

(12) STANDARD PATENT
(19) AUSTRALIAN PATENT OFFICE

(11) Application No. **AU 2017325112 B2**

(54) Title
Assemblies for suspending ceiling panels

(51) International Patent Classification(s)
E04B 9/14 (2006.01) **E04B 9/16** (2006.01)

(21) Application No: **2017325112** (22) Date of Filing: **2017.09.08**

(87) WIPO No: **WO18/045427**

(43) Publication Date: **2018.03.15**

(44) Accepted Journal Date: **2025.02.13**

(71) Applicant(s)
Polygrid Pty Ltd

(72) Inventor(s)
Brett, Paul Adrian

(74) Agent / Attorney
Davies Collison Cave Pty Ltd, Level 15 1 Nicholson Street, MELBOURNE, VIC, 3000, AU

(56) Related Art
US 4438613 A
US 2014/0037366 A1
US 5469681 A
EP 2546430 B1
CN 202866098 U
US 4548010 A
US 4398841 A
US 2017/0241125 A1
US 3097730 A



(51) International Patent Classification:

E04B 9/14 (2006.01) E04B 9/16 (2006.01)

(21) International Application Number:

PCT/AU2017/050977

(22) International Filing Date:

08 September 2017 (08.09.2017)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2016903619 08 September 2016 (08.09.2016) AU
2017900468 14 February 2017 (14.02.2017) AU

(71) Applicant: **POLYGRID PTY LTD** [AU/AU]; 34-44
Heard Avenue, Plenty, Victoria 3090 (AU).

(72) Inventor: **BRETT, Paul Adrian**; 1-29 Heard Avenue,
Plenty, Victoria 3090 (AU).

(74) Agent: **DAVIES COLLISON CAVE PTY LTD**; 1
Nicholson Street, Melbourne, Victoria 3000 (AU).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

(54) Title: ASSEMBLIES FOR SUSPENDING CEILING PANELS

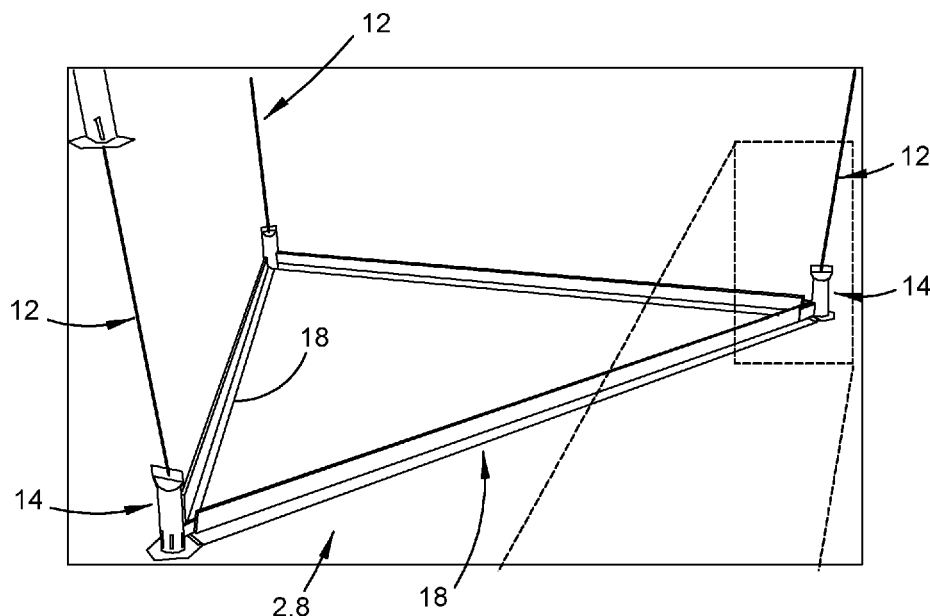


Figure 1

(57) Abstract: An assembly for suspending ceiling panels, having a frame and suspension members for suspending the frame from a structure, the frame having intersection members and support members extending therebetween, each support member being for supporting a respective side of the ceiling panel, and wherein the ends of the support members are configured to engage with engageable portions provided circumferentially about each of the intersection members.

Published:

— *with international search report (Art. 21(3))*

COMPONENT FOR SUSPENDING CEILING PANELS

[0001] The present invention relates to assemblies for suspending ceiling panels, an intersection member for use in those assemblies and suspended ceilings having said assemblies and/or intersection members.

[0002] Suspended ceiling systems provide a grid structure for suspending light-weight panels to form a ceiling in commercial environments such as office or retail spaces. The panels can be used to hide the upper space of a room which can contain wiring, conduit, piping or ductwork. Designers often desire the installation of visually different suspended ceilings other than those that can suspend standard square or rectangular panels. However this can involve complex and expensive installation.

[0003] Examples of the invention seek to avoid or to at least ameliorate problems of existing suspended ceiling systems.

[0004] According to a first aspect of the present invention, there is provided an assembly for suspending ceiling panels, having a frame and suspension members for suspending the frame from a structure, the frame having intersection members and support members extending there between, each support member being for supporting a respective side of the ceiling panel, and wherein the ends of the support members are configured to engage with engageable portions provided circumferentially about each of the intersection members. Advantageously, there is provided an assembly that can be easily formed for suspending ceiling panels.

[0005] According to an embodiment, the positions of the engageable portions are arranged such that the angles between adjacent ends of the support members so engaged in the intersection members correspond to the respective interior angles of the ceiling panel thereby forming a grid for suspending the ceiling panels.

[0006] According to an embodiment, wherein the engageable portions are arranged equiangularly about the intersection member.

[0007] According to an embodiment, the assembly has at least two said frames, wherein the suspension members are adapted to engage with the frames so as to support the frames in a spaced-apart vertical configuration one above the other thereby providing a suspended ceiling with at least two levels.

[0008] According to a second aspect of the present invention, there is provided an assembly for suspending ceiling panels having at least two frames, each frame being for suspending at least one of said ceiling panels, and suspension members for suspending the frames from a structure, wherein at least some of the suspension members are adapted to engage with the frames so as to support the at least two frames in a spaced-apart vertical configuration. Advantageously, there is provided an assembly that can be easily formed for providing a suspended ceiling having at least two levels of ceiling panels.

[0009] According to an embodiment, the frame has intersection members and support members extending therebetween, and wherein an intersection member of each frame is engageable with one of said suspension members such that one of the intersection members is supported above the other.

[0010] According to an embodiment, the intersection member on an upper portion of the suspension member has an aperture in a base thereof configured to allow the suspension member to be received therethrough such that the intersection members engaged to the suspension member are positionable substantially vertically one above the other. Preferably, the aperture is substantially the size of the cross-section of the suspension member.

[0011] According to an embodiment, the intersection member has a transverse element internal to the intersection member which has a further aperture, the transverse element being spaced apart from the base. Preferably, the further aperture is substantially the size of the cross-section of the suspension member.

[0012] According to an embodiment, the opposed ends of the support members are configured to engage with engageable portions provided circumferentially about each of the intersection members.

[0013] According to an embodiment, the engagement of opposed ends of the or each support member and respective engageable portion is a latching engagement.

[0014] According to an embodiment, the positions of the engageable portions are arranged such that the angles between adjacent ends of the support members so engaged in the intersection members correspond to the respective interior angles of the ceiling panel thereby forming a grid for suspending the ceiling panels.

[0015] According to an embodiment, the engageable portions are arranged equiangularly about the intersection member(s).

[0016] According to an embodiment, the frame(s) has support members so engaged in said intersection members to define openings wherein the shape of the openings correspond to the shape of the ceiling panel(s), each side of the ceiling panel(s) being supportable by a respective support member.

[0017] According to an embodiment, each ceiling panel is in the shape of a regular polygon.

[0018] According to an embodiment, each ceiling panel has the same regular polygonal shape.

[0019] According to an embodiment, the ceiling panel(s) has three, four, five, six or eight sides.

[0020] According to an embodiment, at least two adjacent ends of support members form an angle of 60° when so engaged in each of three of said intersection members so as to form an assembly for suspending at least one triangle shaped ceiling panel.

[0021] According to an embodiment, at least two adjacent ends of support members form an angle of 120° when so engaged in each of six of said intersection members so as to form an assembly for suspending at least one hexagonally shaped ceiling panel.

[0022] According to an embodiment, at least two adjacent ends of support members when so engaged in each of four of said intersection members form an angle of 90° so as to form an assembly for suspending at least one quadrilateral shaped ceiling panel.

[0023] According to an embodiment, two adjacent ends of support members form an angle of 108° when so engaged in each of five of said intersection members so as to form an assembly for suspending at least one pentagonal shaped ceiling panel.

[0024] According to an embodiment, at least two adjacent ends of support members form an angle of 135° when so engaged in each of eight of said intersection members so as to form an assembly for suspending at least one octagonal shaped ceiling panel.

[0025] Advantageously, there is provided assemblies that can be easily formed for suspending ceiling panels having shapes of regular polygons, including those having three, four, five, six or eight sides.

[0026] According to an embodiment, the engageable portions are in the form of apertures so as to engagingly receive protrusions provided at the opposed ends of the support structures.

[0027] According to an embodiment, the engageable portions are in the form of protrusions so as to be engagingly received in apertured portions provided at the opposed ends of the support structures.

[0028] According to an embodiment, the engagement of the protrusions and apertured portions is a latching engagement.

[0029] According to an embodiment, the or each protrusion has at least one locating member for inhibiting withdrawal of the or each protrusion from the respective apertured portion.

[0030] According to an embodiment, the at least one locating member for inhibiting withdrawal of the or each protrusion is in the form of a resilient tongue, wherein, when the at least one locating member is inserted into the apertured portion, a side edge of the apertured portion engages and depresses the tongue so the tongue is insertable through the

apertured portion, and wherein, when the protrusion and tongue have passed through the apertured portion, the tongue moves outwardly under resilient bias to engage with the inner wall of the intersection member to inhibit withdrawal of the support member.

[0031] According to an embodiment, the or each support member has at least one locating member for inhibiting further inward movement of the protrusion into the respective apertured portion.

[0032] According to an embodiment, the or each protrusion has at least one locating member for inhibiting further inward movement of the protrusion into the respective apertured portion.

[0033] According to an embodiment, each apertured portion is a slot.

[0034] According to an embodiment, the suspension member is in the form of a rod.

[0035] According to an embodiment, each intersection member is engageable to the suspension member by a fastener.

[0036] According to an embodiment, the fastener is releasably movable relative to the suspension member so as to be able to adjust the position of the intersection member relative to the suspension member.

[0037] According to an embodiment, a lower end portion of the fastener is configured as a hook receivable in an apertured portion of the intersection member.

[0038] According to a third aspect of the present invention, there is provided an intersection member having engageable portions provided circumferentially thereabout, the engageable portions being engageable with the ends of the support members.

[0039] According to an embodiment, the intersection member has an opening configured to allow the suspension member to be received therethrough.

[0040] According to a fourth aspect of the present invention, there is provided a suspended ceiling having an assembly as described above and at least one ceiling panel suspended thereby.

[0041] According to an embodiment, the suspended ceiling has an assembly with least one intersection member as described above and at least one ceiling panel suspended thereby.

[0042] According to an embodiment, the at least one ceiling panel is removable.

[0043] According to an embodiment, the support members have flanges for supporting sides of the at least one ceiling panel.

[0044] According to an embodiment, the at least one ceiling panel has the shape of a regular polygon having 3, 4, 5, 6 or 8 sides.

[0045] The invention also provides an intersection member having engageable portions arranged about a periphery of a mounting member thereof the mounting member being of tubular configuration and the engageable portions being apertures through a wall of the mounting member and being adapted to receive and engage with end protrusions of support members of a suspended ceiling, the intersection member being adapted such that when so received the end protrusions protrude through the engageable portions into an interior portion of the mounting member whereby respective ends of said support members locate proximal to one another therein, and whereby said support members extend outwardly therefrom away from the mounting member to provide support for ceiling panels.

[0046] The mounting member may be of tubular configuration and the engageable portions may be slots extending in the axial direction of the mounting member, and through the wall of the mounting member.

[0047] The base may define an array of outwardly extending support portions for support thereon of support members having the protrusions thereof received in the engageable portions.

[0048] The engageable portions and support portions may be equiangularly disposed about an axis of the intersection member.

[0049] The invention also provides an assembly for suspending ceiling panels having an intersection member as above described, having engaged therewith support members having said protrusions engaged with said engageable portions.

[0050] In a further aspect of the present invention there is provided a suspended ceiling assembly intersection member having engageable portions arranged about a periphery of a mounting member thereof, the mounting member being of tubular configuration and the engageable portions being apertures through a wall of the mounting member and being adapted to receive and engage with end protrusions of support members of a suspended ceiling, the intersection member being adapted such that when so received the end protrusions protrude through the engageable portions into an interior portion of the mounting member whereby respective ends of said support members locate proximal to one another therein, and whereby said support members extend outwardly therefrom away from the mounting member to provide support for ceiling panels.

[0051] The present invention will now be described, by way of non-limiting example only, with reference to the accompanying drawings, in which:

[0052] Figure 1 is a perspective view of an assembly for suspending ceiling panels according to a first embodiment of the present invention having intersection members and support members;

[0053] Figure 2 is a close up view of a portion of the assembly of Figure 1;

[0054] Figure 3A is a perspective view of an assembly having two frames according to another embodiment of the present invention;

[0055] Figures 3B, 3C and 3K are perspective, front and side cross-section views respectively of an embodiment showing the connection of one of the intersection members and one of the support members of the assembly of Figures 1 and 2;

[0056] Figures 3D to 3J are perspective, front and top cross-section views showing a further embodiment of the connection of the support member and intersection member of the assembly shown in Figures 1 and 2;

[0057] Figures 4 and 5 are examples of a suspended ceiling having an assembly for suspending ceiling panels of triangular and hexagonal form respectively;

[0058] Figure 6 is a perspective view of an intersection member of a upper frame for engaging with a suspension member;

[0059] Figure 7 is a perspective view of an intersection member of a lower frame for engaging with the suspension member;

[0060] Figure 8a is a cross-sectional view of the intersection member of Figures 6 and 7 taken through the line marked as X-X with engaged support members;

[0061] Figure 8b is a top view of the intersection member of Figure 6;

[0062] Figures 9 to 11 are schematic diagrams of example grids formed by assemblies having intersection members and support members for suspending triangular, hexagonal and square shaped ceiling panels respectively according to further embodiments of the invention;

[0063] Figure 12 is a perspective view of an intersection member for assembly for suspending quadrilateral shaped ceiling panels;

[0064] Figure 13 is a cross-sectional view of an intersection member shown in Figure 12 taken through the line marked as Y-Y with engaged support members;

[0065] Figure 14 shows a schematic diagram of a example grid for suspending octagonal shaped ceiling panels according to another embodiment of the invention;

[0066] Figure 15 is a perspective view of an intersection member for assembly of a grid as shown in Figure 14;

[0067] Figure 16 is a cross-sectional view of the intersection member shown in Figure 15 taken through the line marked as Z-Z with engaged support members;

[0068] Figures 17 and 18 are side and top views of a schematic diagram for an example grid for suspending a pentagonal shaped ceiling panel surrounded by hexagonally shaped ceiling panels according to another embodiment of the invention; and

[0069] Figure 19 is a cross-sectional view of an intersection member for use in the grid of Figures 17 and 18 with engaged support members.

[0070] Figures 1 to 3A are views of assemblies 2, 4 for suspending ceiling panels 6 having respectively a frame 8 or two frames 8, 10, and suspension members 12 according to preferred embodiments of the present invention. The suspension members 12 are for suspending the frames 8, 10 from structure, such as an interior surface of a roof or a ceiling of a room.

[0071] The frames 8, 10 have intersection members 14, 16 and support members 18 extending therebetween where each support member 18 supports a side of one of the ceiling panels 6. The intersection members 14, 16 have a generally tubular, axially extending, mounting member 19 and a base 15, which base is lowermost in use of the intersection member. The base 15 extends outwardly around the periphery of the mounting member 19, as a peripheral flange. The ends of the support members 18 are configured to engage with engageable portions 20 provided circumferentially about each of the intersection members 14, 16, the engageable portions 20 defining respective slot-like apertures which extend through the side wall of mounting member 19. Together, the support members and intersection members form a support grid having openings principally defined at the peripheries by the support members 18. The shape of these openings corresponds to the shape of the ceiling panels 6, each side of the ceiling panel 6 being supportable by a respective support member 18. That is, the support members 18 have flanges 13 on lower opposite longitudinal edges which receive thereon underside marginal portions of the ceiling panels 6, thereby supporting the ceiling panels 6 to form a suspended ceiling as shown in Figure 3A.

[0072] Figures 3B to 3K show more detailed examples of the engagement of the support members 18 with the intersection member 14 or 16, where the engageable portions 20 are provided as apertures 11 which are adapted to receive protrusions 17 provided at the opposite ends of the support members 18. Alternatively, the engageable portions may be in the form of protrusions which are receivable in apertured portions provided at the opposed ends of the support members 18.

[0073] In the embodiment shown in Figures 3B, 3C, 3G and 3K, the illustrated protrusion 17 is latchingly engaged in an aperture 11. In an alternative embodiment shown in Figures 3D to 3J, the protrusion 17 is latchingly engaged laterally in the aperture 11. Both embodiments will be described further below. In any case, in Figures 3A to 3K, the intersection members 14, 16 are shown with the engageable portions 20 in the form of the described apertures 11 formed through the side wall 19a of the mounting member 19 and being arranged towards an end of the mounting member adjacent to the base 15 of the intersection member 14, 16. The locating member 23 is in the form of a punched-out resilient tongue extending sidewardly, and outwardly at an acute angle, from the remainder of the protrusion 17. Referring to Figures 3H, 3I and 3J, the width S of the aperture 11 is only slightly greater than the width W1 of the main body of the protrusion 17. At the location of the free end 23a of the locating member 23, the width W2 is greater than the width S. As the protrusion 17 is inserted into the aperture 11 (in the direction indicated by arrow A), one side edge 11a of the aperture 11 engages the locating member 23 such that the locating member 23 is depressed inwardly (in the direction indicated by arrow B) of the protrusion 17 by camming action against natural resilience of the locating member, the opposite face 17a of the protrusion 17 engaging the adjacent opposite surface 11b of the aperture 11. By this camming action, the protrusion 17 can pass through the aperture 11 until the locating member 23 has passed through it. Once the locating member 23 is clear of the aperture 11, the free end 23a of the locating member 23 moves outwardly under resilient bias (in the direction indicated by arrow C in Figure 3J) from the protrusion 17 so that withdrawal of the support member 18 is inhibited by engagement of the free end 23a of the locating member 23 with the inner surface 19b of the side wall 19a of the mounting member 19 forming part of the intersection member 14 or 16.

[0074] In the arrangement shown in Figures 3B, 3C, 3G and 3K, further inward movement of the protrusion 17 may be inhibited by engagement of a transverse locating member 29 on support member 18 and the base 15 of the intersection member 14 or 16. Thus an outer edge surface 15a of the base 15 engages a surface 13a of the flange 13. As exemplified in Figure 3F, the protrusion 17 may have locating members 25 and/or 27 to provide an alternative engagement to inhibit further movement of the protrusion 17 into intersection member 14 or 16. Referring to Figure 3K, additionally or alternatively, inwards

movement of the protrusion 17 into the aperture 11, as mentioned, may be limited by engagement between a side edge 15a of the base 15 of the intersection member 14, 16 and a lower transverse 13a surface of the flanges 13 of the support member 18. A transverse locating member 29, forming parts of flange 13, extends side to side of the support member 18, slightly above the main lengthwise extending parts 13b (Figure 3K) of the flanges 13, so as to define a step between the flanges and the transverse locating member 29. It is at this step that the surface 13a is defined; that is, as an end surface of flange parts 13b. Also as shown in figure 3K, in the assembled condition of the support member 18 and intersection member 14 or 16, the transverse locating member 29 rests on the base 15 so as to additionally or alternatively support the support member. Additionally or alternatively, inwards insertion of the protrusion may be limited by providing on the protrusion 17 a further locating member 28, shown in phantom lines in Figures 3J and 3K and in the form of a punched out tongue, like locating member 23, but oppositely directed, and with its free end 28a spaced from the free end of locating member by a distance substantially the same as the thickness of the wall 19a. As the protrusion reaches the latched position, shown in Figures 3J and 3K, the free end 18a is as shown brought into engagement with the outer surface of the wall 19a, to prevent further inwards movement.

[0075] The intersection members 14, 16, shown in Figures 6 to 8b, have engageable portions 20 arranged equiangularly about the circumference of the intersection members 14, 16 wherein the angles formed between the engageable portions 20 and an axis 21 of the intersection members 14, 16 are represented as angle A, which corresponds to 60° (see Figure 8a). This angle A corresponds to the angle of a corner of an equilateral triangle, known as an interior angle. Therefore the assemblies 2, 4 having intersection members 14, 16 and support members 18 form a grid 22 in which there are openings which can suspend ceiling panels 6 in the shape of equilateral triangles to form a suspended ceiling 24.

[0076] The same intersection members 14, 16 and support members 18 can be used to form a grid 26 whereby the ends of adjacent support members 18 engaged in intersection members 14, 16 form an angle of 120° represented as B in Figures 5, 8a and 10. Angle B is the interior angle of a hexagon. The openings of the grid 26 therefore can receive and suspend hexagonal shaped ceiling panels 25, see Figures 5, 8a and 10. The same intersection

members 14, 16 can be used to form an assembly for suspending panels of equilateral triangle shape or hexagonal shape or a combination therefore, depending on the configuration of members 14, 16, 18.

[0077] Further embodiments of the present invention are directed to similar assemblies as described above but for suspending ceiling panels having square, octagonal or pentagonal shaped ceiling panels, see Figures 11 to 19. The angle between ends of adjacent support members engaged in the intersection members 36, 38, 40 can form angles C, D and E being respectively angles of 90° , 135° and 108° (corresponding to the interior angles of quadrilaterals, octagons and pentagons) to form the exemplary grids 42, 44, 46. The openings of grids 42, 44, 46 can receive ceiling panels having the shapes of squares, octagons and pentagons. While the grid 42 is for suspending square ceiling panels, it can be understood that any quadrilateral ceiling panels, such as rectangular panels could be utilized by varying the length of the support members 18 as appropriate.

[0078] Figure 3A is a view of an assembly having two frames 8, 10 in a spaced apart vertical configuration. The intersection member 14, 16 of each frame 8, 10 is engageable with the suspension members 12 such that one intersection member 16 of the two frames 8, 10 is supported above the other intersection member 14, each frame being able to receive at least one ceiling panel 6. The intersection members 14, 16 attach to the suspension members 12 by a fastener 50 such as a suspension clip. The fastener 50 is releasably attachable to the suspension member 12 such that the intersection member 14, 16 can be movably adjustable along the length of the suspension member 12, which can be in the form of a rod, to allow adjustment of the vertical distance between the frames 8, 10 or the adjustment of the height of the suspended ceiling. The intersection members 14, 16 can be attached to the fasteners 50, in particular the lower end portion of the fastener 50 is configured as a hook 58 which can be received in an apertured portion 52 of the intersection members 14, 16.

[0079] Each intersection member 16 on an upper portion of the suspension member 12 has an opening 54 configured to allow the suspension member 12 to be received therethrough such that an axis of the suspension member 12 is substantially parallel to an axis of the intersection member 16 so that the intersection members 14, 16 are spaced-apart substantially vertically one above the other. As shown more particularly in Figure 8b, the

aperture 54 is substantially the size of the diameter of the suspension member 12 and is preferably centrally located within a base 15 of the intersection member 16. In a preferred embodiment, there is a transverse element internal to the intersection member 16, the transverse element 55 having a second aperture 57 and where the transverse element 55 is spaced apart from the base 15 along the longitudinal axis within the body of the intersection member 16 to ensure that the intersection members 14, 16 are accurately positioned vertically, one above the other.

[0080] An example suspended ceiling 24 having three levels is shown in Figure 4. Further frames could be engaged with the suspension members 12 so as to provide a suspended ceiling with four or more levels. Alternatively the assemblies can be arranged with the intersection members 36, 38, 40 as shown in Figures 12, 13, 15, 16 and 19 so as to form a suspended ceiling with one or more levels having quadrilateral, pentagonal or octagonal shaped ceiling panels or combinations thereof.

[0081] It will be apparent that in the described assemblies of completed form can have ceiling panels received in the openings so that the ceiling panels present a complete false ceiling. In the suspended ceiling having two or three levels, each level does not need to be occupied by ceiling panels so they are viewed from below of complete coverage. To provide such coverage, ceiling panels 60 can be received between adjacent intersection members 14, 16 on the same suspension member 12 such that the ceiling panels 60 lie perpendicular to the plane of the frames 8, 10.

[0082] In an example use of the present invention, a user can assemble a suspended ceiling with ceiling panels having an equilateral triangle shape 6. The user can first assemble a frame 8 with intersection members 14 where the ends of six support members 18 are engaged with each of the six engageable portions 20 provided equiangularly about each of the intersection members 14 so as to form a grid 22, see Figure 9. The ends of adjacent support members 18 form an angle A of 60° (the interior angle of an equilateral triangle). The user can then attach each intersection member 14 to a fastener 50 on a rod-shaped suspension member 12, the top portion of which is fixed to structure such as a ceiling of a room or an interior surface of a roof. The suspended ceiling 24 is thereby formed when the user provides equilateral triangle shaped ceiling panels 6 in the correspondingly shaped

recesses formed by the grid 22, the panels being held in the respective recesses by flanges provided on the support members 18.

[0083] In order to form a suspended ceiling with multiple levels, the user can assemble a second frame 10 which is spaced apart vertically above the first frame 8, in the same way as described for the first frame 8 above. The user can then attach the second frame 10 to an upper portion of the suspension member 12 by a second fastener 50. The resultant assembly has first and second frames 8, 10 which are substantially parallel but spaced apart as shown in Figure 3A.

[0084] Similarly, a user can form assemblies for suspending ceiling panels having a quadrilateral, hexagonal, pentagonal or octagonal shapes with the intersection members 14, 16, 36, 38, 40 and support members 18 of Figures 12, 13, 15, 16 and 19. In the example of octagonal shaped ceiling panels, each intersection member 38 receives ends of three support members 18 to form two angles D of 135° and one angle C of 90° thereby forming the grid 32 having both octagonal and square shaped recesses to configured to receive correspondingly shaped octagonal and square ceiling panels, see Figure 16. Although eight engageable portions 20 are shown on the intersection member 38, clearly at a minimum only three engageable portions which form the two angles D of 135° and one angle C of 90° as described above would be necessary to form the required assembly. It can be understood that the intersection members 38 may also be used to form a grid 30 for suspending ceiling panels having only quadrilateral shaped recesses.

[0085] Figures 9 to 11, 14 show exemplary grids which are substantially planar, however Figures 18 and 19 are schematic diagrams showing an opening 46 for suspension of a pentagonal shaped ceiling panel which is the apex of a dome-like grid 62. The dome-like grid 62 is formed by intersection members 40 that can have two adjacent support members 18 engaged therein to form an angle which corresponds to the interior angle of a pentagon, represented as angle E of 108° . The other support member 64 forms angles, B' of 126° each, with the first two adjacent support members 18. If the support members 64 are angled away, for example downwards or upwards from the plane of the pentagonal shaped opening 46, the angle formed by the support members 18, 64 decreases to 120° , represented

as angle B, to accommodate the interior angle of a hexagon shaped ceiling panel, thereby forming the dome-like grid 62.

[0086] The described formation of the intersection members 14, 16, 36, 38, 40, as having engageable portions in the form of slot like apertures enables these to be used to interconnect with support members 18 of a variety of commercially available ceiling support systems. The support members of these systems generally have inverted T-shaped cross sectional form with a central web, upright in use, and sidewardly extended flanges, one to either side of the central web and at a lower edge of the central web in use of the support members. Notwithstanding this similarity, support members from different systems are generally incompatible with each other in the sense that the end protrusions of the support members and the configuration of slots, formed in the central webs, and, which accept the end protrusions are differently configured, such that interchangeability is precluded. This incompatibility may for example particularly arise because intersections between support members are formed by passing end protrusions of two support members oppositely into a single slot in another support member, such that the protrusions cooperate with each other and with the slot to effect latching. On the other hand, with the described arrangements of this invention, this incompatibility problem is lessened because the engageable portions 20 only need to accommodate one protrusion. It has been found that forming the engageable portions 20 as elongate rectangular apertures of about 3mm width by 12mm length, in the axial direction of the intersection member, enables protrusions of various commercially available support members to be used in practicing the invention. The dimensions of the rectangular apertures can vary in length by one or two mm so as to accommodate the variable dimensions of the commercially available support members, so that the apertures can be between 11 to 13 mm in length and 1 to 3 mm wide.

[0087] As particularly illustrated, these apertures may terminate close to the base 15 and with the longer dimensions of the slots aligned in the axial direction of the intersection members. The length of the apertures 11 in the axial direction of the intersection members may be chosen to suit a particular form of protrusions 17 of the support members 18 being used. As shown the length may be somewhat greater than the upper to lower edge dimension of the protrusions. This may enable use of the intersection members of various different

forms of support members, although it may be preferable, mechanically, to make the length only a clearance fit with the upper to lower edge dimension.

[0088] The configuration of the described intersection members as having a generally tubular mounting member 19 and a base 15, of polyhedral form with the number of edge surfaces 15a corresponding to the number of engageable portions 20, enables a neat appearance of the completed ceiling to be achieved, as for example, shown in Figure 5. That is, the base 15 effectively covers the region where the protrusion 17 engaged with the engageable portions 20. Also, as described with reference to Figure 3K, the edge surface 13a of each support member 18 neatly engages an adjacent edge surface 15a, likewise presenting a neat finish. As evident from Figures 6 and 7, for example, the edge surfaces 15a of the base 15 are, when the depicted intersection member is viewed in plan, disposed at 90 degrees to an imaginary line from the axis of the intersection member through the engageable portion 20 and, when viewed from the side, each engageable portion is disposed centrally with respect to the adjacent surface 15a. Generally, the form of the base may be polyhedral, with the number of sides corresponding to the number of engageable portions 20, as mentioned. Thus, the base may be regular polygonal although, for example, corners of the polygonal form may be cut off as illustrated in Figure 12. The latter may still present a neater appearance when viewed from the underside provided the side-to-side width of the flanges of the support members does not exceed the width of the "non-cutoff" side edge surfaces 15a where these abut the surfaces 13a of the flanges 13 although, generally, the edge surfaces 15a may be rather longer than the lengths of the surfaces 13a. Generally, too, the base 15 provides support portions 15b shown for example in Figure 3E, one supporting each support member fitted to the intersection member, and thus arrayed in an array about the axis of the intersection member, preferably equiangularly arrayed as shown for example in Figure 8A.

[0089] In the described arrangements, the latching between the engageable portions 20 and the support members 18 is effective to prevent inwards and outwards movement of the support members relative to the intersection members. This may effectively lock support members to the intersection members in the sense that they cannot be separated without defamation of one or more components, permanent or otherwise.

[0090] While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only, and not by way of limitation. It will be apparent to a person skilled in the relevant art that various changes in form and detail can be made therein without departing from the spirit and scope of the invention. Thus, the present invention should not be limited by any of the above described exemplary embodiments.

[0091] Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

[0092] The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as an acknowledgment or admission or any form of suggestion that that prior publication (or information derived from it) or known matter forms part of the common general knowledge in the field of endeavour to which this specification relates.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A suspended ceiling assembly intersection member having engageable portions arranged about a periphery of a mounting member thereof, the mounting member being of tubular configuration and the engageable portions being apertures through a wall of the mounting member and being adapted to receive and engage with end protrusions of support members of a suspended ceiling, the intersection member being adapted such that when so received the end protrusions protrude through the engageable portions into an interior portion of the mounting member whereby respective ends of said support members locate proximal to one another therein, and whereby said support members extend outwardly therefrom away from the mounting member to provide support for ceiling panels.
2. The intersection member according to claim 1, wherein the engageable portions are slots extending in the axial direction of the mounting member.
3. The intersection member according to claims 1 or 2, wherein the engageable portions are arranged about the mounting member such that an angle formed between an adjacent two of the end protrusions of the support members that are engaged within adjacent two of the engageable portions corresponds to a respective interior angle of a ceiling panel supported by the support members.
4. The intersection member according to claim 3, wherein the angle formed between an adjacent two of the end protrusions of the support members that are engaged within adjacent two of the engageable portions is one of about 60°, about 90°, about 108°, about 120°, or about 135°.
5. The intersection member according to any one of the preceding claims, wherein the engageable portions are equiangularly arranged about the intersection member.
6. The intersection member according to any one of the preceding claims, wherein the engageable portions are disposed adjacent an end of the mounting member at which there is provided a base that extends radially outwardly from the mounting member.

7. The intersection member according to claim 6, wherein the base defines an array of outwardly extending support portions for support thereon of support members having the protrusions thereof received in the engageable portions.
8. The intersection member according to claim 7, wherein the engageable portions and support portions are aligned with one another around the intersection member.
9. The intersection member according to any one of the preceding claims, having an opening configured to allow the suspension member to be received therethrough.
10. An assembly for suspending ceiling panels, having a frame and suspension members for suspending the frame from a structure, the frame having intersection members as claimed in any one of the preceding claims and support members extending therebetween, each support member being for supporting a respective side of the ceiling panel, and wherein the end protrusions of the support members are configured to be received through and engage with the engageable portions provided circumferentially about the mounting member of each of the intersection members.
11. The assembly according to claim 10, having at least two said frames, wherein the suspension members are adapted to engage with the frames so as to support the frames in a spaced-apart vertical configuration one above the other thereby providing a suspended ceiling with at least two levels.
12. An assembly for suspending ceiling panels having at least two frames and suspension members for suspending the frames from a structure, each frame having intersection members according to any one of claims 1 to 9 and support members that extend therebetween for supporting a respective side of the ceiling panels,

wherein at least some of the suspension members are adapted to support the at least two frames in a spaced-apart vertical configuration, with a corresponding pair of the intersection members of each of the at least two frames being engageable with one of said suspension members such that one of the pair of intersection members is supported in substantially vertical alignment above the other intersection member of the pair.

13. The assembly according to claim 12, wherein the intersection member of the pair of the intersection members that engages with an upper portion of the one of the suspension members has an aperture in a base thereof, the aperture being configured to allow the suspension member to be received therethrough.
14. The assembly according to any one of claims 10 to 13, wherein the frame(s) have support members so engaged in said intersection members to define openings wherein the shape of the openings correspond to the shape of the ceiling panel(s), each side of the ceiling panel(s) being supportable by a respective support member.
15. The assembly according to any one of claims 10 to 14, wherein the end protrusion of each of the support members is configured to latchingly engage with a respective one of the engageable portions, once the end protrusion has been passed therethrough.
16. The assembly according to claim 15, wherein the end protrusion are provided with at least one locating member so as to latchingly engage with the respective one of the engageable portions, the at least one locating member inhibiting further inward movement and/or withdrawal of the end protrusion from a respective one of the engageable portions once it has been passed therethrough.
17. The assembly according to claim 16, wherein the at least one locating member for inhibiting withdrawal of the end protrusion is in a form of a resilient tongue, wherein, when the at least one locating member is inserted into the aperture of the respective one of the engageable portions, a side edge of the aperture engages and depresses the tongue so the tongue is insertable through the aperture, and wherein, when the end protrusion and tongue have passed through the aperture, the tongue moves outwardly under resilient bias to engage with the interior surface of the mounting member to inhibit withdrawal of the end protrusion of the support member.
18. A suspended ceiling having an assembly according to any one of claims 10 to 17 and at least one ceiling panel suspended thereby.
19. The suspended ceiling according to claim 18, wherein the at least one ceiling panel is removable.

20. The suspended ceiling according to any one of claims 18 or 19, wherein the at least one ceiling panel has the shape of a regular polygon having 3, 4, 5, 6 or 8 sides.

1/14

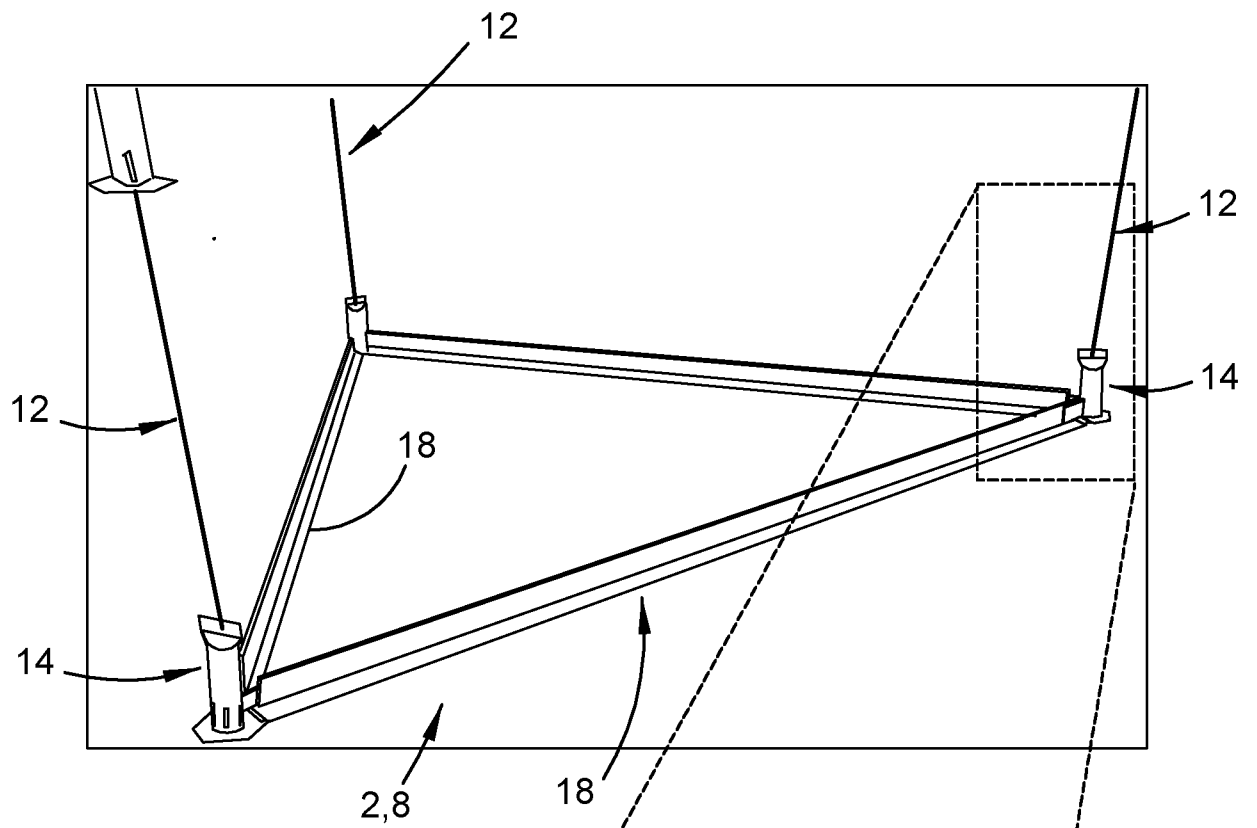


Figure 1

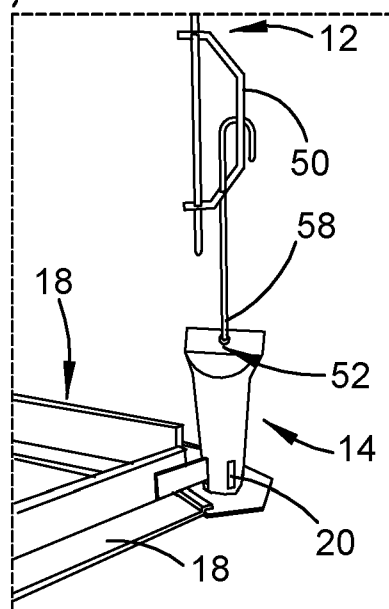


Figure 2

2/14

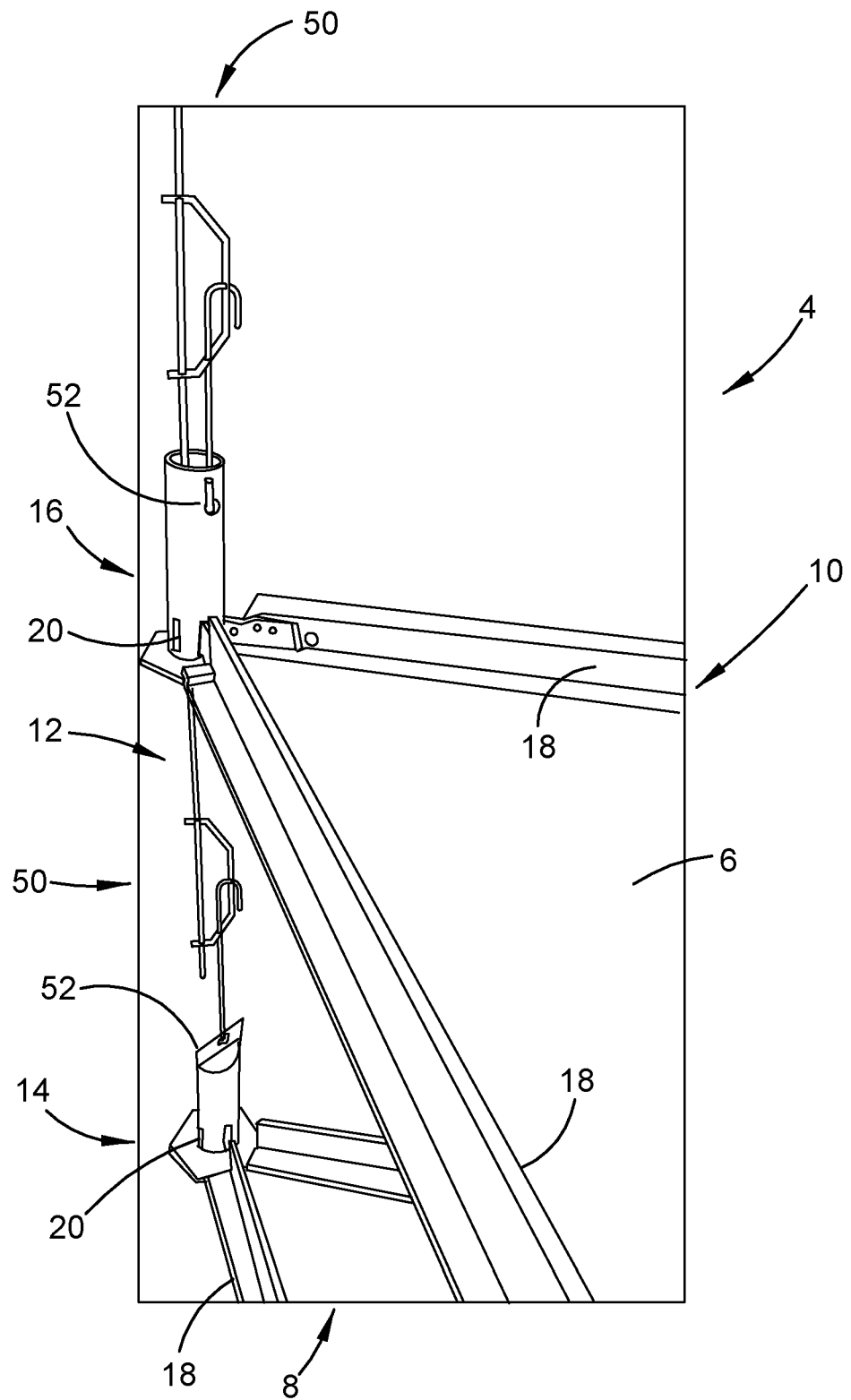


Figure 3A

3/14

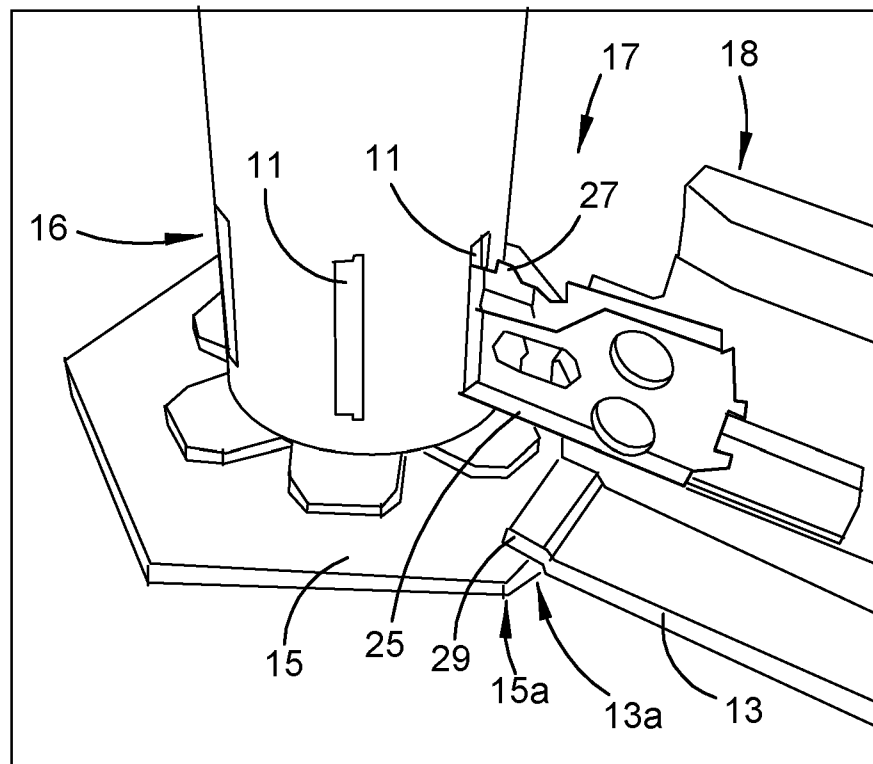


Figure 3B

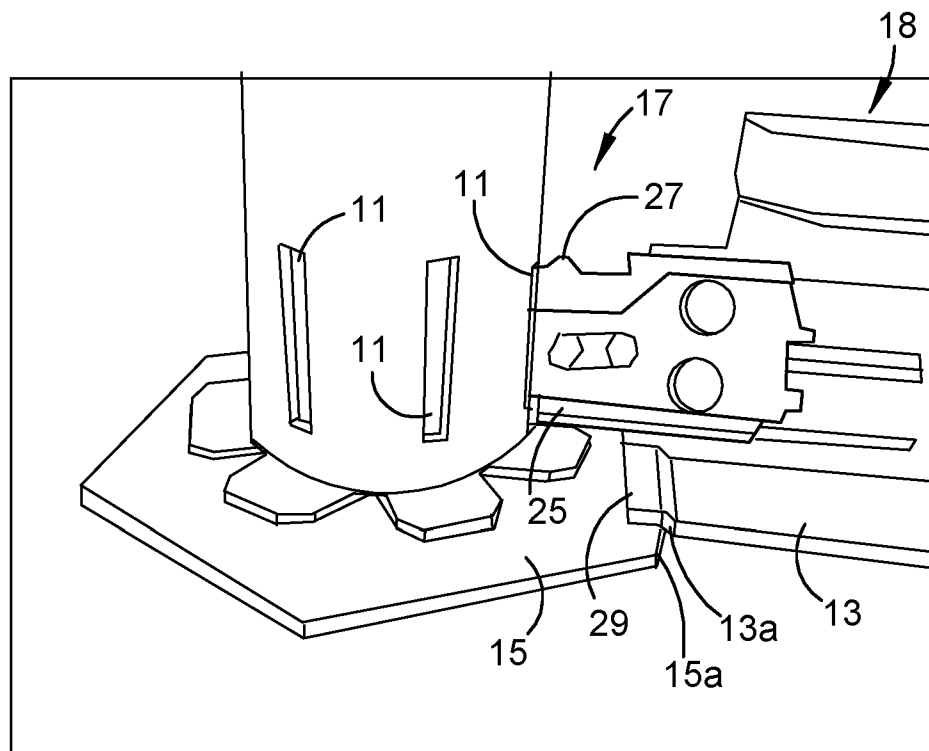


Figure 3C

4/14

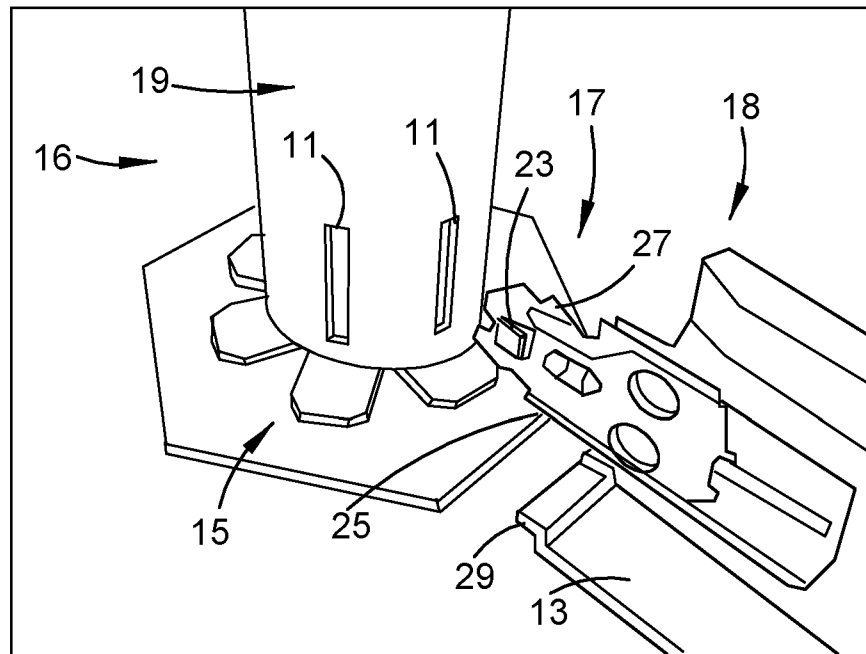


Figure 3D

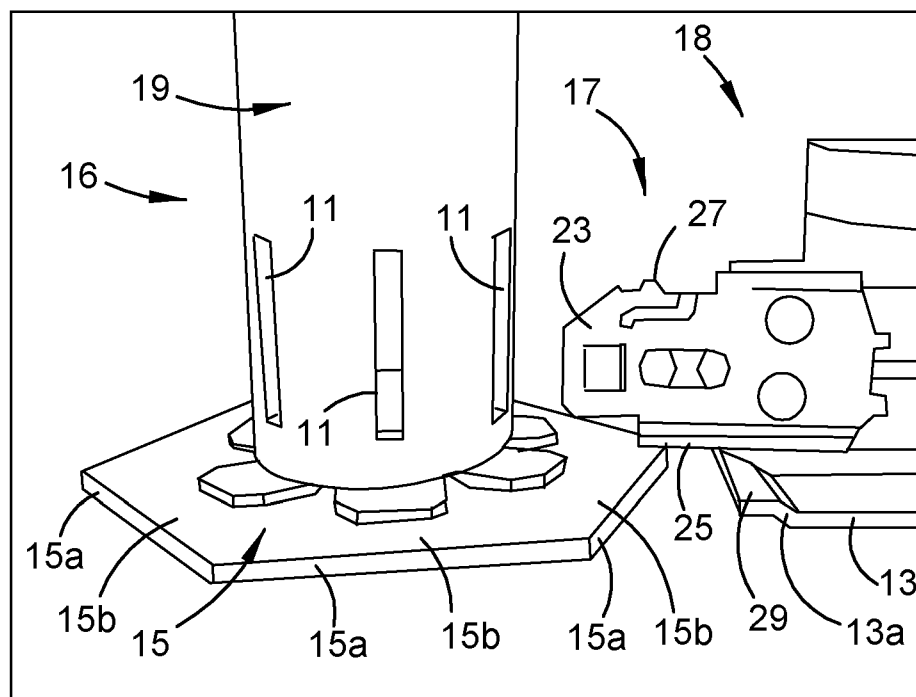


Figure 3E

5/14

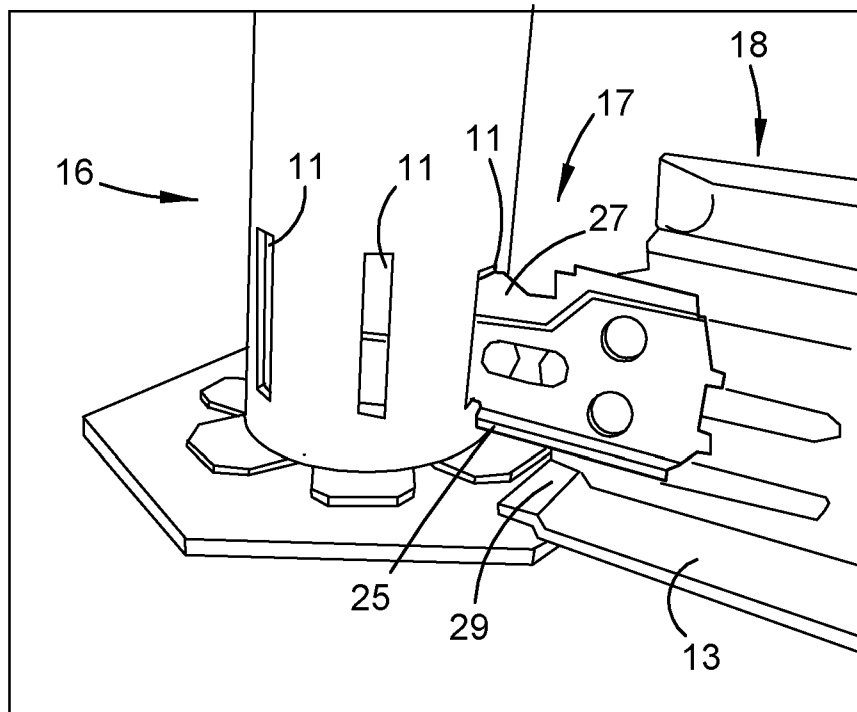


Figure 3F

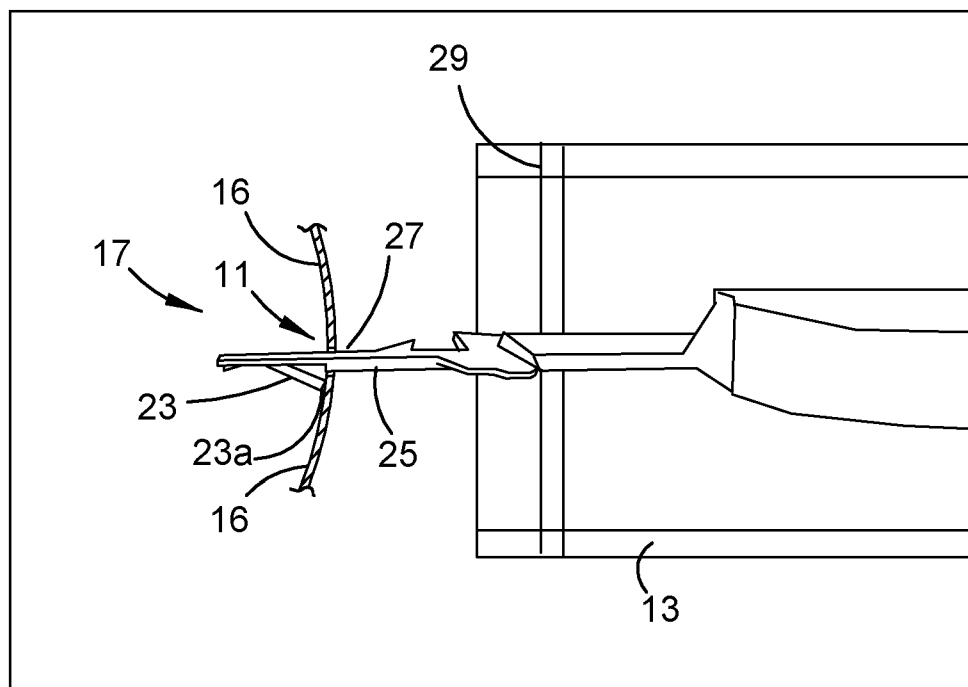


Figure 3G

6/14

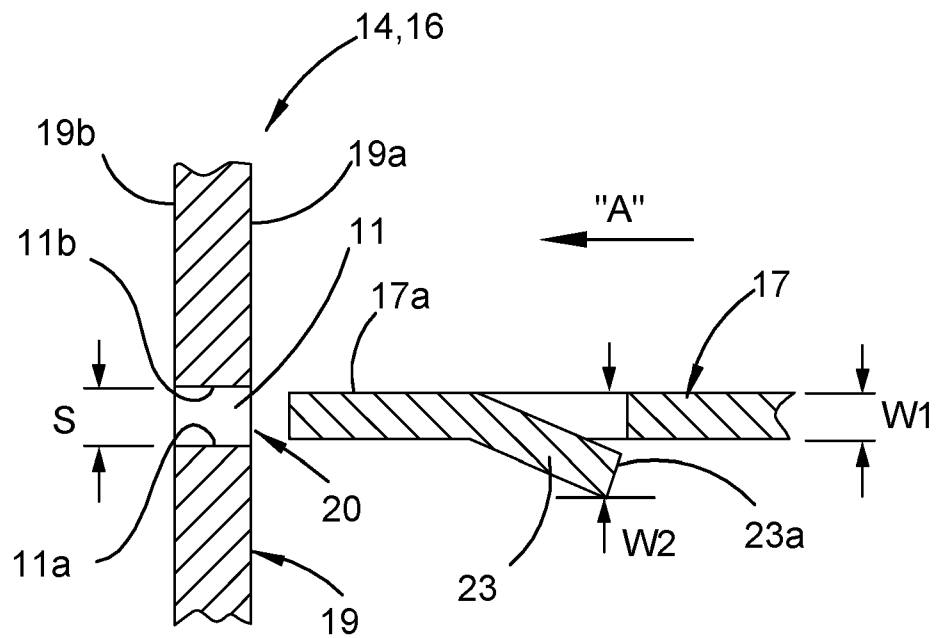


Figure 3H

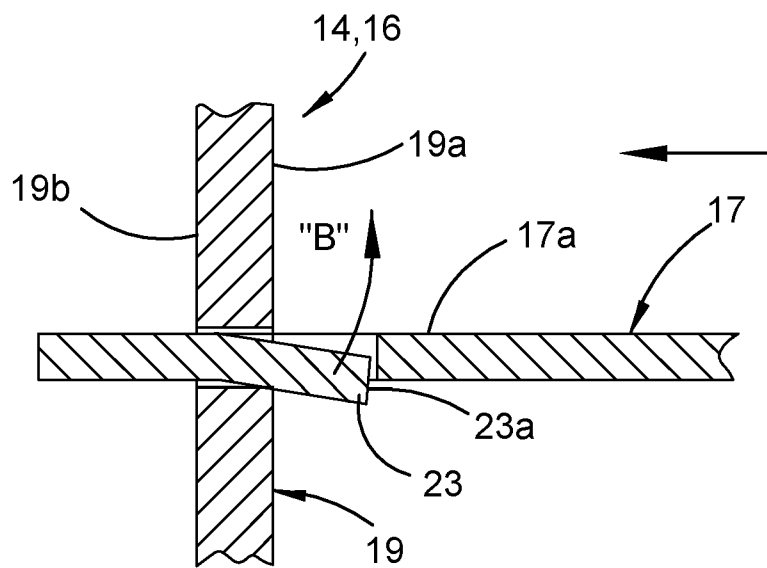


Figure 3I

7/14

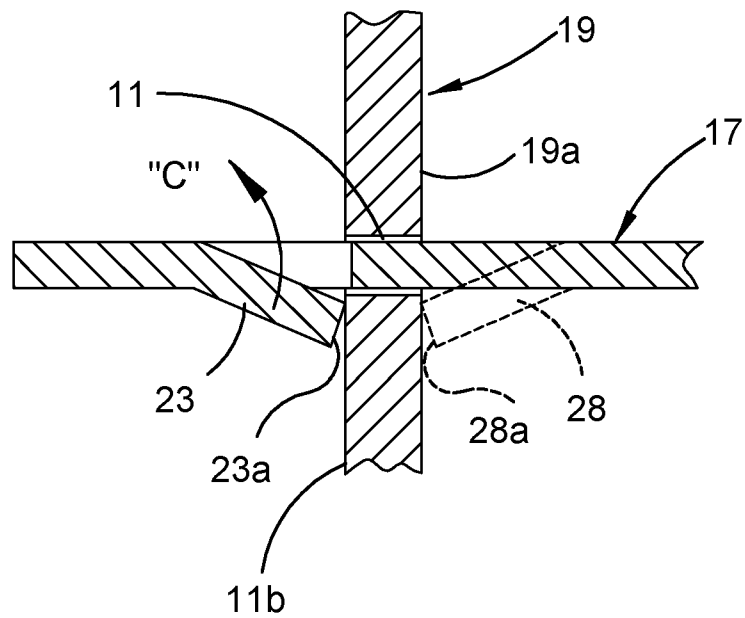


Figure 3J

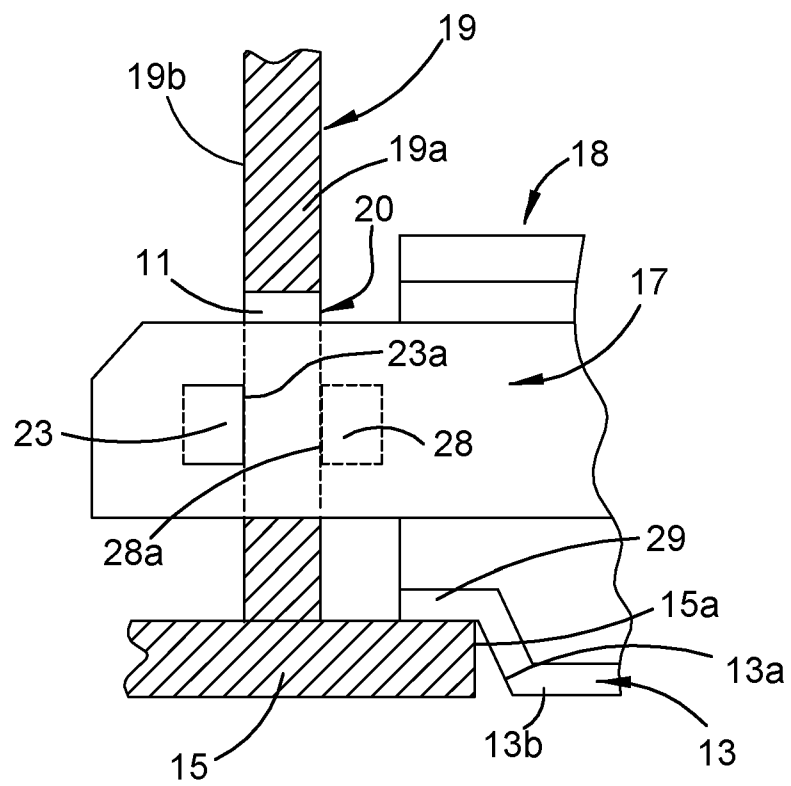


Figure 3K

8/14

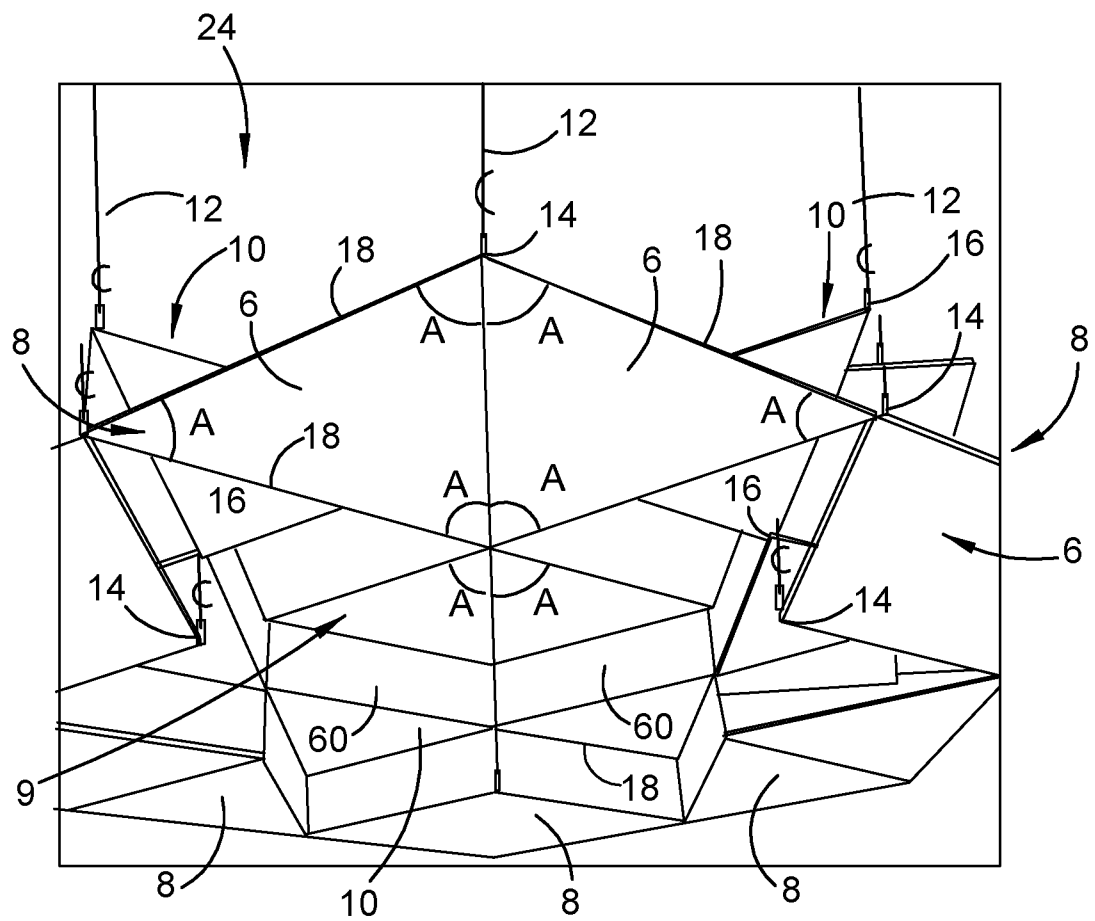


Figure 4

9/14

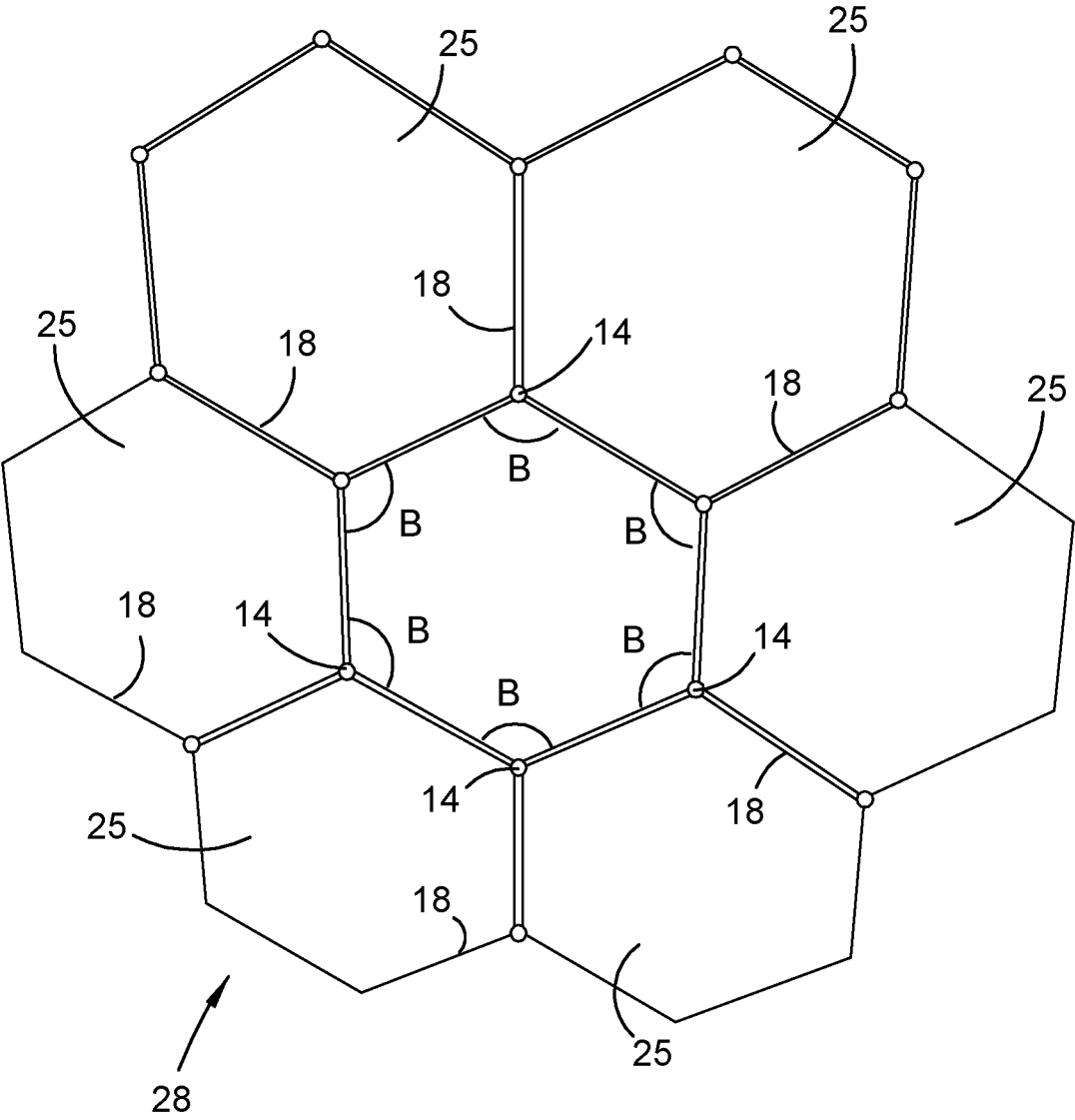


Figure 5

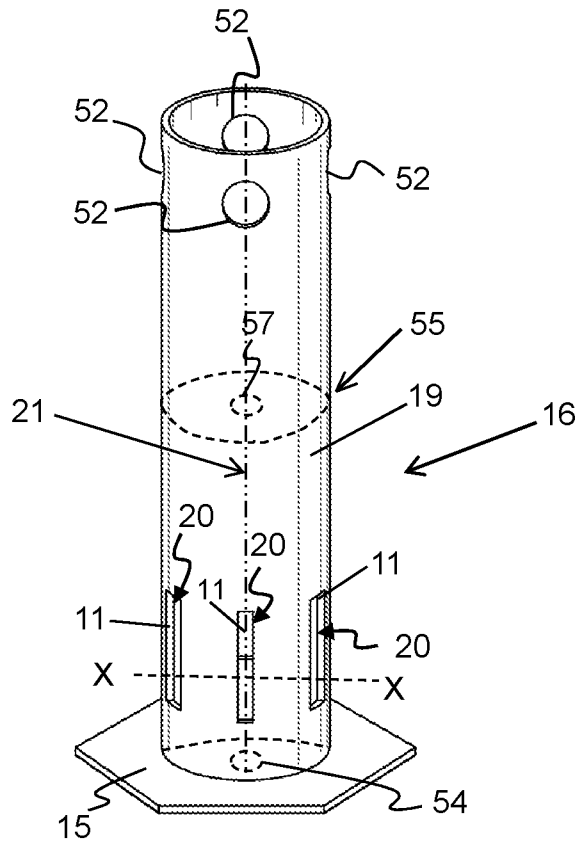


Figure 6

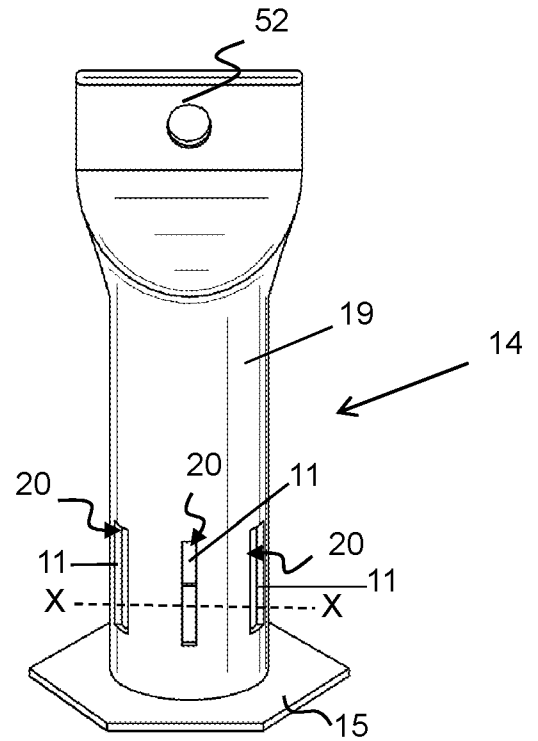


Figure 7

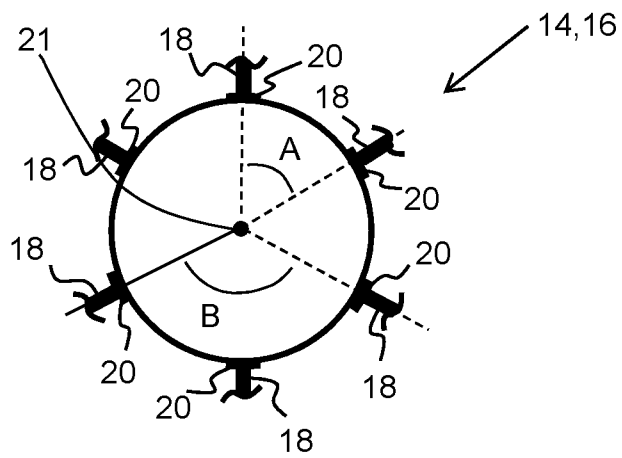


Figure 8a

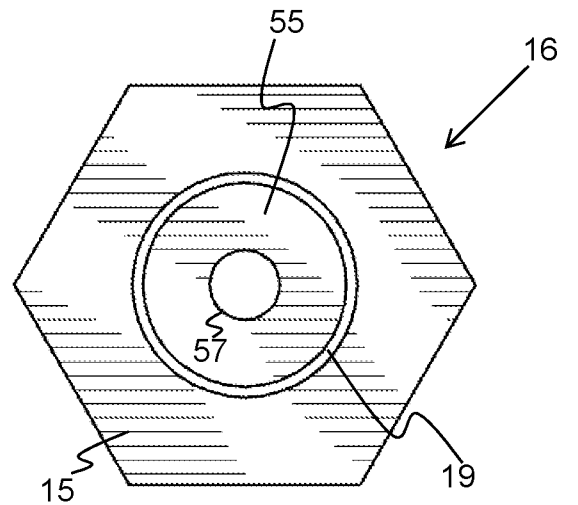


Figure 8b

11/14

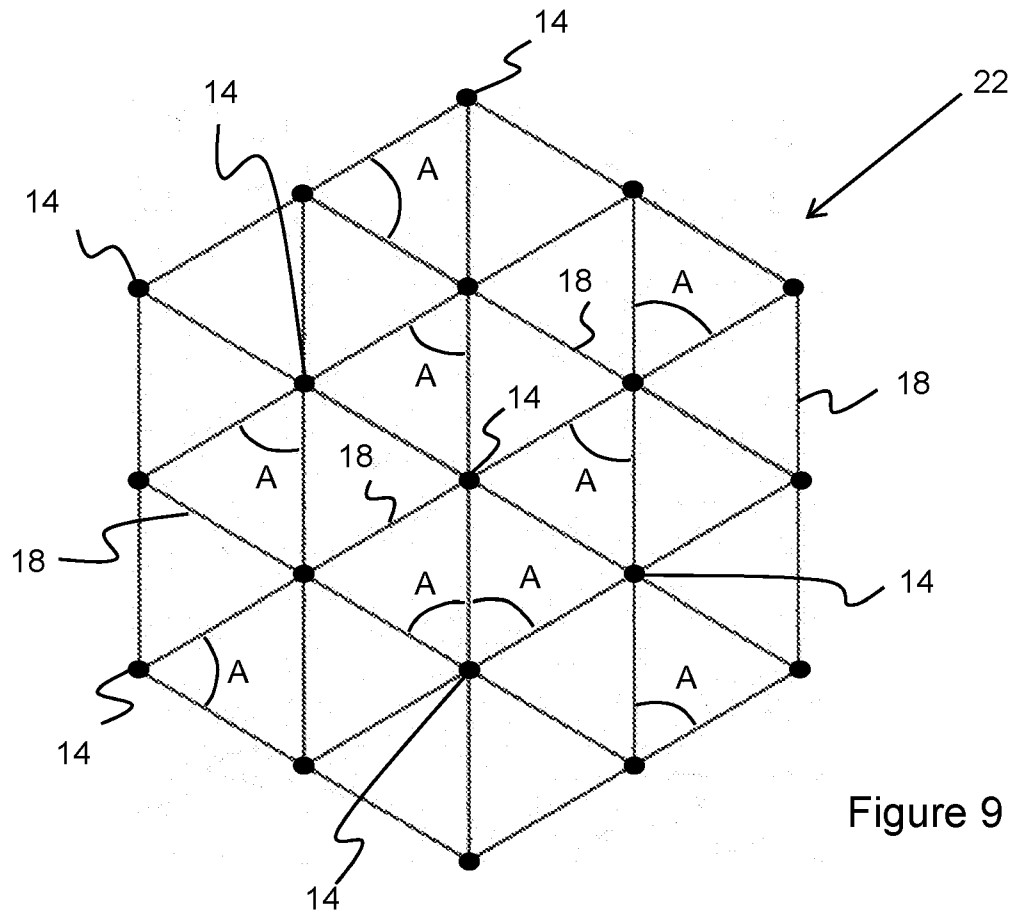


Figure 9

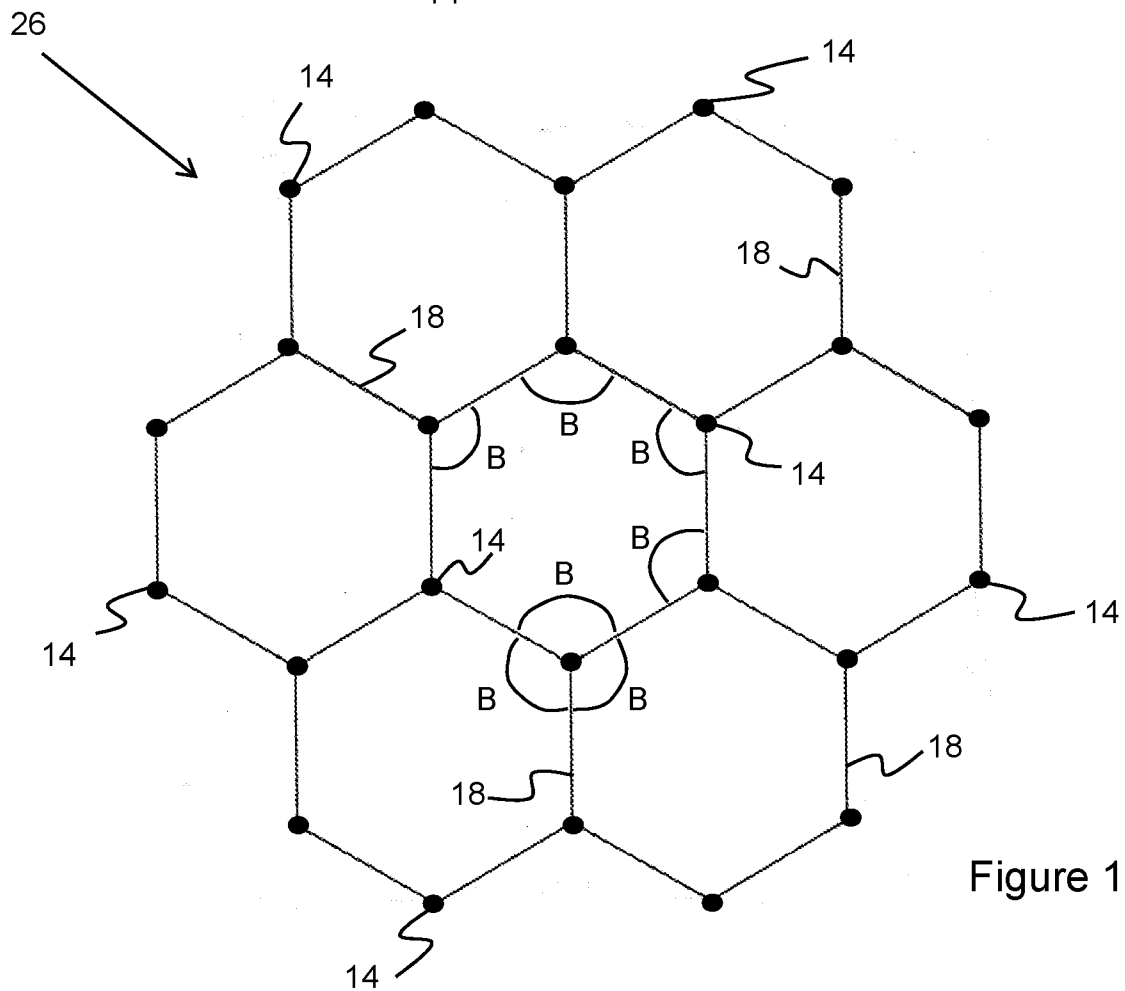


Figure 10

12/14

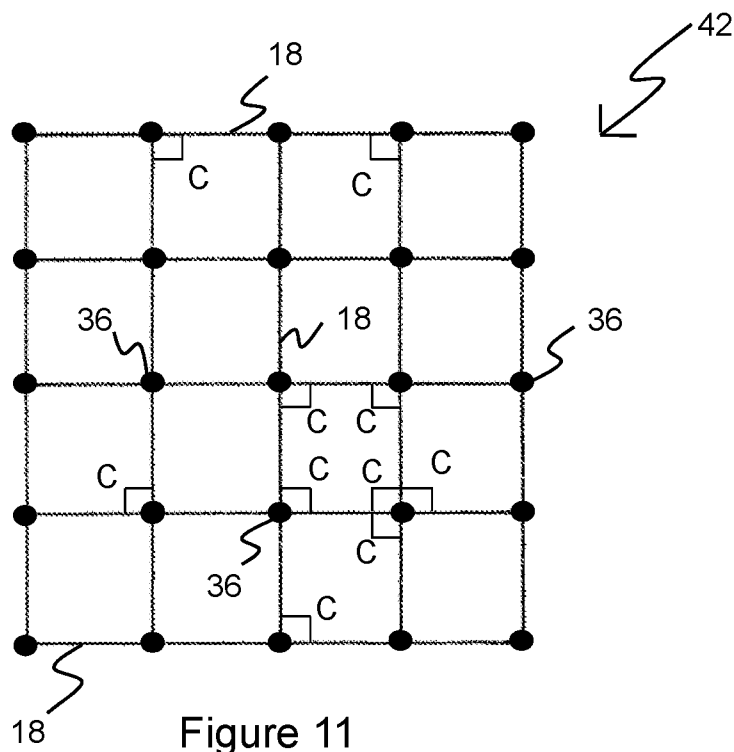


Figure 11

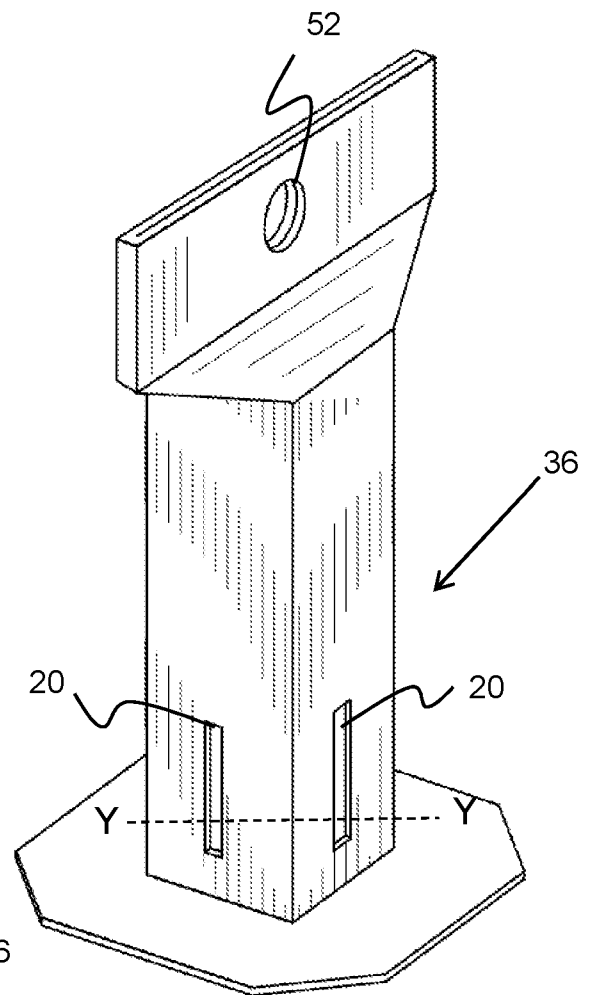


Figure 12

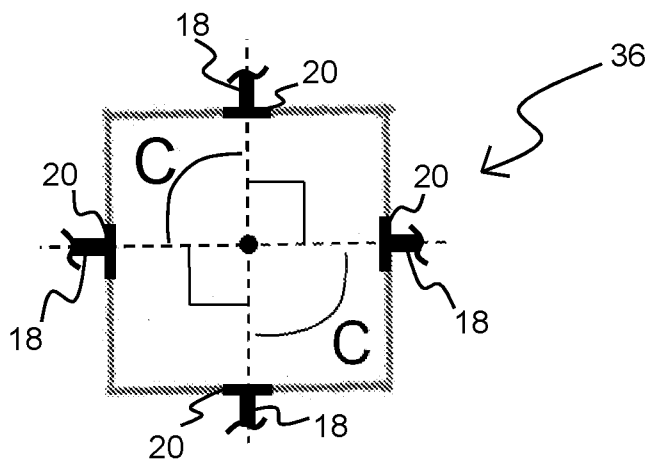


Figure 13

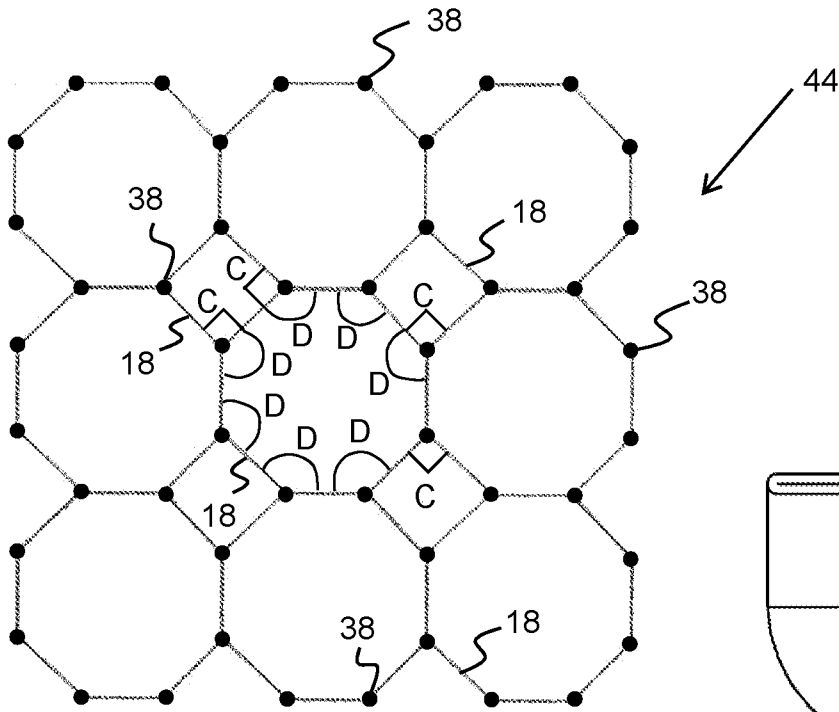


Figure 14

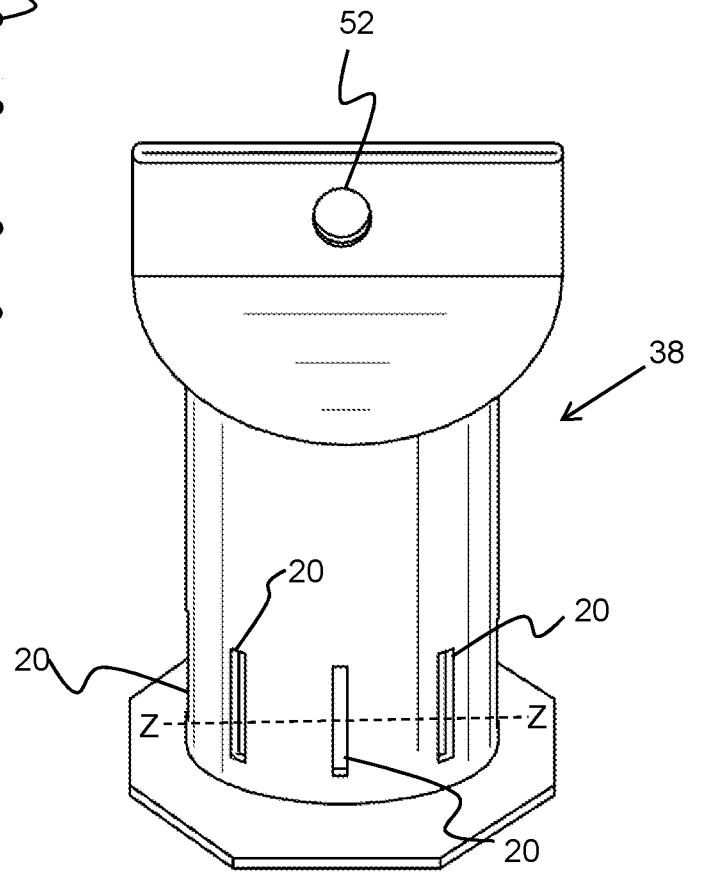


Figure 15

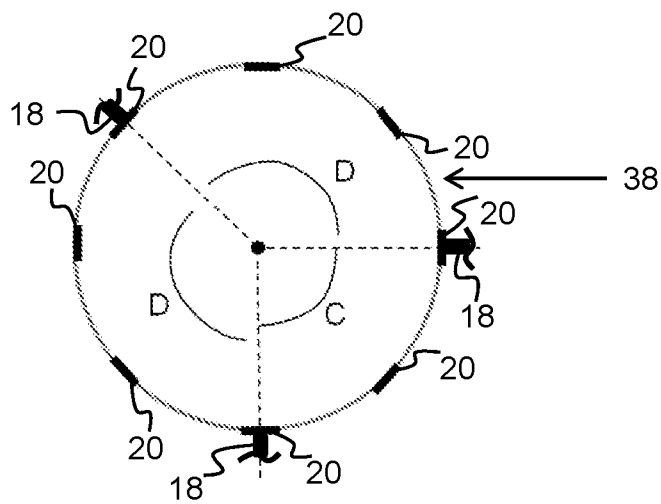


Figure 16

