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(54) **Modular play house connector**

(57) A modular play house connector unit comprises a plurality of sockets (111-117), each arranged to receive a rod (201,202). The connector unit also comprises at least one slot (130) for retaining a sheet (300). In use, a frame structure is assembled from a plurality of connectors and rods and one or more sheets are draped over the frame structure to form a play house. The sheet is retained in close correspondence with the shape of the frame structure by inserting the sheet fabric into the slots in the connectors, thus allowing the sheet to from walls and a roof without having a baggy appearance.

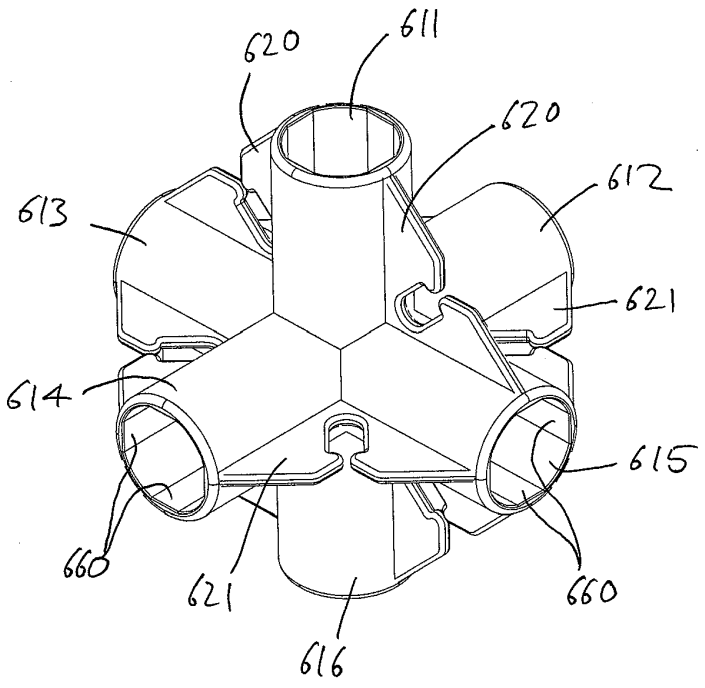


Fig. 6e

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Description

[0001] The invention relates to a connector component of a modular play house, a kit for forming a modular play house and a modular play house.

[0002] Play houses, such as wendy houses of various sorts have been known for a long time. A typical play house is formed from a support frame and a shaped fabric cover. The frame is often provided in a dismantled form and is made up of rods and connectors. The rods are fitted into the connectors in accordance with instructions to form the required shape for the fabric cover. The shaped fabric cover surrounds the frame so as to provide an enclosed (or substantially enclosed) space. The cover may be decorated in various ways, e.g. illustrating a roof, walls, doors and/or windows. Windows and doors may also be formed from transparent fabric and may be made openable via zips or other releasable fasteners. The cover is typically formed from a number of fabric panels, sewn or otherwise fastened together to form the desired shape.

[0003] The frame of such play houses is typically formed from a number of rods of various lengths and a number of connectors designed to connect the rods together into the desired shape. Although connectors may accept rods of different lengths into the various sockets, the rods and connectors must be connected in a specific arrangement in order to fit the cover. The shape of the cover cannot be altered. These play houses therefore do not have any flexibility and do not allow creativity in designing different play houses. Further, loss or damage of any of the pieces (e.g. rods or connectors) is likely to render the play house unusable.

[0004] Some modular play houses have been designed in which the shape of the frame structure can be varied. One such system is provided in US patent number 4212130 in which three different shapes of panel are connectable to each other or to a table-like structure formed from the box by various connectors. This design allows flexibility in construction and allows more creativity in designing different structures. However the panel based system is relatively heavy and the number of different shapes and types of panel and connector make the structure relatively complicated.

[0005] Other more heavy duty play houses have been designed for outdoor use based on rods and connectors to form the frame structure and panels fitted in between the various rods to form walls and roof, etc. Because the structure is formed for outdoor use, it is heavier duty and the rods must be connected together using tools. The kit as a whole is also very heavy.

[0006] According to one aspect, the invention provides a modular play house connector unit, comprising a plurality of sockets, each socket arranged to receive a rod, and the connector unit comprising at least one retaining means for retaining a sheet.

[0007] The retaining means may be any suitable device or arrangement for retaining the fabric of the sheet, for example it may clamp or grip the sheet. The retaining means may be an active retainer, e.g. a hinged and/or sprung clip or it may be a passive retainer such as a constriction through which the sheet is forced. The retaining means preferably retains the sheet through friction between the sheet and the retaining means. The retaining means is preferably a narrow slot arranged to grip the sheet when the sheet is inserted into the slot. The slot may comprise a narrow opening leading to a wider receiving section. As the sheet is passed through the narrow opening into the wider receiving section, the sheet can expand into the receiving section, thereby providing resistance to removal of the sheet. In use, this resistance holds the sheet in place on the connector, and thereby holds the sheet in close correspondence to the play house frame shape. The narrow opening is preferably a narrow enough constriction that it grips the sheet between the sides of the opening when the sheet is inserted therethrough.

[0008] In some preferred embodiments, the slot may be formed in the shape of an arrow. The narrow opening forms the shaft of the arrow and the wider receiving section forms the head of the arrow. The arrow shape further acts as a visual indicator as to the direction in which the fabric of the sheet should be inserted. The head of the arrow (i.e. the retaining section of the slot) may be formed in the shape of a triangle, with the shaft (i.e. the opening section of the slot) extending away from the centre of one of the sides of the triangle.

[0009] The connector or portion thereof from which the retaining means is formed may be manufactured from a resiliently deformable material, such as ABS, polyethylene or polypropylene, which enables the narrow portion, where provided, of the slot to be resiliently deformed during insertion of the sheet, and to grip the sheet once it has been inserted.

[0010] The narrow opening is preferably sufficiently narrow that it grips the sheet when inserted into the slot. The width of the narrow opening will depend on the thickness of the sheet, but it is preferably less than 3 mm wide. In some embodiments there is no separation between the sides of the opening (i.e. the sides are in contact with each other) so as to strongly grip the fabric inserted therebetween. The width of the wider retaining section is preferably not more than 5 mm to avoid the risk of finger entrapment.

[0011] The connector may comprise one or more support plates connecting between two sockets of the connector. The plates may be generally planar. The plates provide structural support to the connector, resisting bending of the connector. The plates thus help to hold the sockets of the connector in the desired orientation and thus maintain good shape structure of the frames which are constructed using the connectors and rods. The support plates also make the connector as a whole more rounded, i.e. the sockets do not form sharp projections. This makes the connector more child friendly and less likely to cause injury.

[0012] In preferred embodiments, the retaining means may be provided on the support plates. Preferably, the retaining means takes the form of slots formed in the support plates.

[0013] The connector may comprise two or more sockets. The relative orientation of the sockets defines the relative orientation of rods inserted into the sockets and thus allows frames of different shapes to be constructed. For simple frame structures, relative orientations of multiples of 45 degrees are often used, e.g. the connector may provide sockets at 45, 90, 135 and/or 180 degrees relative orientation.

[0014] Where more than two sockets are provided, more than two relative orientations can be provided. For example, three sockets may be arranged all in the same plane, with an angle of 45 degrees between the first and second sockets and an angle of 90 degrees between the second and third sockets. This arrangement allows rods to be connected together at relative orientations of 45 degrees (using first and second sockets), 90 degrees (using second and third sockets) or 135 degrees (using first and third sockets).

[0015] The connector may provide sockets which are coplanar (as described above) or non-coplanar. Non-coplanar sockets allow further flexibility of frame construction. For example, three sockets may be provided, all at 90 degrees to each other, i.e. directed along mutually orthogonal axes. This type of connector allows rods to be connected together in a variety of three-dimensional shapes, with all rods parallel to cartesian axes. Alternatively, the connector may have three sockets which are not mutually orthogonal, but have one of the sockets disposed at 45 degrees to a cartesian axis. With such connecters, structures may be formed in three dimensions, but with rods extending diagonally. This provides further flexibility and allows further creativity in frame construction.

[0016] In further preferred embodiments, the connector may comprise a greater number of sockets. The connector may comprise at least three, preferably four coplanar sockets, each separated by 90 degrees. The connector may further comprise a socket directed normal to the plane of said three or four co-planar sockets so as to provide greater three-dimensional flexibility. The connector may comprise a socket disposed at 45 degrees to one of the other sockets. Preferably the connector comprises a socket disposed at 45 degrees to two of the other sockets. This 45 degree socket may be provided within the plane of said three or four coplanar sockets or it may be provided between one of the coplanar sockets and the socket normal to the plane.

[0017] In the most preferred embodiments, the connector is provided with six sockets each pointing along three mutually orthogonal axes, i.e. with one socket pointing in each of the positive and negative directions along each of the three cartesian axes. Such a connector provides great flexibility of three dimensional frame construction as the connector provides a large choice of relative rod orientations. Preferably, the connector further comprises a socket disposed at 45 degrees to one of the other sockets. More preferably, the connector is disposed at 45 degrees to two of the other sockets. Such a connector provides yet further flexibility with yet further relative rod orientations for frame construction.

[0018] One significant advantage of the above connector configurations is that one connector type may be provided in large numbers. It is not necessary to provide several different types of connector for frame construction as the same connector unit can be used to interface rods at any position within the frame structure. This simplifies manufacturing cost as only one unit is required. It also provides for faster and easier frame construction as the same unit is used at each connection, i.e. it is not necessary to find a particular shape of connector for the desired connection as all connector units are capable of providing all possible connections. A further advantage is that, in a kit of rods and connectors, if a connector unit gets lost or damaged, the usability of the kit is not so greatly affected as all of the identical connector units can still be used in any frame joint.

[0019] Support plates as described above may be provided between each pair of connector sockets. However, when a larger number of sockets are present, a full set of support plates is not necessary. In preferred embodiments, support plates are provided in two planes. Thus in the above described arrangements, a connector with three or four coplanar sockets, lying in a first plane, and at least one socket normal to the first plane would be provided with support plates between each pair of connectors in the first plane and the socket normal to the plane would be provided with two coplanar (in a second plane) support plates connecting it to sockets in the first plane. The first and second planes are orthogonal to each other. Support plates in a third plane orthogonal to both the first and second planes are not necessary as sufficient support is provided by support plates in the first and second planes.

[0020] Preferably each socket in the connector has a backstop which determines the maximum depth of insertion of a rod. The backstop makes it easy for the user to tell when a rod has been fully inserted as it will not go any deeper into the connector. The backstop also provides accurate frame construction as when rods are inserted to the backstop, all connectors will be separated by a well defined distance. This is important to ensure that parallel rods in the frame structure are truly parallel and perpendicular rods are truly perpendicular. Rods connecting at a 45 degree angle to two other rods will need to have a greater length than the other two rods, with a ratio of about the square root of two. The backstops of the 45 degree sockets must therefore be set so as to ensure that the ends of these rods are fully inserted in their respective sockets when they are at exactly the right angle. Depending on the exact construction, the diagonal rods may be made slightly longer or shorter than the ideal ratio of the square root of two, with the variation being

accommodated by the position of the backstop in the 45 degree connectors.

[0021] In a particularly preferred embodiment, all the sockets of the connector unit are fluidly connected to a central chamber of the connector. This means that as rods are inserted into any of the sockets, air can be displaced through any of the other sockets, thus making it easier to insert the rods.

[0022] In preferred embodiments, the connector may comprise at least four coplanar sockets separated by 90 degrees and the backstop may be formed in the central chamber. As the sockets all open onto the central chamber, a single backstop may be used to define the insertion length of all sockets. The backstop may be formed in the shape of a cross with four legs, one directed towards each of the four coplanar sockets. Each of the four legs serves as a backstop for one socket. If further sockets are provided normal to the plane of the coplanar sockets, the cross shaped backstop can be provided with sufficient width that it acts as backstop to these sockets too. Rods inserted into these sockets will abut against the side of the cross shaped backstop, i.e. the rods will abut against the sides of all four legs of the backstop. If an additional socket is provided in the same plane as the four coplanar sockets, but at 45 degrees to two of those sockets, a fifth leg may be added to the cross shaped backstop in the direction of the additional socket, i.e. a leg at 45 degrees to two of the other legs. As described above, the length of the additional leg is determined by the geometry and the length of the rods.

[0023] In alternative embodiments, each socket may have its own backstop. These may take any form which defines an insertion distance for the rods, but in some preferred embodiments, these comprise at least one, preferably two projections extending radially inwardly from the inner surface of the socket.

[0024] The rods may be solid, but it is preferred that they are formed as hollow tubes so as to minimize weight and material cost. The tubes may have closed or open ends. If they have open ends, bungs may be inserted into the open ends so as to close them. Closing the ends can make the rods have an overall smoother shape and makes it more difficult for a child to get its finger stuck inside. Alternatively, the tubes may be left open at the ends which allows fluid displacement through the tubes, allowing for easy insertion and removal and also reduces the weight of the tubes.

[0025] If the rods are open ended, backstops in the connector must be formed so as to engage with the sides of the rods. For example a cross shaped backstop as described above must have legs of sufficient width to engage the sides of the rods. The legs are preferably at least as wide as the external diameter of the rods. The legs may be formed to be continuous with frictional engagement ribs inside the sockets as described above.

[0026] According to another aspect the invention provides a modular play house kit comprising a plurality of rods, a plurality of connectors as described above for connecting a plurality of rods together to form a frame structure, and a planar sheet for draping over the frame structure.

[0027] In use, the rods and connectors can be assembled into a frame structure of whatever shape is desired. The planar sheet does not have a predetermined shape which determines a required shape of the frame structure. Therefore a great flexability and versatility is provided which encourages creativity during play. Once a frame structure of the desired shape has been constructed, the planar sheet can simply be draped over the structure so as to provide walls and a roof and hence provide a play house. To ensure a close correspondence between the sheet and the frame structure, the sheet can be attached to the retaining means of the connectors so as to hold it in place. In preferred embodiments the retaining means take the form of slots as described above. The sheet can be inserted into the slots so that there is very little slack along the main walls of the structure, thus ensuring a close correspondence between the covering and the frame structure. If desired, the sheet can also be tucked underneath the bottom of the frame structure.

[0028] In preferred embodiments, the sheet for use with the invention is a simple shape such as a circle or a rectangle. Other polygonal shapes could also be used and may be desirable for certain types of structure. When the planar sheet is laid flat, the outer edge of the sheet is preferably a convex shape or a substantially convex shape, i.e. providing a relatively large and continuous covering which can be draped over a variety of frame structures and still reach down to the ground on all sides.

[0029] Preferably the kit comprises rods of two different lengths, with one length being the hypotenuse of a right angled triangle formed from two rods of the other length. The longer rod can thus be used together with shorter rods to form triangular structures. The two lengths of rods can be used to form squares and rectangles. Preferably the rods have the same diameter so that they can both be fitted into a single sized socket of the connectors. The rods may be of any cross section, e.g. they may be square, but they are preferably circular in cross section, thus forming circular-cylindrical rods. The rods may be solid, but are preferably hollow. Hollow rods may be open or closed at the ends. Open ends may be closed by insertion of a cap or bung so as to provide more rounded ends.

[0030] The cap or bung may be an elastomeric (e.g. rubber) cap or bung. The cap or bung may extend in the longitudinal (axial) direction of the rod a certain distance so as to provide for increased friction between the end of the rod and the connector. Preferably the size and materials are selected such that axial movement of the rod into and out of the socket will meet with relatively little frictional resistance so that the two components can be easily joined and separated by hand, while when a non-axial force is applied to the rod, the elastomeric material is forced harder against the inside of the socket, increasing the friction therebetween and thus resisting separa-

tion of the two components. This arrangement is particularly useful as the frame structure of a children's toy is likely to be subject to non-axial movement during play, e.g. when a child pushes or leans on the structure. At such times, the connectors and rods should remain locked together.

[0031] In other alternative arrangements, the rods may be secured to the connectors via other mechanisms, e.g. via bayonet or twist-lock mechanisms where projections on the rod or socket connect via a twisting action with corresponding receiving apertures in the other of the rod and socket, or via push-and-click connectors where a pin on one part engages with a corresponding receiving hole in the other part (typically a radially projecting pin at the end of the rod engages with a radial hole in the inside of the socket).

[0032] Preferably the rods are hollow tubes with an external diameter of at least 15 mm. Preferably the rods have an internal diameter of at least 12 mm. In alternative embodiments, the rods may have an internal diameter of less than 5 mm. These limits exclude the range of holes most likely to entrap a child's finger.

[0033] Preferably one of the rods and the connectors comprises one or more ribs projecting towards the other of the rods and the connectors for providing a frictional engagement between the rods and the connectors when the rods are inserted into the connectors. For example the rods may have ribs formed on the outer surface, i.e. portions of increased diameter which engage with the inside surface of the connector sockets. However preferably the rods have a smooth outer surface and the ribs are formed in the inside surface of the connector sockets, i.e. providing portions of reduced internal diameter. Preferably the ribs extend longitudinally with respect to the rods and the axis of the socket.

[0034] Any number of ribs may be provided so as to provide the necessary frictional contact between sockets and rods. If the ribs are longitudinally extending, preferably at least two ribs are provided so as to centre the rod within the socket. If a plurality of ribs are provided, they are preferably spaced evenly around the circumference of the rod. In a preferred embodiment, four ribs are provided.

[0035] The ribs preferably have a small contact surface area. The contact surface area of the ribs should provide sufficient friction to prevent accidental disengagement of the rods and the connectors, but low enough friction that it is still relatively easy for a child to disengage the rods and the connectors by hand.

[0036] In alternative embodiments, The contact surface area may be provided by areas of reduced diameter in the socket which do not necessarily project to form ribs. These may be formed by flats in the inner surface of the socket. For example, a circular socket may have at least one area of the side wall flattened so as to reduce the diameter in that area. A plurality of such flats may be provided as described above in relation to ribs.

[0037] The sheet may be a continuous uninterrupted area, but in some embodiments it may have holes formed in it. The holes prevent the sheet from being a suffocation hazard. There may be at least two holes. The holes may have a total area of at least 650 square millimetres.

[0038] The invention also extends to a play house made from a kit as described above. Therefore according to a further aspect, the invention provides a play house, comprising: a plurality of rods, a plurality of connectors connecting a plurality of rods together to form a frame structure, each connector comprising at least one retaining means for retaining a sheet, and a planar sheet draped over the frame structure and held within one or more of the retaining means.

[0039] The planar sheet of the play house is preferably removably held at a plurality of places by a plurality of retaining means.

[0040] According to a further aspect, the invention provides a method of assembling a play house, comprising: connecting a plurality of rods together with a plurality of connectors as described above to form a frame structure, draping a sheet over the frame structure, and removably attaching the sheet to the frame structure using one or more retaining means of the plurality of connectors.

[0041] Preferred embodiments of the invention will now be described, by way of example only, and with reference to the accompanying drawings in which:

Fig. 1 a shows a plan view of a connector unit according to a first embodiment;
Fig. 1b shows a side elevation of the connector unit of Fig. 1 a;
Fig. 1c shows a front elevation of the connector unit of Fig. 1 a;
Fig. 1d shows a front elevation cross sectional view of the connector unit of Fig. 1a;
Fig. 1e shows an isometric view of the connector unit of Fig. 1 a;
Fig. 1f shows an isometric cross section view of the connector unit of Fig. 1a;
Fig. 2 illustrates rods;
Fig. 3 shows a frame construction made from connectors and rods;
Figs. 4a to 4g illustrate a number of different frame constructions that can be made from a particular kit;
Fig. 5 shows a planar sheet for covering the frame structures; and
Figs. 6a-f show various views of a connector unit according to a second embodiment.

[0042] A first embodiment of a connector unit which forms one of the basic structural elements of the modular play house of this invention is illustrated in Figs. 1a-1f in various views and cross-sections.

[0043] The connector 100 comprises seven connector sockets 111-117, each designed to receive a rod 201 or 202. The rods 201 and 202 are illustrated in Figs. 2a and 2b. Rod 201 is longer than rod 202. The long rod 201 has a length of 756 mm and an external diameter of 15

mm. The short rod 202 has a length of 545 mm and an external diameter of 15 mm. The rods have a length ratio of approximately the square root of two so that a long rod 201 can form an isoceles right angled triangle with two short rods 202. It will be seen that the long rod 201 is actually slightly shorter than would be provided by this ratio, but that extra length is accommodated by the backstop as described later.

[0044] Both the long rod and the short rod are formed as hollow circular-cylindrical tubes with a wall thickness of about 1.2 mm. This makes the internal diameter of the tube greater than 12 mm which is large enough to avoid a child's finger getting trapped inside.

[0045] As shown in Fig. 2c, an elastomeric cap or bung 203 is inserted into each end of each rod 201, 202. The elastomeric cap or bung 203 provides increased friction between the rod 201, 202 and the connector 100, particularly when the rod 201, 202 is forced in a non-axial direction, providing a torque between the rod 201, 202 and the connector 100. This increased friction resists separation of the components when under such forces and reduces the chance of accidental or unintended separation of the components.

[0046] It will be appreciated that the dimensions provided here are illustrative and not limiting. The rods and connectors could be manufactured in a wide variety of sizes.

[0047] The connector 100 has six sockets 111 to 116 which are directed along cartesian axes. That is the angles between these six sockets are 90 degrees or 180 degrees. These sockets provide for square or rectangular frame construction. Connector 100 has one (and only one) socket 117 formed at 45 degrees to the other sockets. In this embodiment, the socket 117 is formed at 45 degrees to each of sockets 113 and 116. Socket 117 is coplanar with sockets 113, 116, 111 and 115, while sockets 112 and 114 are normal to that plane (and extending in opposite directions). The off-axis socket 117 allows greater flexibility in frame construction as it allows diagonal components to be incorporated into the frame. Two connectors 100, placed at opposite ends of a diagonal rod can connect that diagonal rod into a generally square or rectangular framework.

[0048] The connector 100 is provided with only a single off-axis socket 117 as further off-axis sockets are generally unnecessary. Further off-axis sockets could be incorporated into the connector 100 in other embodiments where even greater flexibility of construction is required, but for most small play houses with limited space and a limited quantity of structural parts, a connector with a single off-axis socket 117 provides a great amount of creative freedom. Further off-axis sockets would add to the complexity of the connector part 100 and could make the system less attractive to smaller children.

[0049] To make the connector 100 more rigid, support plates 120, 121 are provided in between various sockets. Support plates 120 are provided in a first plane (a plane containing the off-axis socket 117 and four other sockets 111, 113, 115, 116), while support plates 121 are provided in a second plane perpendicular to the first plane and containing sockets 111, 112, 114 and 116. A third plane (perpendicular to the first and second planes) can be defined by sockets 112, 113, 114 and 115, but no support plates are provided between these sockets as it is found that they are unnecessary. These extra support plates could be provided in alternative embodiments where further support is required. In the embodiment shown, the support plates 120 and 121 are found to provide ample ridigity to the connector structure and prevent it form being deformed or damaged easily. They also ensure that every socket 111-117 is attached to at least two other sockets via two support plates 120, 121. Thus none of the sockets 111-117 protrude on their own and therefore do not provide sharp extensions to the connector. This reduces the chance of injury from the connector unit.

[0050] Within the support plates 120, 121, slots 130 are formed. Each slot 130 is formed from a narrow portion 131 which is open to the outside and a wide portion 132 which is accessed through the narrow portion 131. In a first embodiment, shown in Figs. 1a-1f, the narrow portion 131 and the wide portion 132 together form an arrow shape.

[0051] The slots 130 are provided for retaining a sheet 300 (depicted in Fig. 5) which is draped over the assembled frame structure. The sheet 300 is inserted into the slots 130 of a number of connectors 100 so as to keep the sheet 300 in close contact with the frame structure. The sheet 300 thereby forms walls and a roof of the play house and can conform to the shape of the frame structure without having a baggy appearance.

[0052] In use, a portion of the sheet 300 is inserted through the narrow portion 131 of the slot 130 and expands into the wide portion 132. As the sheet 300 expands into the wide portion it is retained by the rear of the arrow head which forms barbs resisting the withdrawal of the sheet 300. The slots 130 provide enough friction to hold the sheet 300 in place against the frame structure while still allowing the sheet 300 to be easily removed from the slots 130 for disassembly.

[0053] It can be seen that, in the embodiment shown, slots 130 are formed in all of the support plates 120, 121 except those connecting the off-axis socket 117 to its adjacent sockets 113, 116 as there is not enough room for slots 130 in this size of connector 100. However it will be appreciated that in larger connectors 100, or with smaller slots 130, these support plates could also be provided with slots 130. Similarly, it will be appreciated that in other embodiments, slots 130 need not be provided in every other support plate (i.e. support plates other than those connecting socket 117 to sockets 113 and 116). However for maximum versatility, this embodiment provides the maximum possible number of slots 130.

[0054] Inside the connecter 100, each of the sockets 111-117 is fluidly connected to a central chamber 140. The fluid connection allows air to move easily between sockets 111-117. Therefore if closed rods are used with

the connector 100, air can easily be displaced and will not resist the insertion of the rod.

[0055] In the central chamber 140, a backstop structure 150 is provided. The backstop structure 150 comprises five legs 151-155. Legs 151, 152, 154 and 155 form a cross shape with each of these legs separated from its neighbours by 90 degrees. These four legs extend respectively in the directions of sockets 111, 113, 116 and 115. Leg 153 extends in the direction of the off-axis socket 117 and is consequently separated from its neighbours 152, 154 by 45 degrees.

[0056] Each leg 151-155 is formed generally as a flat rectangular plate and extends to the back of its respective socket 111, 113, 117, 116, 115. The width of the legs is the same as the internal diameter of the sockets so that a tubular object (whether open or closed) inserted into the socket will be obstructed by the tip of the corresponding leg. The legs thus act as backstops to the rods inserted into the sockets and ensure that all rods 201, 202 can reliably be inserted into the sockets the appropriate distance for forming neat frame structures.

[0057] Two of the sockets, 112 and 114 do not have legs extending from the backstop structure 150. However, as these sockets 112, 114 are perpendicular to the five sockets 111, 113, 117, 116, 115 which are provided with legs 151-155, the sides of the legs 151-155 act as backstops to these sockets 112, 114. In other words, as shown in Figs. 1c and 1d, looking down the sockets 112, 114, one can see the cross-shaped profile of the backstop structure 150. On the other hand, looking down the sockets 111, 113, 117, 116, 115, one can see the tip of a leg 151-155 as shown in Figs. 1a and 1 b.

[0058] As shown best in the sectional views of Figs. 1d and 1f, ribs 160 are formed on the insides of each socket 111-117. These ribs 160 provide a frictional engagement between the rods 201, 202 and the sockets 111-117. The ribs 160 extend longitudinally with respect to the sockets which again allows air to flow in and out of the sockets during insertion, however in alternative embodiments, circumferential ribs could be used. The contact surface area between the ribs 160 and the rods 201, 202 is selected so as to provide enough friction to prevent accidental decoupling of the rods 201, 202 and connectors 100, but sufficiently low friction that the rods and connectors can easily be engaged and disengaged by hand, without the use of tools. As shown in the figures, this embodiment provides four ribs 160 within each socket 111-117. In other embodiments a different number of ribs could be used.

[0059] The connector 100 of this embodiment is formed from ABS plastic and the rods 201, 202 are formed from polypropylene. However, it will be appreciated that these choices of material are not limiting on the invention. Relatively rigid plastics are preferred over metals or ceramics for reasons of minimising weight.

[0060] Figure 3 illustrates a number of rods 201, 202 and a number of connectors 100 assembled into a frame structure. As can be seen, all the connector units used in the structure are identical, although they are connected with different orientations. It can be seen that by simply rotating the connector units 100, a wide variety of frame constructions is possible with the seven-socket arrangement,

[0061] It can also be seen that providing a large number of slots 130, the connectors, whatever their orientation, provide ample connection points for a planar sheet 300 draped over the structure.

[0062] Figures 4a-4g illustrate seven different frame constructions which are possible with one particular kit of connectors and rods. This particular kit comprises 22 connector units 100, 34 short tubes 202, 4 long tubes 201 and a planar sheet 300.

[0063] In use, once the frame structure has been created into the desired shape, the planar sheet is simply draped over the structure to form walls and a roof. Portions of the sheet 300 which rest adjacent to the connectors 100 are pushed through the narrow portions 131 of slots 130 into the wide portions 132 so as to retain the sheet in close correspondence with the shape of the underlying frame structure. Thus the modular play house kit provides a simple, but extremely versatile way of creating play houses of different shapes and configurations based on a base set of components.

[0064] It will be appreciated that the number of components provided in the kit can be varied greatly according to the desired frame shapes. This includes variation of the number of sheets 30. For example, the twin structure shown in Fig. 4c can be covered by either one sheet or two, depending on choice.

[0065] A sheet 300 is shown in Fig. 5. As illustrated, the sheet is planar, i.e. it can be laid completely flat and it is not stitched, glued, or otherwise shaped into a predetermined three dimensional shape. The planar sheet 300 may have a number of holes 310 therein so as to provide ventilation into the assembled play house. The holes prevent the sheet from being a suffocation hazard and can advantageously be used as windows of the assembled play house. It will be appreciated that the holes 310 are not always required, depending (among other things) on the material used for the sheet 300. A typical sheet is a simple rectangle of 3 metres by 3.5 metres.

[0066] Figs. 6a-f show a second embodiment of a connector 600. The connector 600 is suitable for use with the rods 201, 202 and the sheet 300 described above in relation to the first embodiment.

[0067] Features of the connector 600 of the second embodiment which correspond to features of the connector 100 of the first embodiment are labelled with similar reference numerals, increased by 500.

[0068] The differences between the connector 100 of the first embodiment and the connector 600 of the second embodiment are that the connector 600 of the second embodiment has a different slot 630, different backstops 650, and instead of ribs 130, it has flats 630 in the sockets. These differences will be briefly described below.

[0069] The slots 630 are best illustrated in Figs. 6b and

6c, showing a side view and a front view. The slots 630 are not shaped so much like arrows as the slots 130 of the first embodiment. The narrow portion 631 is narrower and is sufficiently narrow to pinch the fabric of the sheet 300 when it is inserted into the slot 630, thus gripping the sheet 300 between the edges of the slot 630. The narrow portion 631 in this embodiment is 1 mm wide, although it will be appreciated that this is merely exemplary. In other embodiments, the narrow portion 631 may have no gap between the sides. The wide portion 632 is elongate and rounded at the end. As in the first embodiment, the wide portion 632 provides a receptacle for fabric which has been inserted into the slot 630. When inserted, the fabric of the sheet can be bunched together in the wide portion 632, thus enabling a tight fit of the sheet to the frame structure.

[0070] The backstops 650 in the second embodiment are best shown in the sectional front view of Fig. 6d. Backstops 650 are shown for each of four coplanar sockets 611, 613, 615, 616 and also for an off-axis socket 617. It can be seen that the backstop for off-axis socket 617 is longer than those for the other sockets. This is so as to take up the difference between the selected rod lengths for this particular embodiment. By shortening the longer rod (for diagonal frame structures), the connector 600 can ensure that the diagonal rod does not spatially conflict with the on-axis rods inserted into any of the other sockets 611-616. The backstops 650 in this embodiment do not extend across the whole width of each socket, but are simply ribs or projections extending from the inner surfaces of the sockets.

[0071] Finally, the ribs 160 of the first embodiment have been replaced with flats 660 in the second embodiment. The flats 660 provide areas of reduced diameter in the sockets 611-617. The flats do not form projections, but do provide a restriction which results in a contact area between the connector 600 and rods 201, 202 which in turn results in frictional engagement between the components. The diameters of the rods and the internal diameter of the sockets 611-617 in the region of the flats 660 are selected for optimal friction between the components so that the rods 201, 202 may be readily inserted and removed by hand, but so that when the rods are torqued relative to the connector (e.g. when an off-axial force is applied when the structure is pushed or leaned against), the frictional engagement between the components is increased to an extent which prevents accidental or unintended disengagement.

[0072] Variations and modifications of the above embodiments will be readily apparent to the skilled person and the invention is not intended to be limited to the above described embodiments, but to encompass such modifications and equivalents. The scope of the invention is defined by the appended claims.

[0073] The following statements are not claims, but relate to various aspects of the invention:

1. A modular play house connector unit, comprising a plurality of sockets, each socket arranged to receive a rod, and the connector unit comprising at least one retaining means for retaining a sheet.

2. A connector unit according to statement 1, wherein the retaining means comprises a narrow slot arranged to grip the sheet when the sheet is inserted into the slot.

3. A connector unit according to statement 2, wherein the narrow slot comprises a narrow portion leading to a wider receiving portion.

4. A connector unit according to any of statements 1, 2 or 3, wherein the connector unit comprises one or more support plates connecting between two sockets of the connector unit.

5. A connector unit according to statement 4, wherein the plates are generally planar.

6. A connector unit according to statement 4 or 5, wherein the or each retaining means is formed in the support plates.

7. A connector unit according to any of statements 1 to 6, comprising at least three sockets which are mutually orthogonal to each other.

8. A connector unit according to any of statements 1 to 7, comprising at least three coplanar sockets.

9. A connector unit according to statement 8, wherein the coplanar sockets are separated by 90 degree angles.

10. A connector unit according to statement 9, further comprising a socket directed normal to the plane of said co-planar sockets.

11. A connector unit according to any of statements 7 to 10, wherein the connector comprises a socket disposed at 45 degrees to one of the other sockets.

12. A connector unit according to statement 11, wherein the connector unit comprises a socket disposed at 45 degrees to two of the other sockets.

13. A connector unit according to any of statements 1 to 12, wherein the connector unit comprises six sockets, one pointing in each of the positive and negative directions along three mutually orthogonal axes

14. A connector unit according to statement 13, wherein the connector unit further comprises a socket disposed at 45 degrees to one of the other sockets, preferably at 45 degrees to two of the other sockets.

15. A connector unit according to any of statements 1 to 14, further comprising support plates provided between sockets.

16. A connector unit according to statement claim 15, wherein support plates are provided in only two planes.

17. A connector unit according to statement 16, wherein the two planes are orthogonal to each other.

18. A connector unit according to any of statements 1 to 17, further comprising a backstop for determining the maximum depth of insertion of a rod.

19. A connector unit according to any of statements 1 to 18, wherein all the sockets of the connector unit are fluidly connected to a central chamber of the connector.

20. A connector unit according to statement 19, wherein the connector comprises at least four coplanar sockets separated by 90 degree angles and wherein a backstop is formed in the central chamber.

21. A connector unit according to statement 20, wherein the backstop is formed in the shape of a cross with four legs, one directed towards each of the four coplanar sockets.

22. A connector unit according to statement 21, further comprising an additional socket provided in the same plane as the four coplanar sockets, but at 45 degrees to two of those sockets, and wherein the cross shaped backstop further comprises a fifth leg extending in the direction of the additional socket.

23. A modular play house kit comprising:

a plurality of rods,
a plurality of connectors as claimed in any of claims 1 to 22 for connecting a plurality of rods together to form a frame structure, and
a planar sheet for draping over the frame structure.

24. A kit according to statement 23, comprising rods of two different lengths, with one length being the hypotenuse of a right angled triangle formed from two rods of the other length.

25. A kit as according to statement 23 or statement 24, wherein one of the rods and the connectors comprises one or more ribs projecting towards the other of the rods and the connectors for providing a frictional engagement between the rods and the connectors when the rods are inserted into the connectors.

26. A kit according to statement 25, wherein the ribs extend longitudinally with respect to the rods and the axis of the socket.

27. A kit according to any of statements 23 to 26, wherein the sheet has holes formed in it.

28. A play house, comprising:

a plurality of rods,
a plurality of connectors according to any of statements 1 to 22, connecting a plurality of rods together to form a frame structure, and
a planar sheet draped over the frame structure and held within one or more retaining means on one or more of the connectors.

29. A method of assembling a play house, comprising:

connecting a plurality of rods together with a plurality of connectors according to any of statements 1 to 22 to form a frame structure,
draping a sheet over the frame structure, and
removably attaching the sheet to the frame structure using one or more retaining means of the plurality of connectors.

Claims

1. A modular play house connector unit, comprising a plurality of sockets, each socket arranged to receive a rod, and the connector unit comprising at least one retaining means for retaining a sheet.

2. A connector unit as claimed in claim 1, wherein the retaining means comprises a narrow slot arranged to grip the sheet when the sheet is inserted into the slot.

3. A connector unit as claimed in claim 2, wherein the narrow slot comprises a narrow portion leading to a wider receiving portion.

4. A connector unit as claimed in claim 1, 2 or 3, wherein the connector unit comprises one or more support plates connecting between two sockets of the connector unit.

5. A connector unit as claimed in claim 4, wherein the plates are generally planar.

6. A connector unit as claimed in claim 4 or 5, wherein the or each retaining means is formed in the support plates.

7. A connector unit as claimed in any of claims 1 to 6,

comprising any one or more of the group comprising: at least three sockets which are mutually orthogonal to each other; at least three coplanar sockets; at least three coplanar sockets separated by 90 degree angles; and at least three coplanar sockets separated by 90 degree angles and a further socket directed normal to the plane of said co-planar sockets

8. A connector unit as claimed in claim 7, wherein the connector comprises a socket disposed at 45 degrees to one or two of the other sockets.

9. A connector unit as claimed in any of claims 1 to 8, wherein the connector unit comprises six sockets, one pointing in each of the positive and negative directions along three mutually orthogonal axes

10. A connector unit as claimed in claim 13, wherein the connector unit comprises a further socket disposed at 45 degrees to one of the other sockets, preferably at 45 degrees to two of the other sockets.

11. A connector unit as claimed in any preceding claim, wherein the socket or support plate is at least partially manufactured of a resiliently deformable material, such as ABS, polyethylene or polypropylene

12. A connector unit as claimed in any of claims 1 to 11, further comprising a backstop for determining the maximum depth of insertion of a rod.

13. A modular play house kit comprising: a plurality of rods, and a plurality of connectors as claimed in any of claims 1 to 22 for connecting a plurality of rods together to form a frame structure.

14. A kit as claimed in claim 13, comprising rods of two different lengths, with one length being the hypotenuse of a right angled triangle formed from two rods of the other length.

15. A kit as claimed in claim 13 or claim 14, further comprising sheet for draping over the frame structure, and preferably a sheet comprising one or more apertures therein.

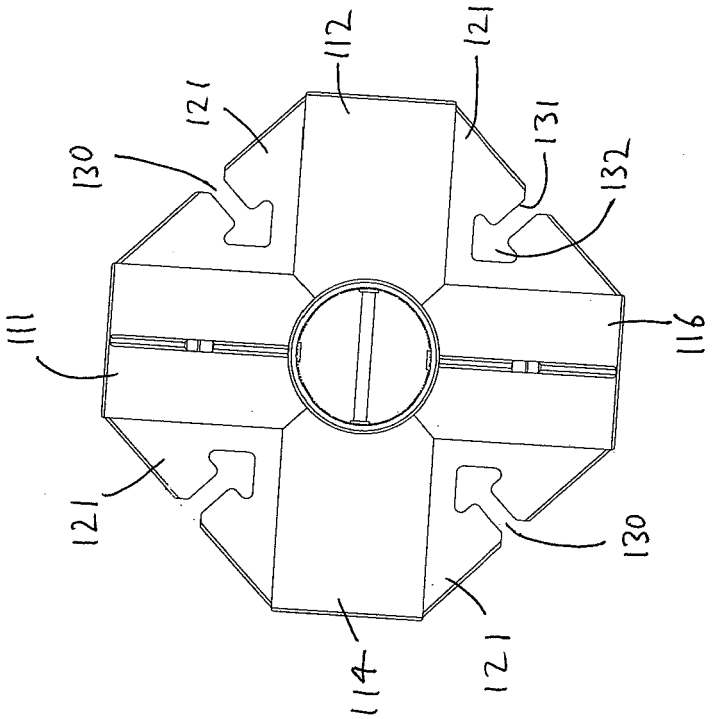

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Fig. 1b

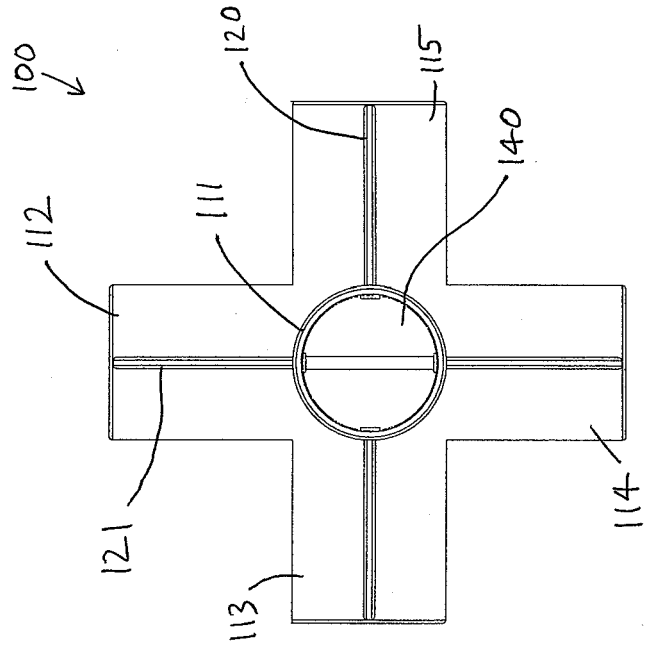

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Fig. 1a

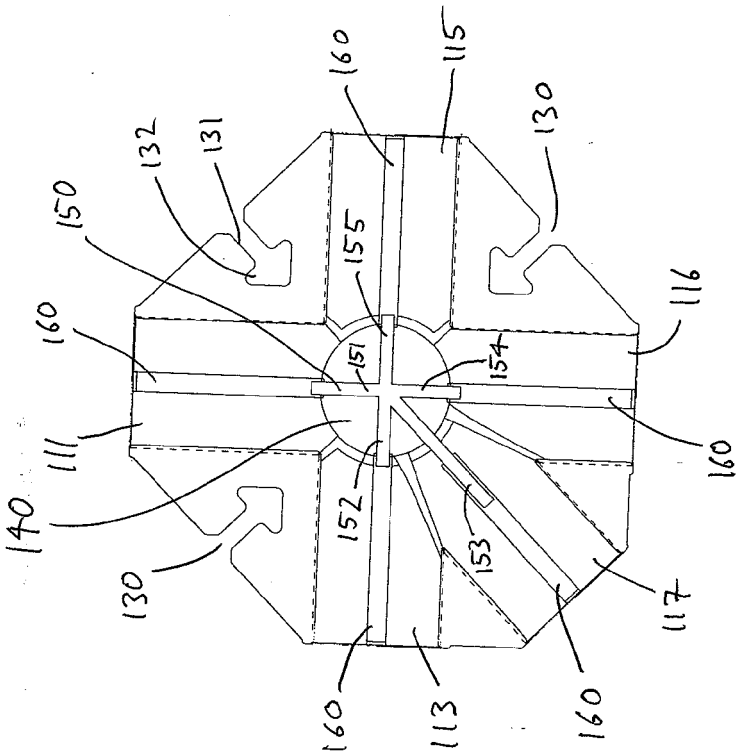

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Fig. 1d

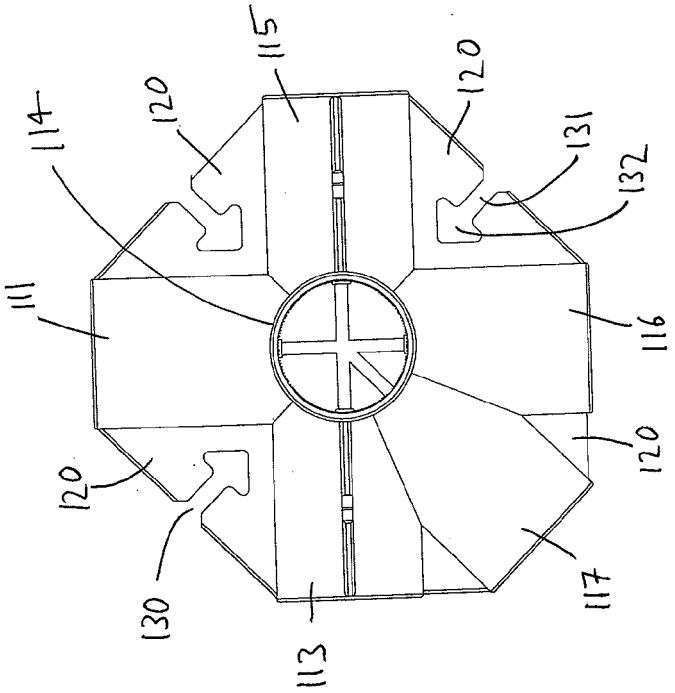

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Fig. 1c

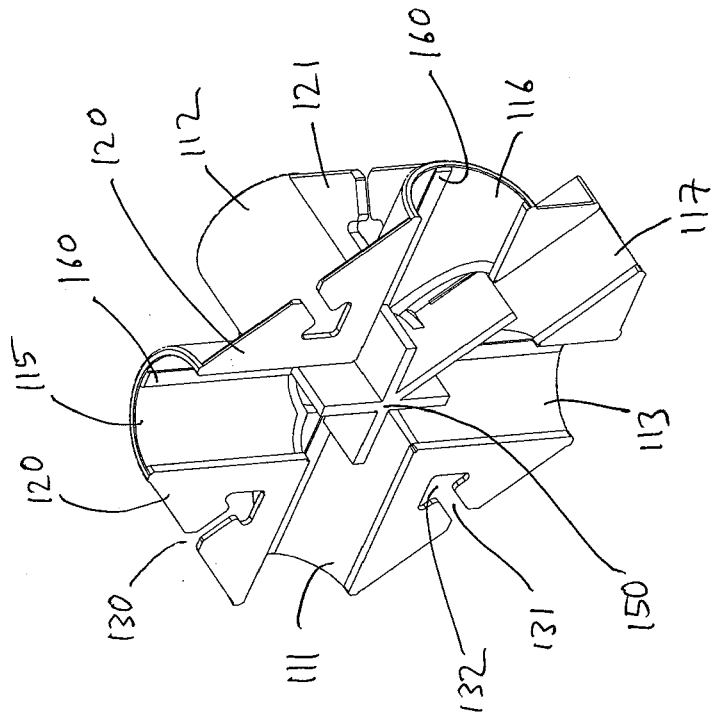

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Fig. 1f

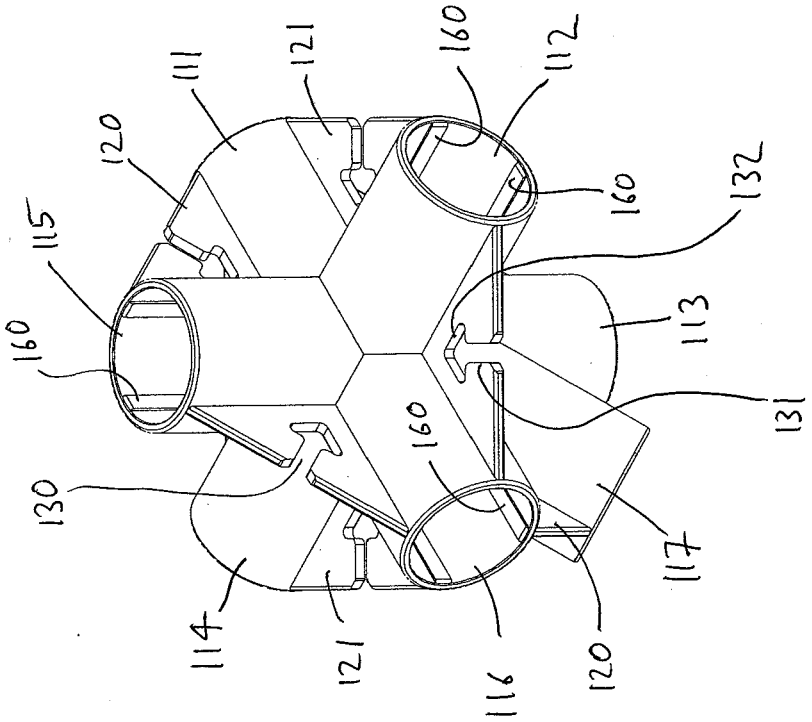

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Fig. 1e

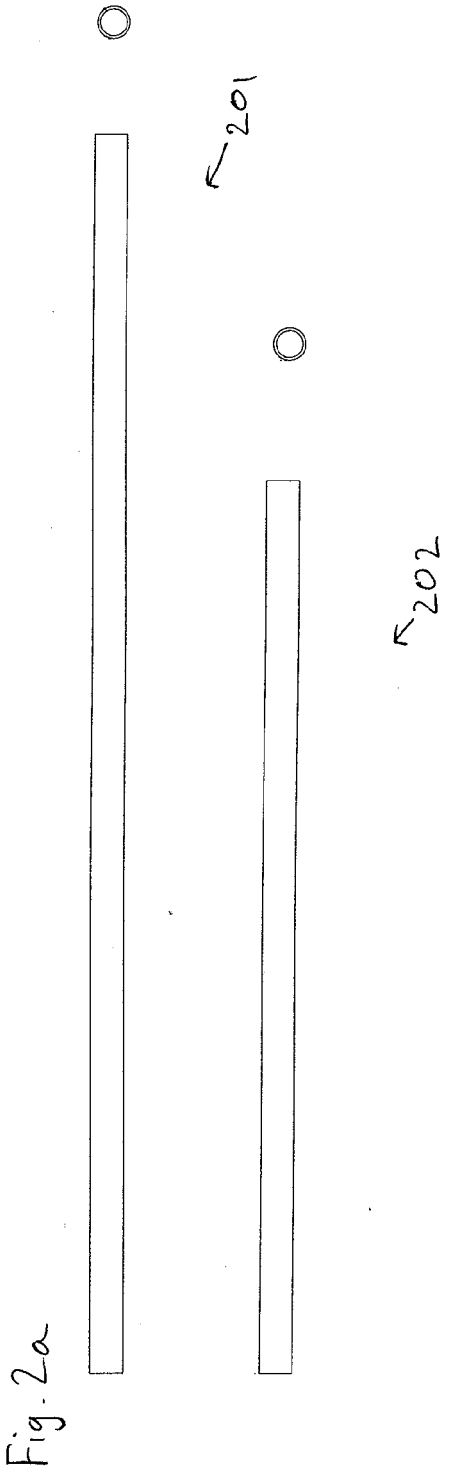


Fig. 2a

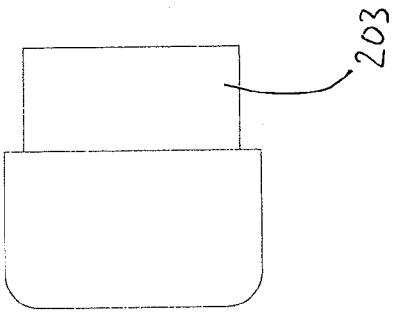


Fig. 2c

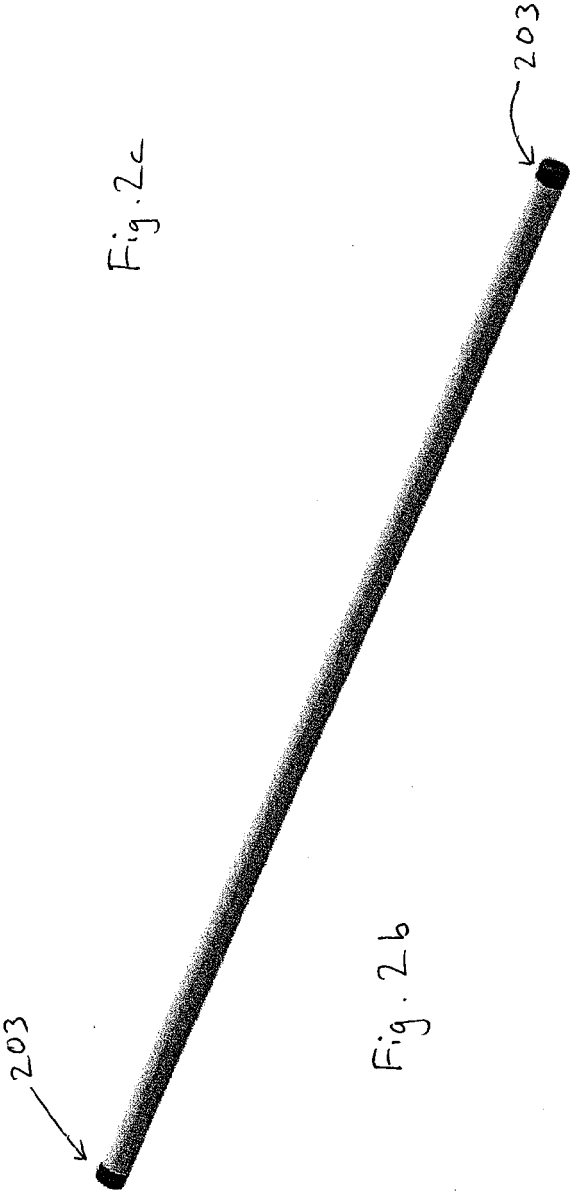


Fig. 2b

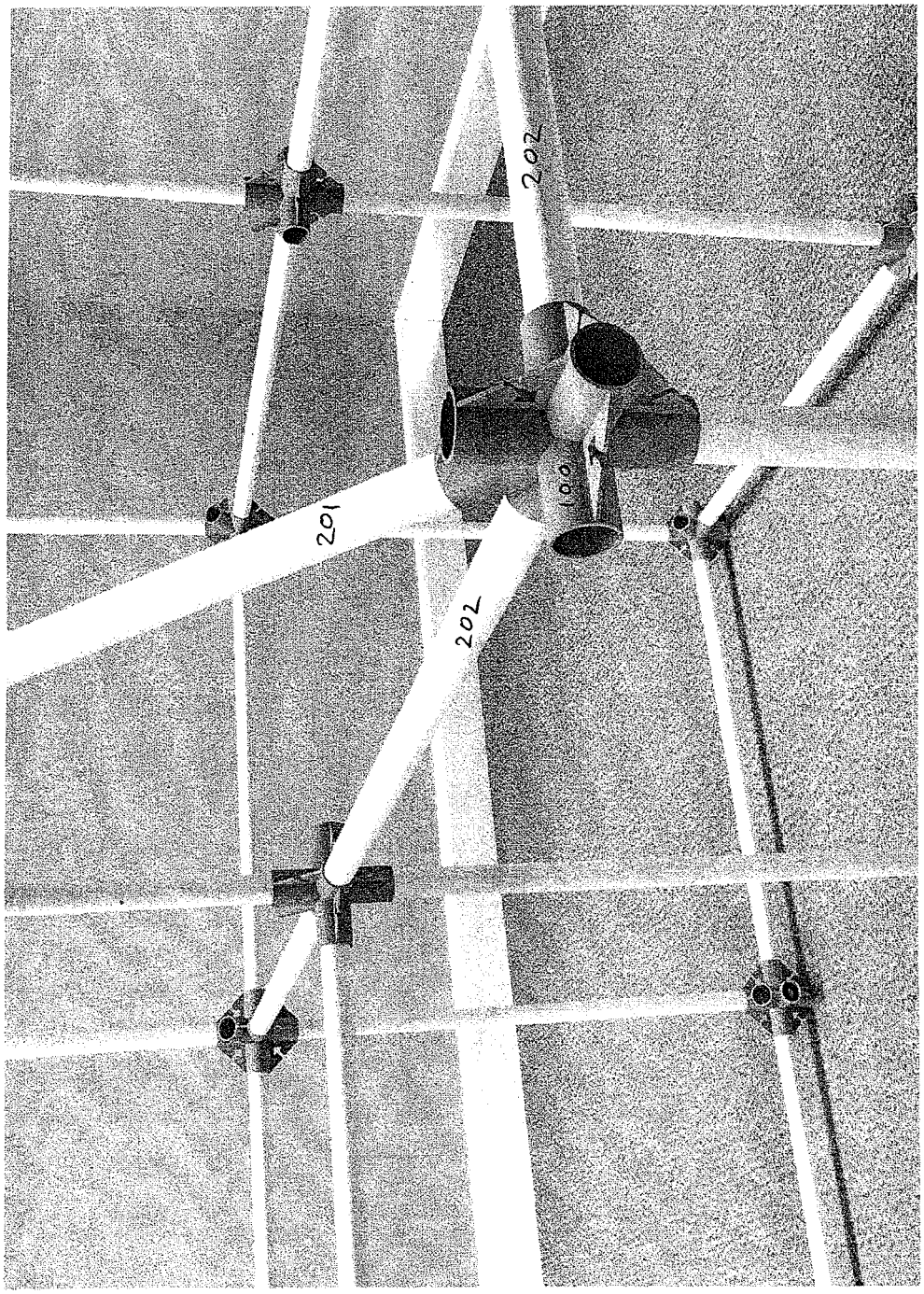


Fig. 3

Fig. 4a

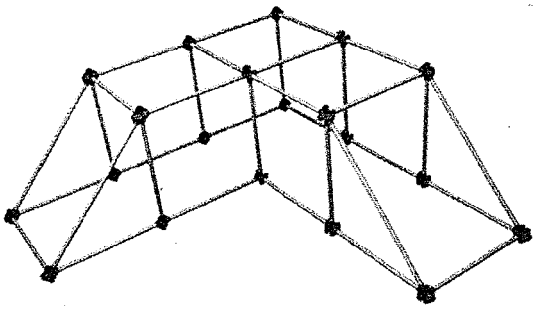


Fig. 4b

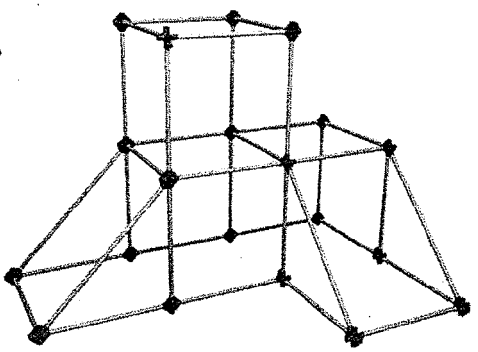


Fig. 4c

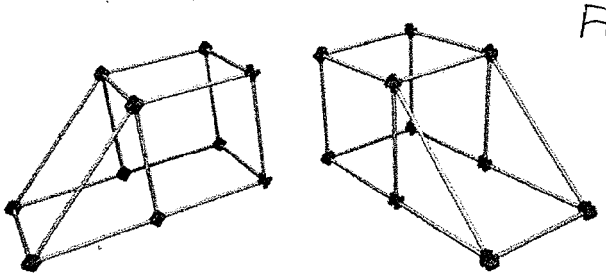
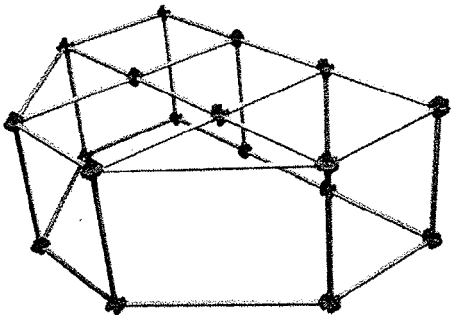


Fig. 4d



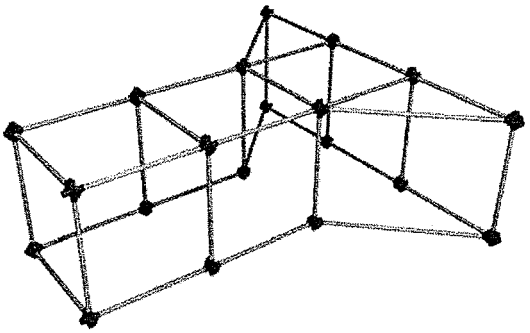
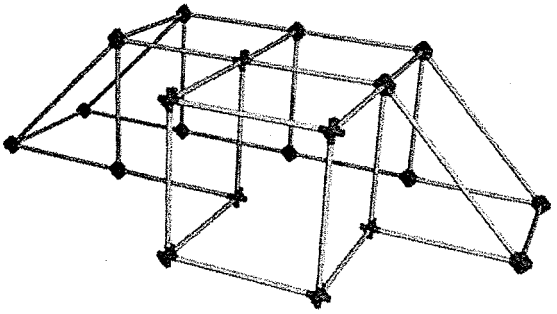


Fig. 4e

Fig. 4f



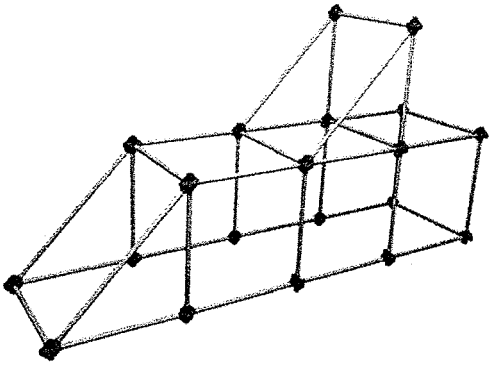


Fig. 4g

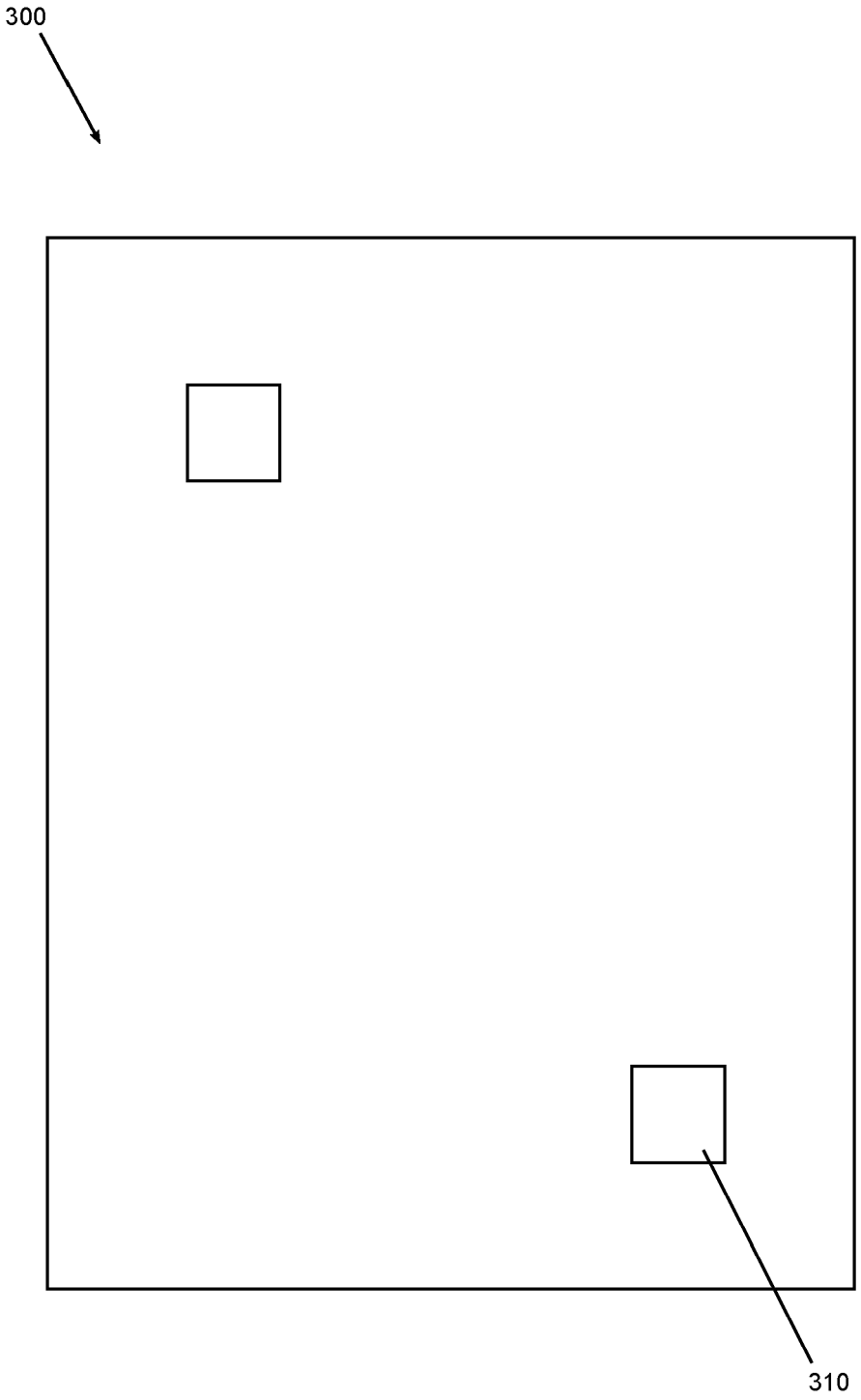


Fig. 5

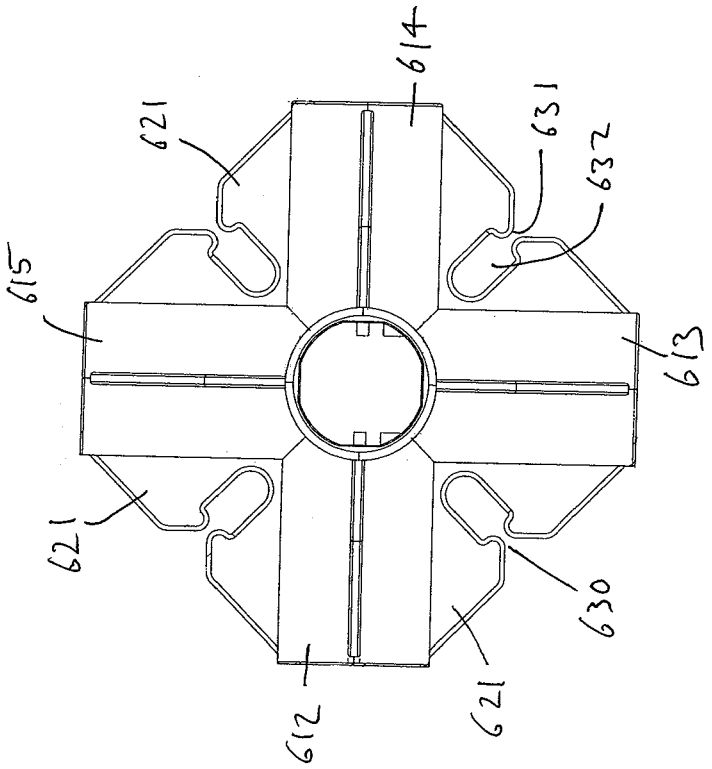

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Fig. 6b

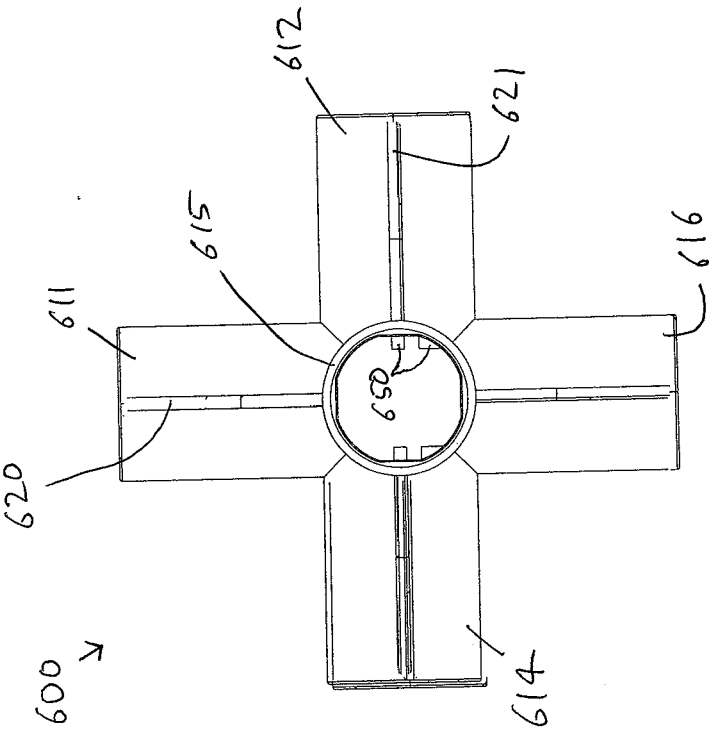

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Fig. 6a

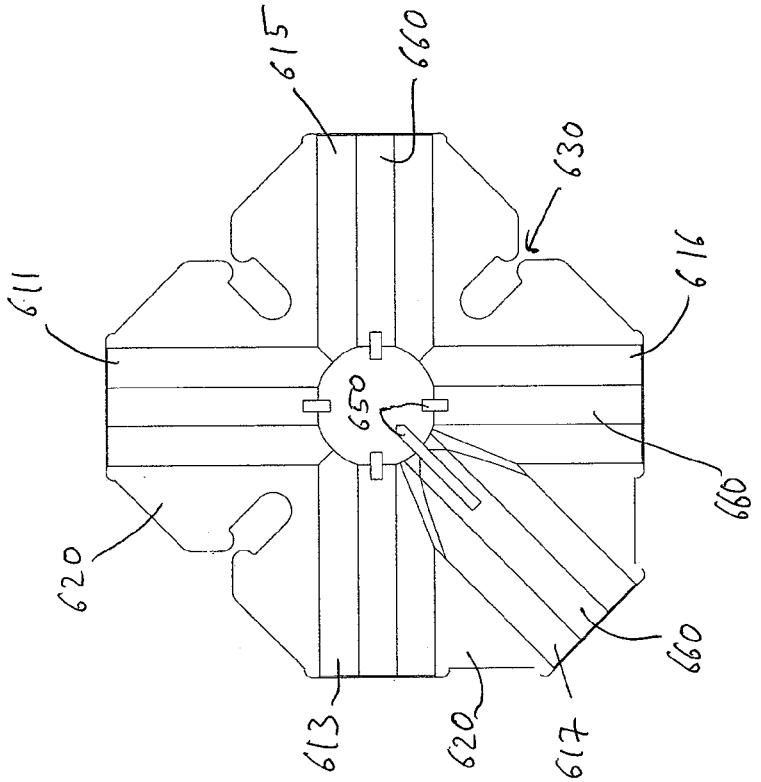

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Fig. 6d

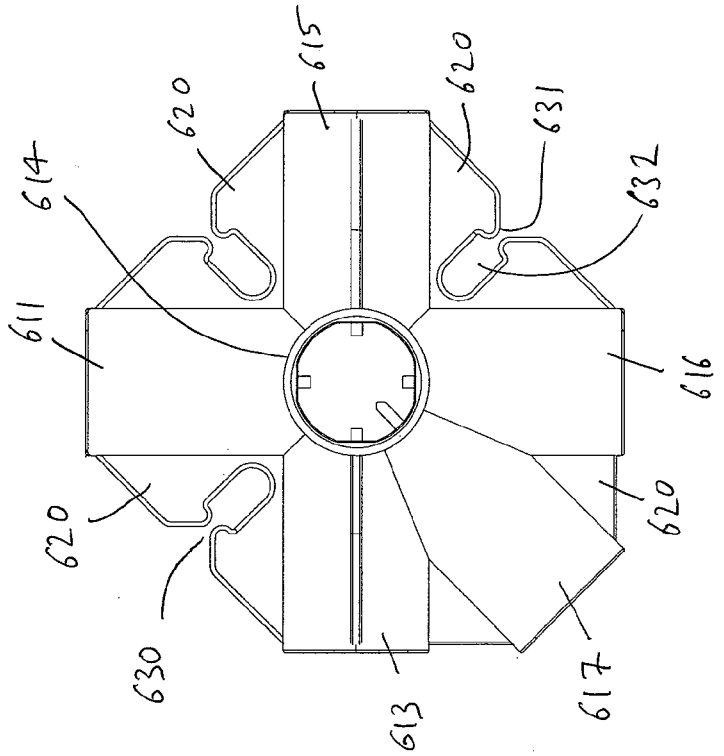

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Fig. 6c

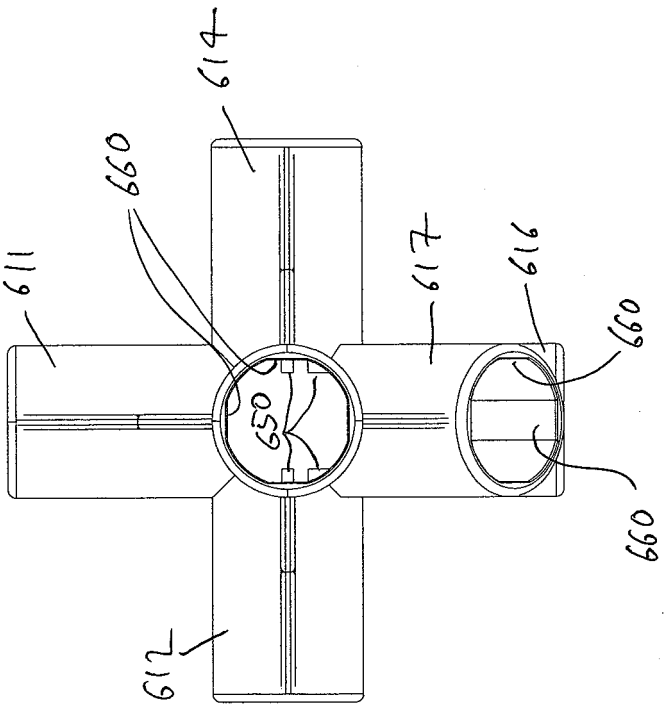

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Fig. 6f

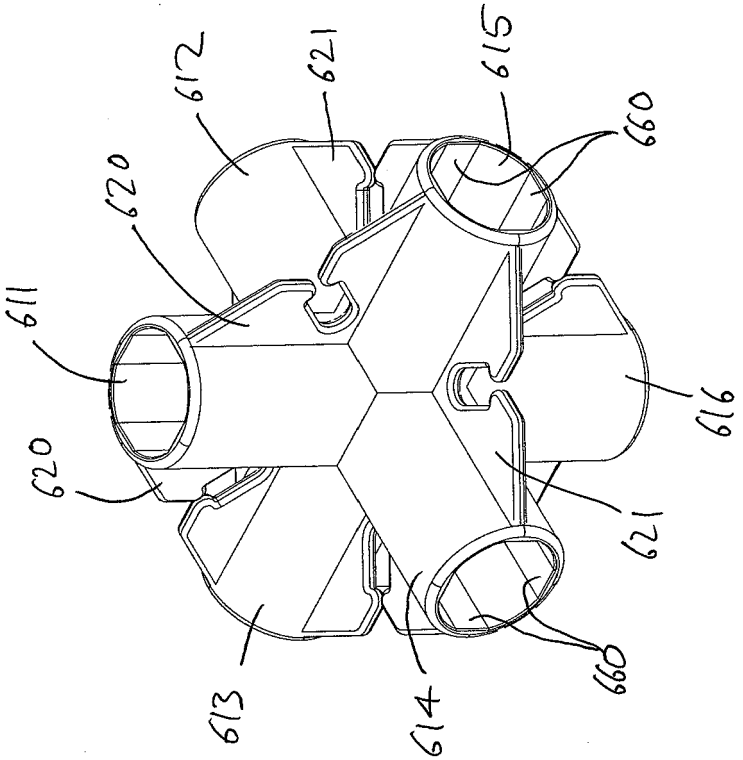

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Fig. 6e

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EUROPEAN SEARCH REPORT

Application Number
EP 11 27 5152

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A	US 6 067 676 A (CARNAHAN MICHAEL [US] ET AL) 30 May 2000 (2000-05-30) * the whole document *	1	TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	7 March 2012	Turmo, Robert

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