating the cooperative engagement between the side panels and cover panel;

[0033] FIG. 11 is a perspective view illustrating the instant invention in a shipping configuration.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0034] While the present invention is susceptible of embodiment in various forms, there is shown in the drawings and will hereinafter be described a presently preferred embodiment with the understanding that the present disclosure is to be considered an exemplification of the invention and is not intended to limit the invention to the specific embodiments illustrated.

[0035] FIGS. 1-10 which are now referenced illustrate perspective, exploded and sectioned views of the cupola assembly and kit therefor, generally referenced as 100, according to a preferred embodiment of the present invention. The cupola assembly is made up of substantially like-constructed left wall panel and right side panel 200, substantially like constructed rear side panel and front side panel 300 and cover panel 400. In the preferred embodiment, the panels comprising the assembly are formed of but not limited to a suitable plastic such as polystyrene, polypropylene, polyvinyl chloride, polyethylene or the like, through the process of injection molding. The result is that the side and cover panels comprising the cupola assembly 100 are formed as unitary panels with integral connectors, and cross bracing. Strengthening ribs 202 and gussets 204 are formed within the inner surfaces of the side panels 200, 300 and cover panel 400 in order to enhance rigidity of the panels while leaving the external surface in a generally smooth condition for aesthetic purposes, as shown in FIG. 1.

[0036] Referring to FIG. 2, the inner surface 302 of the front and rear side panels 300 is shown. The front and rear side panels 300 are each configured having a first end 308 and a second end 312. Both ends 308, 312 include an integrally formed first attachment means illustrated as at least one outwardly extending attachment post 310. The attachment posts 310 are generally constructed and arranged to cooperate with inwardly extending sockets 208 provided in either end of the left and right panels 200. The top surface 314 includes a second attachment means illustrated herein as one side of an upwardly extending boss 316. When all four side panels are assembled the boss 316 is constructed and

arranged to cooperate with a socket **408** (FIG. 5) that extends around the perimeter of the lower surface of the cover panel **400**.

[0037] Referring to FIG. 4, the left and right side panels **200** are shown. The left and right side panels include a top surface **205**, bottom surface **206**, first end **210** and second end **212**. Adjacent to each of the first and second edges **210**, **212** is a means of attaching the left and right side panels **200** to the front and rear side panels **300** illustrated herein as a plurality of integrally formed sockets **216** extending downwardly from about the top surface **205** to about the bottom surface **206**. The formed sockets **216** are constructed and arranged to cooperate with locking posts **310** extending outwardly along the first and second edges **308**, **312** of the front and rear side panels **300**. The locking posts **310** and sockets **216** are constructed and arranged so that the locking posts **310** enter and mateably engage the sockets **216** securing the panels together in an inter-fitting engagement with their respective outer surfaces in a perpendicular arrangement.

[0038] Referring to FIG. 5, the bottom surface of the cover panel **400** is illustrated. The bottom surface of the cover panel **400** is constructed with a socket **408** extending around the perimeter of the bottom surface **402**. The socket **408** is constructed and arranged to cooperate with the boss **316** (FIG. 4) extending upwardly from the top surfaces of the front, back, and side panels. The boss **316** and socket **408** arrangement increases the structural integrity of the cupola assembly **100** by preventing the panels **200**, **300** from bowing or bending inwardly or outwardly, and thus, adversely affecting the appearance or operation of the cupola **100**.

[0039] Referring to FIGS. 1-10, the outer surface of the side panels **200**, **300** are constructed generally smooth having a plurality of inwardly bowed grooves **218** for added strength and aesthetic appearance. In an alternative embodiment, a portion of each groove includes an elongated aperture (not shown). In this embodiment, the apertures are constructed and arranged to allow air to flow through the cupola for ventilation of the structure to which it is attached as is well known in the art. The inside surface of the side panels **200**, **300** are constructed with a plurality of integrally formed strengthening ribs **202** extending across the panels with a portion of the ribs **202** being provided with a plurality of gussets **204** to further strengthen the panels. The ribs **202** and gussets **204** increase the structural integrity of the cupola **100** by preventing the side panels **200**, **300** from bowing or bending inwardly or outwardly, and thus, adversely affecting the appearance or operation of the cupola **100**. The integrally formed ribs **202** and gussets **204** are facilitated by injection molding. Injection molding offers significant strength and stability advantages over cupola constructions utilized in the prior art. In this manner the cupola assembly of the instant invention is capable of handling a significant amount of snow and wind loads.

[0040] Referring to FIG. 4, the left and right side panels **200** are attached to the front and rear panels **300** by inserting the locking posts **310** into sockets **216** until the spring tabs **318** integrally formed onto the locking posts **310** engage the apertures **220** integrally formed into the sockets **216** of the left and right side panels **200**. It will be appreciated that the purpose of the locking posts **310** are to align two panels in

a perpendicular relationship and to facilitate their mechanical connection. The perpendicular panels are brought into an overlapping relationship wherein the contoured locking posts **310** enter the corresponding socket **216** in the left and right panels **200**. The result is a mechanically secure connection between the two panels. The overlapping edges between the panels as described above provides a secure connection and offers several advantages. First, the design allows the panels to be connected without the need for separate connectors. Second, the design creates a positive lock that prevents separation of the panels. Third, the design maintains alignment of the panels and prevents bowing or bending of either panel relative to one another. The resultant cupola assembly created by the combination of the interlocking panels benefits from high structural integrity and reliable operation.

[0041] Referring to FIG. 6, the side panels **200**, **300** are attached to the cover panel **400** by sliding the boss **316** formed along the top edges **205**, **314** of the assembled side panels into the corresponding socket **408** integrally formed into the bottom surface of the cover panel. The socket **408** in the cover panel **400** corresponds in shape and size to that of the boss **316**. In one embodiment spring tabs **318** integrally formed onto the boss **316** align with apertures **220** in the socket **408** to engage the cover panel to the side panels **200** and **300**. In an alternative embodiment self threading fasteners (not shown) are inserted through apertures **220** for engagement a side surface **410** of the cover socket. The result of either embodiment is a positive mechanical connection between the side panels **200**, **300**, and the cover panel **400**.

[0042] Referring to FIG. 11, the kit for assembling a cupola is illustrated in a knocked-down configuration. Within this compact configuration the cupola may be packaged, shipped and stored more economically than prior art cupolas.

[0043] All patents and publications mentioned in this specification are indicative of the levels of those skilled in the art to which the invention pertains. All patents and publications are herein incorporated by reference to the same extent as if each individual publication was specifically and individually indicated to be incorporated by reference.

[0044] It is to be understood that while a certain form of the invention is illustrated, it is not to be limited to the specific form or arrangement herein described and shown. It will be apparent to those skilled in the art that various changes may be made without departing from the scope of the invention and the invention is not to be considered limited to what is shown and described in the specification.

[0045] One skilled in the art will readily appreciate that the present invention is well adapted to carry out the objectives and obtain the ends and advantages mentioned, as well as those inherent therein. The embodiments, methods, procedures and techniques described herein are presently representative of the preferred embodiments, are intended to be exemplary and are not intended as limitations on the scope. Changes therein and other uses will occur to those skilled in the art which are encompassed within the spirit of the invention and are defined by the scope of the appended claims. Although the invention has been described in connection with specific preferred embodiments, it should be

understood that the invention as claimed should not be unduly limited to such specific embodiments. Indeed, various modifications of the described modes for carrying out the invention which are obvious to those skilled in the art are intended to be within the scope of the following claims.

What is claimed is:

1. A kit for a cupola assembly comprising:
 - a left side panel for enclosing the left side of said cupola assembly, said left side panel including a first edge and a second edge, said first and said second edges including an integrally formed first means for connecting to adjacently positioned panel members;
 - a right side panel for enclosing the right side of said cupola assembly, said right side panel including a first edge and a second edge, said first and said second edges including an integrally formed first means for connecting to adjacently positioned panel members;
 - a rear side panel for enclosing the back of said cupola assembly, said rear side panel including a first edge and a second edge, said first and said second edges including an integrally formed first means for connecting to adjacently positioned panel members;
 - a front panel for enclosing the front of said cupola assembly, said front side panel including a first edge and a second edge, said first and said second edges including an integrally formed first means for connecting to adjacently positioned panel members;
 - a cover panel for enclosing the top of said cupola assembly; wherein said cupola assembly can be shipped in a disassembled compact configuration and assembled on a desired site.
2. The kit for a cupola assembly of claim 1 wherein said left and said right side panel each include a top surface, each said top surface having a second means of connecting for securing said cover panel to said top surface.
3. The kit for a cupola assembly of claim 2 wherein said second means of connecting includes at least one upwardly extending boss, wherein said at least one boss is constructed and arranged to cooperate with a socket integrally formed into a bottom surface of said cover panel, wherein said cover panel is secured in interlocking engagement with said left side panel and said right side panel.
4. The kit for a cupola assembly of claim 1 wherein said left side panel, said right side panel, said front side panel and said rear side panel each include a top surface, each said top surface having a second means of connecting for securing said cover panel to said top surface.
5. The kit for a cupola assembly of claim 4 wherein said second means of connecting includes at least one upwardly extending boss, wherein a portion of said at least one boss is formed by said left said panel, said right side panel, said front side panel and said rear side panel, wherein said at least one boss constructed and arranged to cooperate with a socket integrally formed into a bottom surface of said cover panel, wherein said cover panel is secured in interlocking engagement with said left side panel, said right side panel, said front side panel and said rear side panel.
6. The kit for a cupola assembly of claim 4 wherein said first means for connecting includes at least one integrally formed locking post extending outwardly from each of said first and said second edges of said front side panel and said rear side panel, wherein said first and said second edges of said front side panel and said rear side panel each include at least one inwardly extending socket, wherein said side panels are positioned substantially perpendicular with respect to each other and wherein said at least one locking post of said front and said rear side panel are constructed and arranged to enter a corresponding socket of an adjacently positioned left or right side panel resulting in a mechanically secure connection therebetween.
7. The kit for a cupola assembly of claim 6 wherein said first and said second edges of said front and said rear side panels include at least two of said locking posts arranged in a linear fashion along said first and said second edges, wherein said right side panel and said left side panel include at least two said sockets arranged in a linear fashion along said first and said second edges thereof.
8. The kit for a cupola assembly of claim 6 wherein each of said at least one locking post includes at least one spring lock integrally formed thereto, wherein said at least one spring lock is constructed and arranged to interlock with an adjacently positioned front side panel or rear side panel to provide a secure connection therebetween.
9. The kit for a cupola assembly of claim 8 wherein said front and said rear side panels include at least one aperture positioned to cooperate with said at least one spring lock, wherein said at least one spring lock enters and engages said at least one aperture for interlocking engagement between two substantially perpendicular side panels.
10. The kit for a cupola assembly of claim 1 wherein left side panel and said right side panel are substantially similar in construction.
11. The kit for a cupola assembly of claim 1 wherein left side panel and said right side panel are identical in construction.
12. The kit for a cupola assembly of claim 1 wherein front side panel and said rear side panel are substantially similar in construction.
13. The kit for a cupola assembly of claim 1 wherein left side panel and said right side panel are identical in construction.
14. The kit for a cupola assembly of claim 1 wherein at least one of said left side panel, said right side panel, said front side panel and said rear side panel include a means for ventilating a structure to which said cupola is attached.
15. The kit for a cupola assembly of claim 14 wherein said means for ventilating includes a plurality of apertures extending through said at least one panel, whereby air is free to flow into and out of said cupola.
16. A kit for assembling a cupola comprising:
 - a left side panel, a right side panel, a front side panel, a rear side panel and a cover panel, wherein each said panel includes connectors integrally formed thereto for assembling said cupola without additional fasteners, wherein said cupola may be shipped in a disassembled compact state and wherein said cupola may be snapped together at a desired site.
17. A cupola assembly comprising:
 - a left side panel having monolithic construction including:
 - a first end having a first means of connecting for interlocking cooperation with a second end of a front side panel in a substantially perpendicular relationship;

- a second end having said first means of connecting for interlocking cooperation with a first end of a rear side panel in a substantially perpendicular relationship;
- a top edge having a second means of connecting for interlocking cooperation with a cover panel;
- a bottom edge having a depending lip constructed and arranged to accept fasteners for attaching said cupola to a building structure;
- an inner surface;
- an outer surface;
- a right side panel having monolithic construction including;
 - a first end having said first means of connecting for interlocking cooperation with a second end of said rear side panel in a substantially perpendicular relationship;
 - a second end having said first means of connecting for interlocking cooperation with a first end of said front side panel in a substantially perpendicular relationship;
 - a bottom edge having a depending lip constructed and arranged to accept fasteners for attaching said cupola to a building structure;
 - an inner surface;
 - an outer surface;
- a front side panel having monolithic construction including;
 - a first end having said first means of connecting for interlocking cooperation with said second end of said right side panel in a substantially perpendicular relationship;
 - a second end having said first means of connecting for interlocking cooperation with said first end of said right side panel in a substantially perpendicular relationship;

- a bottom edge having a depending lip constructed and arranged to accept fasteners for attaching said cupola to a building structure;
- an inner surface;
- an outer surface;
- a rear side panel having monolithic construction including;
 - a first end having said first means of connecting for interlocking cooperation with said second end of said right side panel in a substantially perpendicular relationship;
 - a second end having said first means of connecting for interlocking cooperation with said first end of said right side panel in a substantially perpendicular relationship;
 - a bottom edge having a depending lip constructed and arranged to accept fasteners for attaching said cupola to a building structure;
 - an inner surface;
 - an outer surface;
- wherein said cupola may be shipped in a disassembled compact state and wherein said cupola may be snapped together at a desired site.

18. The cupola assembly of claim 17 wherein said inner surface of said left side panel, said right side panel, said front side panel and said rear side panel each include at least one rib extending at least partially across said inner surface, wherein said at least one rib increases the structural integrity of said cupola by inhibiting said panels from bowing or bending inwardly or outwardly.

19. The cupola assembly of claim 17 wherein said inner surface of said left side panel, said right side panel, said front side panel and said rear side panel each include at least one gusset extending between said inner surface and said at least one rib, wherein said at least one gusset increases the structural integrity of said cupola by inhibiting said panels from bowing or bending inwardly or outwardly.

* * * * *