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(54) **MODULAR COURTYARD PERGOLA AND ASSEMBLY METHOD**

(57) A modular pergola including a plurality of columns (1) which are vertically erected, crossbeams (2) and screen assemblies (4) that are horizontally arranged between adjacent ones of the plurality of columns. The pergola further includes connecting assemblies configured to connect the plurality of columns with the crossbeams, where a top of each of the plurality of columns is provided with a socket end (12) corresponding to a respective one of the connecting assemblies, two ends of each of the crossbeams are provided with inclined sockets (21), one of the inclined sockets of each of the crossbeams is combined with a respective one of the inclined sockets of a respective adjacent one of the crossbeams to match the socket end, and the cover plate is hermetically inserted into tops of the crossbeams to cover the connecting assemblies.

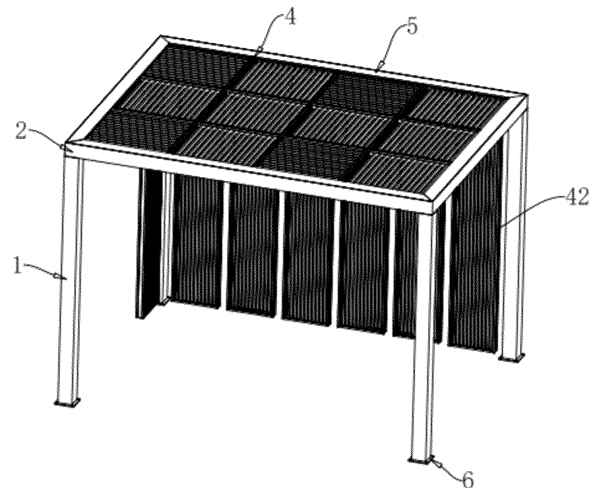


FIG. 1

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to the technical field of pergola, and in particular, to a modular courtyard pergola and an assembly method.

BACKGROUND ART

[0002] A pergola is a component that supports objects to prevent them from tipping over, which usually includes columns, beams, slabs, web members, crossbeams, uprights, diagonal braces, supporting seats, pillars, joints, etc. The pergola combines aesthetics and functionality, and is an important means of constructing exterior characteristics of buildings and dividing spatial patterns.

[0003] Existing pergolas are divided into modular and non-modular types. Although non-modular pergola exhibits highly wind-resistant and earthquake-resistant properties, but its transportation is cumbersome and structure is relatively large. Modular pergola has advantages of convenient transportation and easy assembly, the application thereof is becoming increasingly widespread. The modular pergola is composed of a plurality of components, and an interface treatment between components is a critical aspect of the construction process. However, existing modular pergola has serious problems of looseness and water leakage in interface connections.

SUMMARY

[0004] In order to improve the overall structural stability of the courtyard pergola system while ensuring effective waterproofing performance, the present application provides a modular courtyard pergola and an assembly method.

[0005] The invention is set out in the appended set of claims.

[0006] According to the invention, it is provided a modular courtyard pergola as claimed in claim 1 and an assembly method as claimed in claim 10.

[0007] By adopting the technical solution of the invention, when assembling the pergola, the inclined sockets of adjacent crossbeams form an opening to match with the socket end, thus realizing the connections between the crossbeams and the columns by means of the connecting assembly. Compared with a direct connection between the crossbeams and the column, the present application can enhance the overall stability of the pergola structure, and improve the flexibility of the connecting assembly, so as to adapt to different installation environments while facilitating the assembly of construction personnel. In addition, the top of the crossbeams is covered with the cover plate to minimize the ingress of rainwater into the connection surfaces between the crossbeams and the columns.

[0008] Optionally, each of the connecting assemblies includes a lower connector, an upper connector, and a locking element, where the lower connector is fixedly sleeved on the socket end, each of the crossbeams is configured with a first positioning groove in each of its inclined sockets, into which the lower connector is inserted, and the upper connector is inserted at a joint of adjacent ones of the crossbeams.

[0009] The above technical solution discloses a structural composition of the connecting assembly, the upper connector and the lower connector are adopted to respectively press upper and lower sides of the crossbeams, which can effectively disperse and transmit the stress on the ends of the crossbeams, thereby improving the overall stability of the structure, because two connectors can provide a larger connection contact area to improve the connection strength.

[0010] Optionally, the lower connector includes a sleeve part and two first extension parts respectively on two adjacent sides of the sleeve part, where the two first extension parts are inserted into the adjacent ones of the crossbeams, each of the first extension parts is provided with a first socket, each of the crossbeams is configured with a first through hole corresponding to the first socket, and the locking element is fixed to the first socket through the first through hole.

[0011] The above technical solution specifically discloses the structure of the lower connector. During assembly, the lower connector is first inserted into the socket end, then ends of the crossbeams are inserted into the first extension parts, and each of the crossbeams is fixed with the lower connector through the locking element, that is, adjacent crossbeams are fixed with each other.

[0012] Optionally, a seal gap is formed between a bottom of the lower connector and a bottom of the socket end, into which one of the crossbeams is inserted.

[0013] By the seal gap in the above technical solution, a bottom surface of one of the crossbeams and a top surface of one of the columns are in contact when the one of the crossbeams is inserted into, so as to seal the lower connector.

[0014] Optionally, the upper connector includes a positioning part and two second extension parts respectively on two adjacent sides of the positioning part, where the two second extension parts respectively extend along extension directions of the adjacent ones of the crossbeams, a connecting frame is provided inside the positioning part, an inner wall of the connecting frame is provided with a second socket, the socket end has a connecting tube corresponding to the second socket, each of the crossbeams has a second through hole corresponding to the second socket, and the locking element is inserted into the second through hole, the second socket and the connecting tube to connect a respective one of the crossbeams, the upper connector, and a respective one of the plurality of columns.

[0015] The above technical solution discloses the

structure of the upper connector. After completing the preliminary connection of the lower connector to two crossbeams, the upper connector is inserted into corners of two crossbeams, so that the second extension parts are inserted into the tops of the two crossbeams respectively, then the locking element is into the first connecting tube sequentially through the second through hole and the first socket, so as to realize the fixed connection between the crossbeams and the columns.

[0016] Optionally, a top of each of the crossbeams is configured with a through groove along a length direction thereof for accommodating one of the second extension parts, where each of the crossbeams is configured with two insertion slots on two sides of the through groove, the cover plate has seal strips that are hermetically inserted into the insertion slots respectively, and each of the crossbeams is provided with a clamping side strip configured to press a respectively one of the seal strips in each of the insertion slots.

[0017] By adopting the above technical solution, after completing the connection of the upper connector, the cover plate is inserted into the top of the crossbeams, and the seal strips of the cover plate are inserted into the insertion slots respectively, so that the clamping side strip presses tightly against a side wall of the seal strip, causing the seal strip to deform and bend inward, thereby improving the sealing effect between the seal strip and the insertion slots.

[0018] Optionally, each of the screen assemblies includes a first screen that is slidably installed on the crossbeams, and a second screen that is vertically erected between respective adjacent ones of the plurality of columns, where the first screen includes at least three third through holes and screen partitions inside the third through holes, an inner side of each of the crossbeams has a through slot along a length direction thereof, into which the first screen is slidable, and the second screens are fixed at intervals to a bottom of each of the crossbeams.

[0019] By adopting the above technical solution, the first screen is slidably installed between two crossbeams through the groove in horizontal direction, which simplifies the installation of the first screen.

[0020] Optionally, the base includes a base plate and a vertical rod that is erected vertically on the base plate, where a side wall of the vertical rod is configured with a lateral gap, into which the connecting tube is inserted.

[0021] By adopting the above technical solution, the bottom of the columns are preliminarily fixed with the bases respectively through the connection of the columns and the connecting tubes, which facilitates the fixed connection between the bases and the columns, such that the pergola as a whole is fixed to the ground through the bases, which can increase the contact area with the ground and improve the structural strength compared to the columns.

[0022] Optionally, the modular courtyard pergola further includes a drainage assembly in each of the

insertion slots, where bottom walls of the insertion slots are higher than a bottom wall of the through groove, the drainage assembly includes a storage strip, a shim, and a guide strip, the storage strip is detachably provided on an outer side of the cover plate, two ends of the storage strip are provided with tearing parts to be lifted, the shim is disposed on an inclined surface of an end of the cover plate, the shim gradually inclines downwards from the outer side to an inner side of the cover plate, and the guide strip is provided on opposite side walls of adjacent ones of the crossbeams away from a center of the pergola.

[0023] By providing the storage strip in the above technical solution, it is possible to accommodate water from the gap between the cover plate and the insertion slots, the shim can guide water from the joint of adjacent cover plates to flow out of top surfaces of the cover plates, thereby minimizing the ingress of rainwater into the columns from outer side walls of the crossbeams.

[0024] In a second aspect, the assembly method of the modular courtyard pergola includes following steps:

S1, fixedly connecting the bases and the plurality of columns through self-tapping screws respectively, then placing a plurality of sets of columns and bases at four corners where layout positioning are completed according to design requirements, and fixing the bases on the ground using expansion bolts;

S2, inserting the lower connector into the socket end at the top of one of the plurality of columns, where there is a clearance between the lower connector and a bottom of the socket end, passing countersunk screws through the socket end from a side wall of the lower connector to connect the lower connector and the socket end;

S3, inserting respective ones of the crossbeams horizontally from two adjacent sides of the socket end respectively, such that bottom surfaces of the respective ones of the crossbeams tightly abut against a top surface of a respective one of the plurality of columns, inserting the locking element into the first through hole and the first socket in sequence to achieve a preliminary connection between the respective ones of the crossbeams and the lower connector;

S4, inserting the upper connector vertically into through grooves at the tops of the respective ones of the crossbeams, inserting the locking element into the second socket, the second through hole, and the connecting tube in sequence to fix the respective ones of the crossbeams, the upper connector, and the socket end;

S5, completing the fixation of three ones of the crossbeams, where one side of the pergola is open, so that a first screen horizontally slides into it, so that side walls of the first screen are inserted into the through slots of the crossbeams, and fixing a last one of crossbeams after the first screen is installed on

the top of the pergola;

S6, inserting the cover plate into the crossbeams in a sealing manner, fixing a second screen at the bottom of the crossbeams and fixing a light strip on the plurality of columns.

[0025] In summary, the present application includes at least one of the following beneficial technical effects:

1. the modular courtyard pergola of the present application includes the columns, the crossbeams, the screen assemblies, the connecting assemblies, the bases, and the cover plate, this structure is stable, has high connection strength, and is easy to assemble;
2. the present application uses the upper connector and the lower connector to press upper and lower sides of the crossbeam respectively, which can effectively disperse and transmit the stress on the ends of each crossbeam, thereby improving the overall stability of the structure, the two connectors can provide a larger connection contact area to improve the connection strength;
3. the present application can further improve the waterproof effect of the top of the pergola through the drainage assembly, which minimize the ingress of external rainwater into the internal connecting assemblies, thereby ensuring connection stability.

BRIEF DESCRIPTION OF THE DRAWINGS.

[0026]

Fig. 1 is a general structure view of Embodiment 1;
 Fig. 2 is an exploded view of a column, a connecting assembly, and a crossbeam in Embodiment 1;
 Fig. 3 is a structure view of Embodiment after a lower connector is installed;
 Fig. 4 is a partially enlarged view of portion A in Fig. 3;
 Fig. 5 is an exploded view showing a first installation method of an upper connector in Embodiment 1;
 Fig. 6 is an exploded view showing a second installation method of the upper connector in Embodiment 1.
 Fig. 7 is a sectional view of the crossbeam and a cover plate in Embodiment 1;
 Fig. 8 is a schematic view of coordination between a first screen and the crossbeam in Embodiment 1;
 Fig. 9 is an exploded view of the column and a base in Embodiment 1;
 Fig. 10 is a sectional view of an storage strip in Embodiment 2;
 Fig. 11 is a schematic view showing the end structure after the crossbeam and the cover plate is assembled together in Embodiment 2;
 Fig. 12 is a schematic structure view of a shim and a guide strip in Embodiment 2.

DETAILED DESCRIPTION

[0027] In the description of the present application, it should be understood that the directional or positional relationships indicated by the terms "center", "longitudinal", "transverse", "length", "width", "thickness", "up", "down", "front", "back", "left", "right", "vertical", "horizontal", "top", "bottom", "inside", "outside", "clockwise", "anticlockwise", "axial", "radial", "circumferential", etc. are based on the directional or positional relationships shown in the accompanying drawings, which are only for a convenience of describing the present application and simplifying the description, and do not indicate or imply that the device or element referred to must be constructed and operated in a specific orientation. Due to a fact that the disclosed embodiments of the present application can be provided in different directions, these directional terms are only used for illustration and should not be considered as limitations. For example, "up" and "down" are not necessarily limited to directions opposite or consistent with a direction of gravity. In addition, features limited to "first" and "second" may explicitly or implicitly include one or more of these features.

[0028] The present application is further described in detail below with reference to FIGS. 1-11.

[0029] The present application discloses a modular courtyard pergola and an assembly method.

Embodiment 1:

[0030] Referring to FIGS. 1 and 2, a modular courtyard pergola includes a plurality of columns 1 which are vertically erected, a crossbeam 2 which extends horizontally between adjacent columns 1, a connecting assembly configured for connecting the column 1 and the crossbeam 2, a screen assembly 4 on the crossbeam 2, a cover plate 5 for covering the connecting assembly, and a base 6 configured for supporting.

[0031] The column 1 has a full-length rectangular cross-section with open ends. The column 1 is integrally formed with an inner reinforcing frame 11 in its length direction, and the inner reinforcing frame 11 has a # -shaped cross-section. A top of the column 1 is milled to form a socket end 12. The socket end 12 is a # - shaped inner hole of the inner reinforcing frame 11, which means that the cross-section of the socket end 12 is rectangular. In order to facilitate connection between the column 1 and the base 6 with the connecting assembly, the inner reinforcing frame 11 is integrally formed with a tube socket 13. The tube socket 13 includes a first tube socket 131 in the # - shaped inner hole and a second tube socket 132 at four corners of # - shaped inner hole. The first tube socket 131 and the second tube socket 132 are both arc-shaped tubes with one open end.

[0032] The crossbeam 2 is a rectangular pipe, two ends thereof are both formed with inclined sockets 21 which can be horizontally inserted into the socket ends 12 respectively. An inclination angle of the inclined socket 21

is 45°. The crossbeam 2 is provided with a top plate 22, a transverse reinforcement plate 23, and a bottom plate 24 spaced from top to bottom along a height direction. Both ends of the bottom plate 24 and ends of the top plate 22 are flush with the inclined sockets 21 respectively, and a length of the transverse reinforcement plate 23 is smaller than that of the bottom plate 24. A first positioning groove 25 is formed between the transverse reinforcement plate 23 and the bottom plate 24. A second positioning groove 29 is formed between the transverse reinforcement plate 23 and the top plate 22.

[0033] Referring to FIGS. 2 and 3, the connecting assembly includes a lower connector 31, an upper connector 32, and locking elements 33. In this embodiment, the locking elements 33 are self-tapping screws 331 and countersunk screws 332. The lower connector 31 is sleeved on the socket end 12, which includes a sleeve part 311 and first extension parts 312 which are provided on adjacent sides of the sleeve part 311. The sleeve part 311 has a rectangular inner hole that is adapted to the socket end 12. The lower connector 31 and the socket end 12 are fixedly connected by the countersunk screws 332, the countersunk screws 332 pass through the sleeve part 311 and the socket end 12 along a horizontal direction. There is a seal gap 34 between a bottom wall of the lower connector 31 and the column 1.

[0034] Extension directions of the two first extension parts 312 are perpendicular to each other. Each first extension 312 is integrally formed with first sockets 313 on opposite inner side walls. A cross-section of the first socket 313 is an arc-shaped ring, a curvature of the arc-shaped ring is greater than 180°. An inner wall of the first socket 313 is vertically provided with convex parts 3131 along a circumferential direction.

[0035] After fixing the lower connector 31 with the socket end 12, the crossbeam 2 is installed. When horizontally inserting the crossbeam, the bottom plate 24 is inserted into the seal gap 34, and the two first extension parts 312 are respectively inserted into the first positioning grooves 25 between the transverse reinforcement plates 23 and the bottom plates 24. The transverse reinforcement plate 23 has a first through hole 231 corresponding to the first socket 313, and the top plate 22 has a strip-shaped through hole 221 corresponding to the first through hole. The first through hole 231 is adapted to the locking element 33, and a size of the strip-shaped through hole 221 is larger than that of the first through hole 231.

[0036] Referring to FIGS. 4, 5 and 6, the upper connector 32 is configured to insert into a joint of adjacent crossbeams 2, and it includes a positioning part 321 and second extension parts 322 on two adjacent side walls of the positioning part 321. A size of the upper connector 32 is the same as that of the lower connector 31, and a difference between the upper connector 32 and the lower connector 31 is that the upper connector is provided with a rectangular connecting frame 323 inside the positioning part 321. The connecting frame 323 is integrally formed

or detachably connected with the upper connector 32. In this embodiment, the connecting frame 323 and the upper connector 32 are fixedly connected by the countersunk screws 332.

[0037] Inner walls of the connecting frame 323 are all provided with second sockets 3231 that are structurally consistent with the first tube socket 131. The second socket 3231 corresponds one-to-one with the first tube socket 131. The top plate 22 has second through holes 222 that correspond one-to-one with the first sockets 313. The top plate 22 is lower than a top surface of the crossbeam 2, so as to form a through grooves 26 through the top plate 22 and two side walls of the crossbeam 2 for positioning and inserting the upper connector 32.

[0038] The upper connector 32 can be assembled by two methods. By the first assembly method the upper connector 32 is inserted into a joint of two through grooves 26 after a preliminary connection between the crossbeams 2 and the lower connector 31 is completed. Then, the self-tapping screws 331 are vertically inserted into the second socket 3231, the second through hole 222, and the first tube socket 131, so as to further press and fix the crossbeam 2 fixed by the upper connector 32.

[0039] By the second assembly method it is not necessary to install the connecting frame 323 on the upper connector 32. The upper connecting frame 323 is inserted into the socket end 12 and fixed with the self-tapping screws 331, by which it is to be ensured that a distance between the upper connector 32 and the lower connector 31 is greater than a thickness of the transverse reinforcement plate 23. Then, the crossbeam 2 is horizontally inserted into the column 1, by which the lower connector 31 is inserted into the first positioning groove 25 and the upper connector 32 is inserted into the second positioning groove 29.

[0040] Referring to FIG. 7, the crossbeam 2 is further formed with insertion slots 27 on two sides of the through groove 26 that match with the cover plate 5. A bottom surface of the insertion slot 27 is higher than the through groove 26. The cover plate 5 covers the crossbeam 2 hermetically, a length of the cover plate 5 is the same as that of the crossbeam 2, and its two ends are also formed with inclined surfaces with the inclination angle of 45° respectively.

[0041] The crossbeam 2 is integrally formed with clamping side strips 271 on two sides of the inner wall of the insertion slot 27 along the horizontal direction. The clamping side strips 271 is located closer to a top opening of the insertion slot 27. A bottom of the cover plate 5 has seal strips 51 on two sides which are configured to be inserted into the insertion slots 27 respectively. The seal strip 51 has a certain elastic deformation performance. When the seal strip 51 is inserted into the insertion slot 27, the clamping side strip 271 will compress and deform a side wall of the seal strip 51 inward, improving a sealing effect between the seal strip 51 and the insertion slot 27. An end of the seal strip 51 is also formed with an inwardly inclined guide part 511.

[0042] Referring to FIG. 8, the screen assembly 4 includes a first screen 41 which is slidably installed on a side wall of the crossbeam 2, and a second screen 42 which is vertically fixed at a bottom of the crossbeam 2. The first screen 41 is generally in a shape of a rectangular frame, and it has three third through holes 411. An inner wall of the third through holes 411 is evenly spaced with screen partitions 412. An inner wall of the crossbeam 2 has a through slot 28 spanning two ends along the horizontal direction, and the first screen 41 slides horizontally to be inserted into the through slot 28.

[0043] The second screens 42 are vertically connected with a bottom wall of the crossbeam 2 and are evenly spaced apart from each other, by which a top and bottom of the second screen 42 are fixed by screws.

[0044] Referring to FIGS. 8 and 9, the base 6 includes a base plate 61 and a vertical rod 62 which is fixedly installed on a top of the base plate 61. The vertical rod 62 includes four L-shaped rods which extend vertically. There are lateral gaps 621 between adjacent L-shaped rods. The lateral gaps 621 correspond one-to-one with the first tube sockets 131 of the inner reinforcing frame 11, and a positioning of the base 6 relative to the column 1 can be achieved through the lateral gap 621 and the first tube socket 131. A side wall of the column 1 is provided with a light strip 14.

[0045] The base plate 61 is configured with fourth through holes 611 surrounding the vertical rod 62, which correspond one-to-one with the second tube sockets 132. After completing a preliminary positioning of the base 6 and the column 1, the countersunk screw 332 pass through the fourth through hole 611 and is inserted into the second tube socket 132 to fixedly connect the base 6 and the column 1. A bottom of the base plate 61 is further configured with a clearance slot 612 for accommodating screw heads of countersunk screws 332, so as to prevent interference with the ground-level leveling of the base plate 61.

Embodiment 2

[0046] Compared with Embodiment 1, this embodiment has a same structure as Embodiment 1 except for the structure of the cover plate and a presence of a drainage assembly.

[0047] Referring to FIGS. 10, 11 and 12, in order to improve a waterproof effect of a top of the courtyard pergola and minimize the ingress of external rainwater or moisture into the connecting assembly, the present application is further provided with the drainage assembly 7. The drainage assembly 7 includes a storage strip 71, a shim 72, and a guide strip 73.

[0048] The storage strip 71 is an upward-opening U-shaped strip with elastic deformation capability. The storage strip 71 is detachably disposed on an outer side of the cover plate 5, with a length direction that is the same as that of the cover plate 5, and has tearing parts 711 extending to the crossbeam 2 at two ends. The storage

strip 71 is installed synchronously with the cover plate 5. After a period of usage, there is water stored in the storage strip 71 that enters a gap between the cover plate 5 and the insertion slot 27. At this moment, the tearing parts 711 may be pulled to remove the entire storage strip 71 from a top of the pergola.

[0049] Two ends of the cover plate 5 have extension parts 52 that extend to the top of the crossbeam 2. The extension parts 52 completely cover the crossbeam 2. The shim 72 is fixed on the inclined surfaces at two ends of the cover plate 5 along the extension direction of the cover plate, and extends to the extension parts 52. The shims 72 on adjacent cover plates 5 abut against each other and press against each other to form a guiding channel with a U-shaped cross-section, a bottom of the guiding channel gradually inclines downward from an outer side to an inner side of the cover plate 5.

[0050] The guide strip 73 is fixedly installed on side walls of adjacent crossbeams 2 on a side away from a center of the pergola. A cross-section of the guide strip 73 is a curved surface that protrudes outward, to minimize the ingress of rainwater into the inner side of the pergola from outside.

[0051] The assembly method of the modular courtyard pergola of the present application is as follows:

S1, fixedly connecting the bases and the columns through the self-tapping screws respectively, then placing a plurality of sets of columns and bases at four corners where layout positioning are completed according to design requirements, and fixing the base on the ground using expansion bolts;

S2, inserting the lower connector into the socket end at the top of the column, by which there is a clearance between the lower connector and a bottom of the socket end, passing the countersunk screws through the socket end from a side wall of the lower connector to connect the lower connector and the socket end; S3, inserting the respective crossbeams horizontally from two adjacent sides of the socket end respectively, such that bottom surfaces of the respective crossbeams tightly abut against a top surface of the column, inserting the locking element into the strip-shaped through hole, the first through hole, and the first socket in sequence to achieve a preliminary connection between the respective crossbeams and the lower connector;

S4, inserting the upper connector vertically into a through groove at the tops of the respective crossbeams, inserting the locking element into the second socket, the second through hole, and the connecting tube in sequence to fix the respective crossbeams, the upper connector, and the socket end;

S5, completing the fixation of three sets of crossbeams, where one side of the pergola is open, to slide the first screen horizontally, so that a side wall of the first screen is inserted into the through slot of the crossbeam, and fixing a last set of crossbeams after

the first screen is installed on the top of the pergola,; S6, inserting the cover plate into the crossbeam in a sealing manner, fixing the second screen at the bottom of the crossbeam and fixing the light strip on the column as needed.

[0052] The above are the optional embodiments of the present application, which are not intended to limit the protection scope of the present application. Therefore, all equivalent changes made according to the structure, shape and principle of the present application should be covered within the protection scope of the present application.

List of reference signs

[0053]

1	column
11	inner reinforcing frame
12	socket end
13	tube socket
131	first tube socket
132	second tube socket
2	crossbeam
21	inclined socket
22	top plate
221	strip-shaped through hole
222	second through hole
23	transverse reinforcement plate
231	first through hole
24	bottom plate
25	first positioning groove
26	through groove
27	insertion slot
271	clamping side strip
28	through slot
29	second positioning groove
31	lower connector
311	sleeve part
312	first extension part
313	first keyway sleeve
3131	convex part
32	upper connector
321	positioning part
322	second extension part
323	connecting frame
3231	second keyway sleeve
33	locking element
331	self-tapping screw
332	countersunk screw
34	seal gap
4	screen assembly
41	first screen
411	third through hole
412	partition of first screen
42	second screen
5	cover plate

51	seal strip
511	guide part
52	third extension part
6	base
5 61	base plate
611	fourth through hole
612	clearance groove
62	vertical rod
621	lateral gap
10 7	drainage assembly
71	storage strip
711	tearing part
72	shim
73	guide strip

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Claims

1. A modular courtyard pergola, comprising a plurality of columns (1) which are vertically erected, crossbeams (2) and screen assemblies (4) that are horizontally arranged between adjacent ones of the plurality of columns (1), **characterized in that** the modular courtyard pergola further comprises connecting assemblies configured to connect the plurality of columns (1) with the crossbeams (2), a base (6) at a bottom of each of the plurality of columns (1), and a cover plate (5) configured for covering the crossbeams (2), wherein a top of each of the plurality of columns (1) is provided with a socket end (12) corresponding to a respective one of the connecting assemblies, two ends of each of the crossbeams (2) are provided with inclined sockets (21), one of the inclined sockets (21) of each of the crossbeams is combined with a respective one of the inclined sockets of a respective adjacent one of the crossbeams to match the socket end (12), and the cover plate (5) is hermetically inserted into tops of the crossbeams (2) to cover the connecting assemblies.
2. The modular courtyard pergola according to claim 1, **characterized in that** each of the connecting assemblies comprises a lower connector (31), an upper connector (32), and a locking element (33), wherein the lower connector (31) is fixedly sleeved on the socket end (12), each of the crossbeams (2) is configured with a first positioning groove (25) in each of its inclined sockets (21), into which the lower connector (31) is inserted, and the upper connector (32) is inserted at a joint of adjacent ones of the crossbeams (2).
3. The modular courtyard pergola according to claim 2, **characterized in that** the lower connector (31) comprises a sleeve part (311) and two first extension parts (312) respectively on two adjacent sides of the sleeve part (311), wherein the two first extension parts (312) are inserted into the adjacent ones of the crossbeams (2), each of the first extension parts

(312) is provided with a first socket (313), each of the crossbeams (2) is configured with a first through hole (231) corresponding to the first socket (313), and the locking element (33) is fixed to the first socket (313) through the first through hole (231).

4. The modular courtyard pergola according to claim 3, **characterized in that** a seal gap (34) is formed between a bottom of the lower connector (31) and a bottom of the socket end (12), into which one of the crossbeams (2) is inserted. 10
5. The modular courtyard pergola according to claim 2, **characterized in that** the upper connector (32) comprises a positioning part (321) and two second extension parts respectively on two adjacent sides of the positioning part (321), wherein the two second extension parts respectively extend along extension directions of the adjacent ones of the crossbeams (2), a connecting frame (323) is provided inside the positioning part (321), an inner wall of the connecting frame (323) is provided with a second socket (3231), the socket end (12) has a connecting tube corresponding to the second socket (3231), each of the crossbeams (2) has a second through hole (222) corresponding to the second socket (3231), and the locking element (33) is inserted into the second through hole (222), the second socket (3231) and the connecting tube to connect a respective one of the crossbeams (2), the upper connector (32), and a respective one of the plurality of columns (1). 20 25 30
6. The modular courtyard pergola according to claim 4, **characterized in that** a top of each of the crossbeams (2) is configured with a through groove (26) along a length direction thereof for accommodating one of the second extension parts, wherein each of the crossbeams (2) is configured with two insertion slots (27) on two sides of the through groove (26), the cover plate (5) has seal strips (51) that are hermetically inserted into the insertion slots (27) respectively, and each of the crossbeams (2) is provided with a clamping side strip (271) configured to press a respectively one of the seal strips (51) in each of the insertion slots (27). 35 40 45
7. The modular courtyard pergola according to claim 1, **characterized in that** each of the screen assemblies (4) comprises a first screen (41) that is slidably installed on the crossbeams (2), and a second screen (42) that is vertically erected between respective adjacent ones of the plurality of columns (1), wherein the first screen (41) comprises at least three third through holes (411) and screen partitions (412) inside the third through holes (411), an inner side of each of the crossbeams (2) has a through slot (28) along a length direction thereof, into which the first screen (41) is slidable, and the second screens (42) 50 55

are fixed at intervals to a bottom of each of the crossbeams (2).

8. The modular courtyard pergola according to claim 4, **characterized in that** the base (6) comprises a base plate (61) and a vertical rod (62) that is erected vertically on the base plate (61), wherein a side wall of the vertical rod (62) is configured with a lateral gap (621), into which the connecting tube is inserted.
9. The modular courtyard pergola according to claim 6, **characterized in that** the modular courtyard pergola further comprises a drainage assembly (7) in each of the insertion slots (27), wherein bottom walls of the insertion slots (27) are higher than a bottom wall of the through groove (26), the drainage assembly (7) comprises a storage strip (71), a shim (72), and a guide strip (73), the storage strip (71) is detachably provided on an outer side of the cover plate (5), two ends of the storage strip (71) are provided with tearing parts (711) to be lifted, the shim (72) is disposed on an inclined surface of an end of the cover plate (5), the shim (72) gradually inclines downwards from the outer side to an inner side of the cover plate (5), and the guide strip (73) is provided on opposite side walls of adjacent ones of the crossbeams (2) away from a center of the pergola.
10. An assembly method of the modular courtyard pergola according to one of claims 1 to 9, **characterized in that** the assembly method comprises following steps:
 - S1, fixedly connecting the bases (6) and the plurality of columns (1) through self-tapping screws (331) respectively, then placing a plurality of sets of columns (1) and bases (6) at four corners where layout positioning are completed according to design requirements, and fixing the bases (6) on the ground using expansion bolts;
 - S2, inserting the lower connector (31) into the socket end at the top of one of the plurality of columns (31), wherein there is a clearance between the lower connector (31) and a bottom of the socket end (12), passing countersunk screws through the socket end (12) from a side wall of the lower connector (31) to connect the lower connector (31) and the socket end (12);
 - S3, inserting respective ones of the crossbeams (2) horizontally from two adjacent sides of the socket end (12) respectively, such that bottom surfaces of the respective ones of the crossbeams (2) tightly abut against a top surface of a respective one of the plurality of columns (1), inserting the locking element (33) into the first through hole (231) and the first socket (313) in sequence to achieve a preliminary connection between the respective ones of the crossbeams

(2) and the lower connector (31);
S4, inserting the upper connector (32) vertically
into through grooves at the tops of the respective
ones of the crossbeams (2), inserting the locking
element (33) into the second socket (3231), the
second through hole (22), and the connecting
tube in sequence to fix the respective ones of the
crossbeams (2), the upper connector (32), and
the socket end (12);
S5, completing the fixation of three ones of the
crossbeams (2), wherein one side of the pergola
is open, so that a first screen (41) horizontally
slides into it, so that side walls of the first screen
(41) are inserted into the through slots (28) of the
crossbeams, and fixing a last one of cross-
beams (2) after the first screen (41) is installed
on the top of the pergola;
S6, inserting the cover plate (15) into the cross-
beams (2) in a sealing manner, fixing a second
screen (42) at the bottom of the crossbeams (2)
and fixing a light strip on the plurality of columns
(1).

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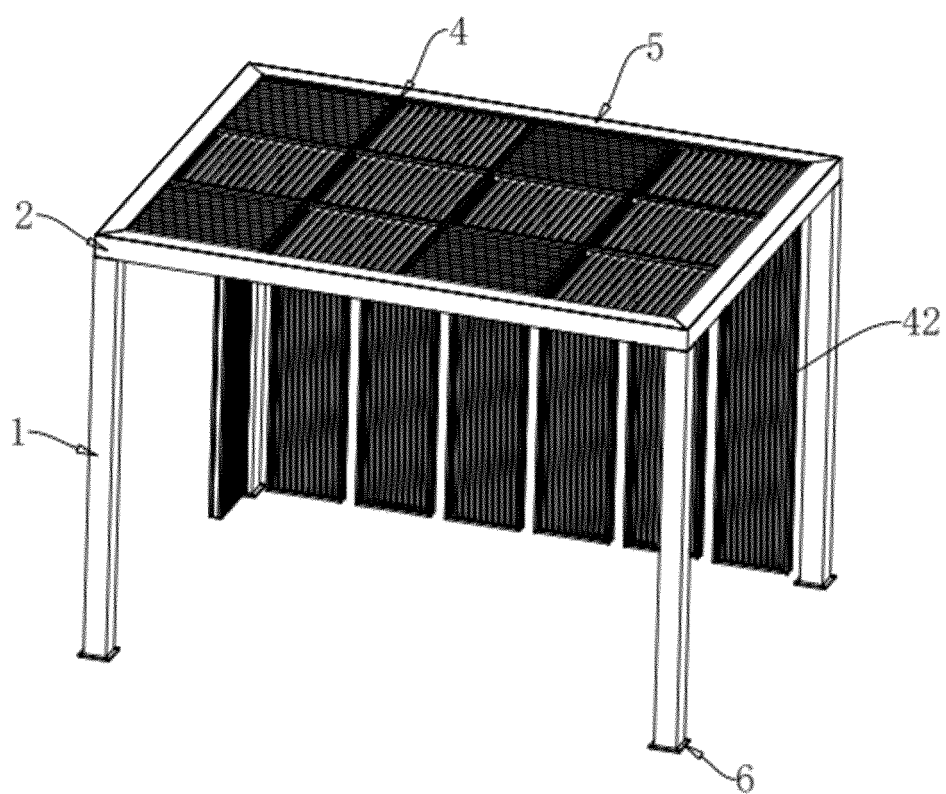


FIG. 1

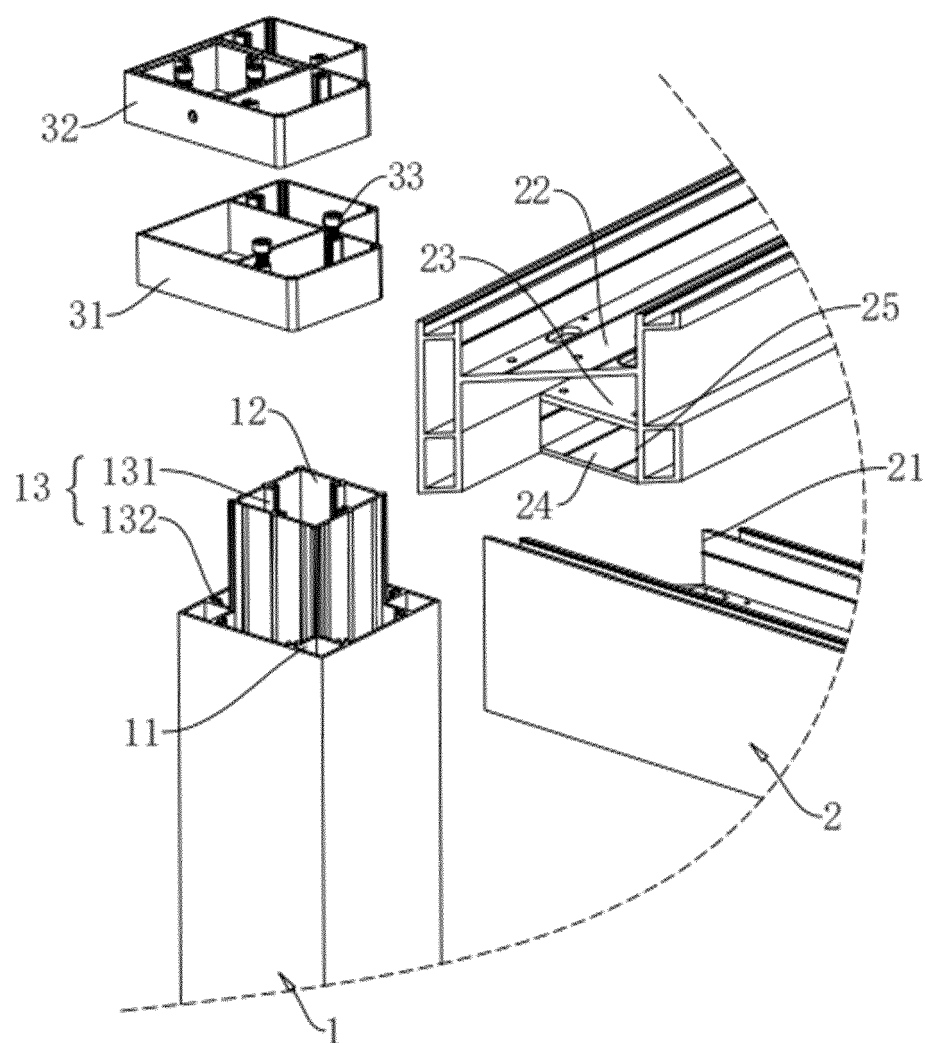


FIG. 2

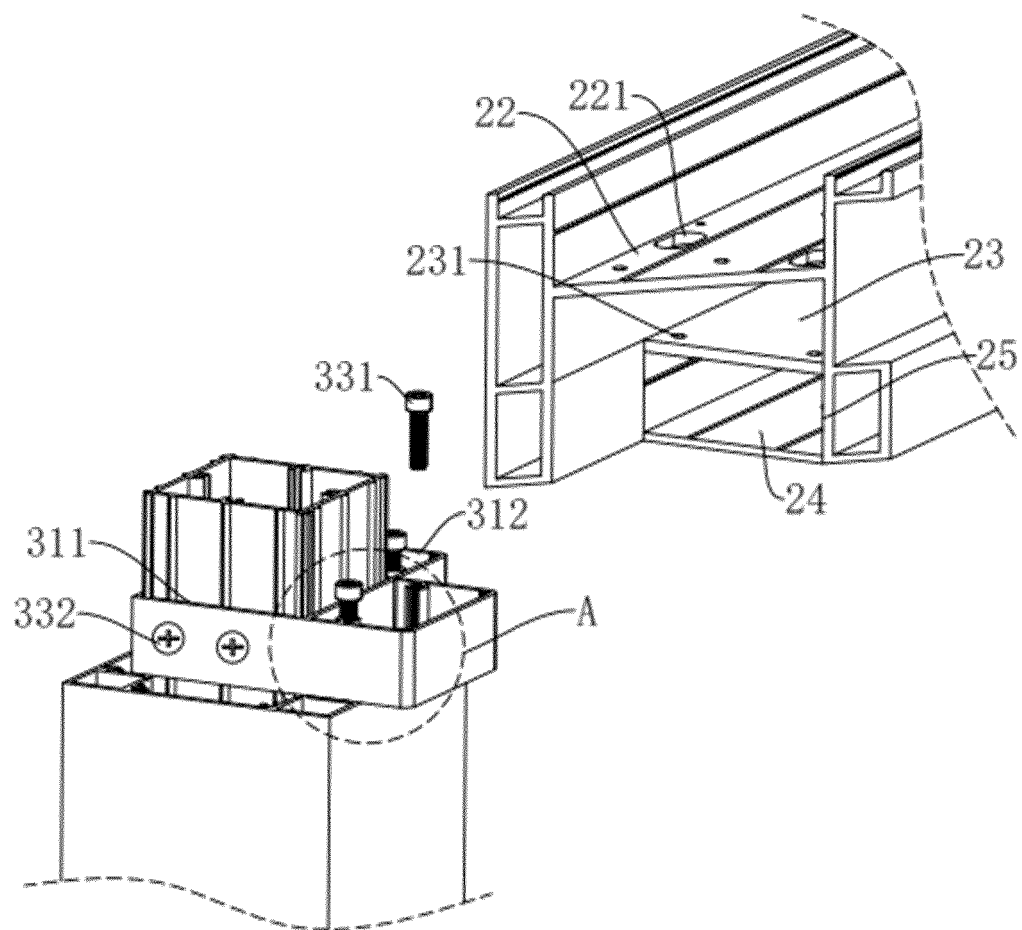
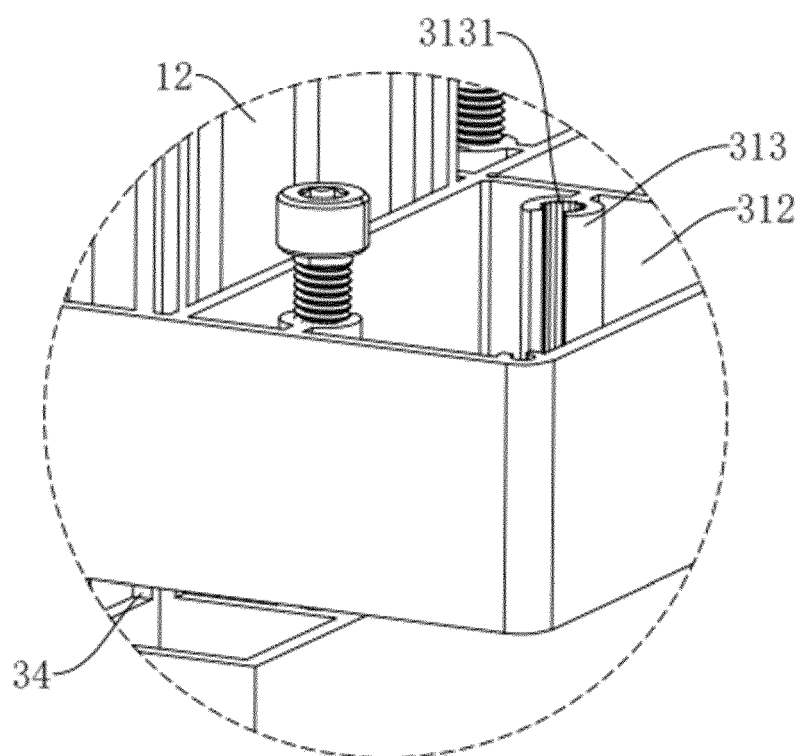


FIG. 3



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FIG. 4

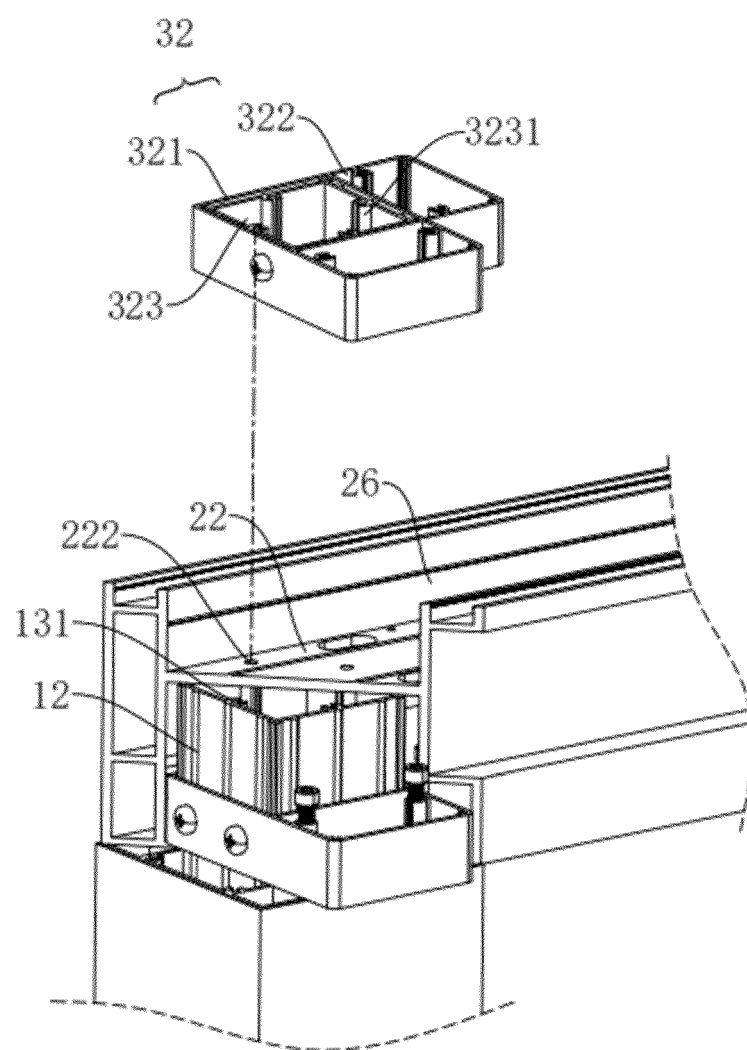


FIG. 5

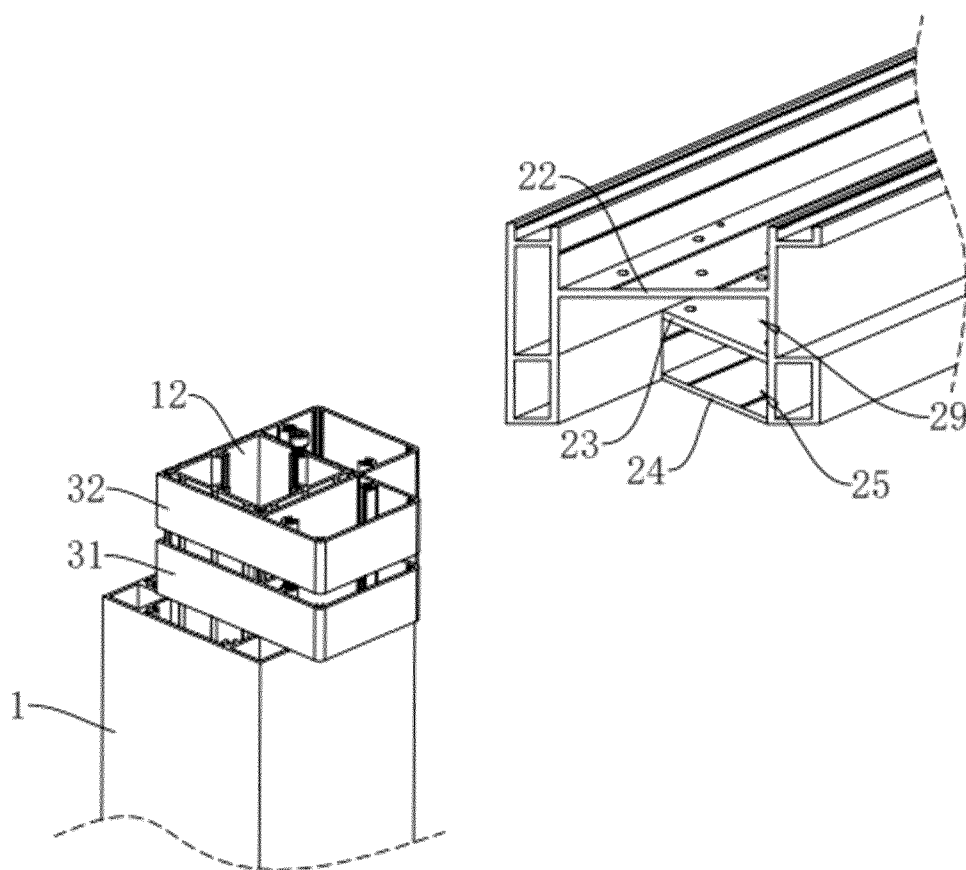


FIG. 6

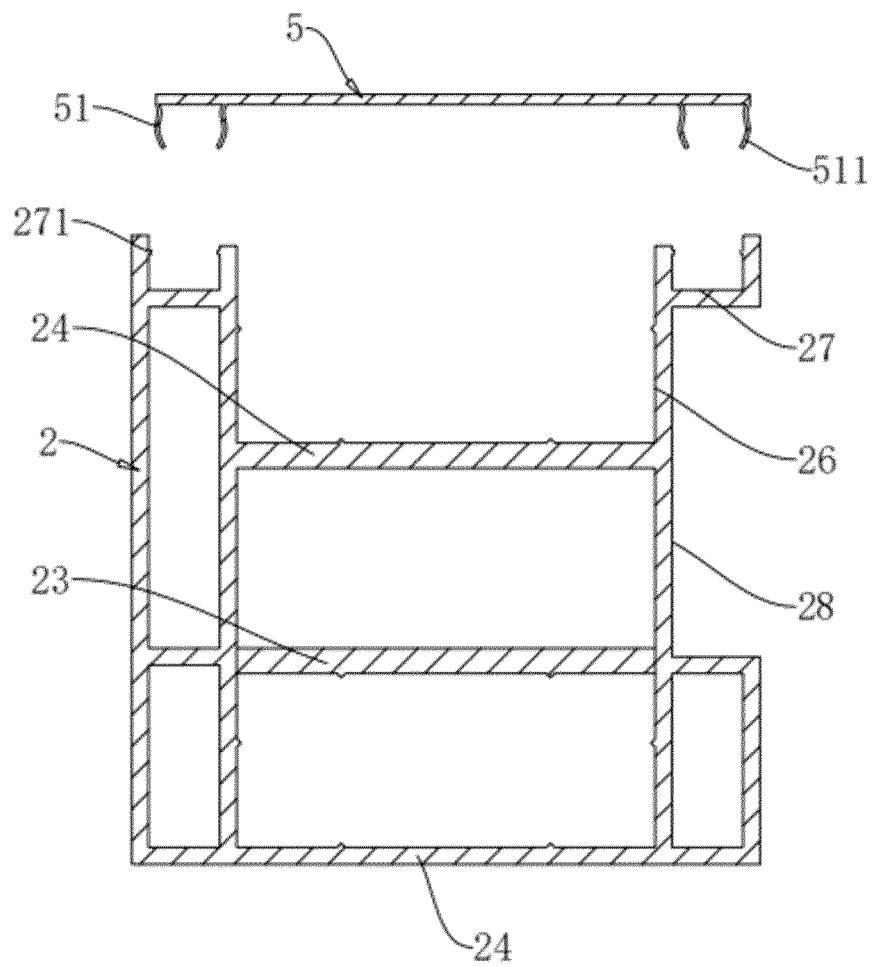


FIG. 7

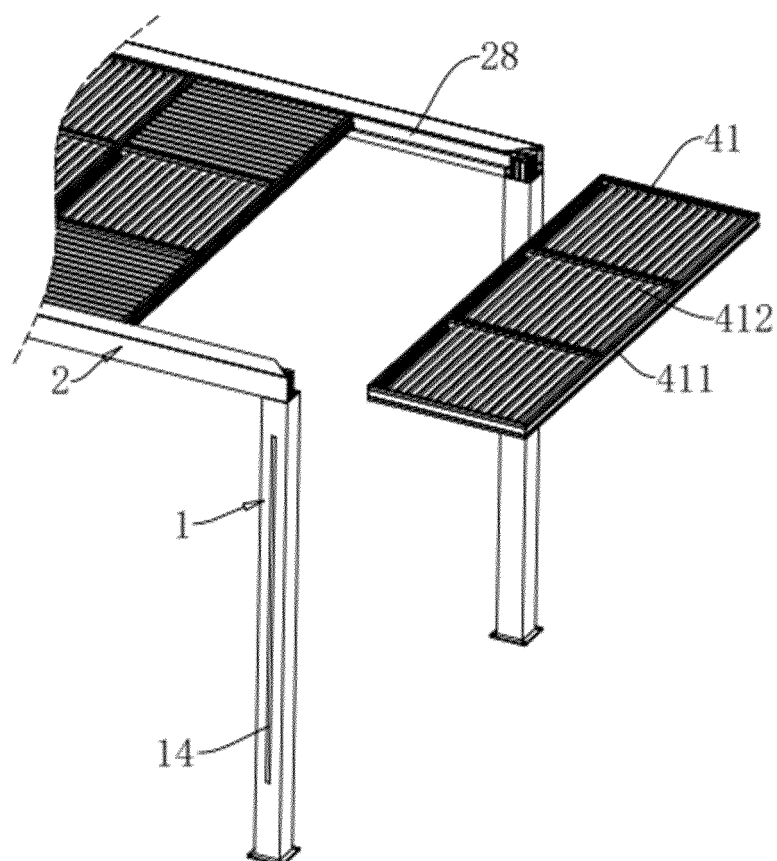


FIG. 8

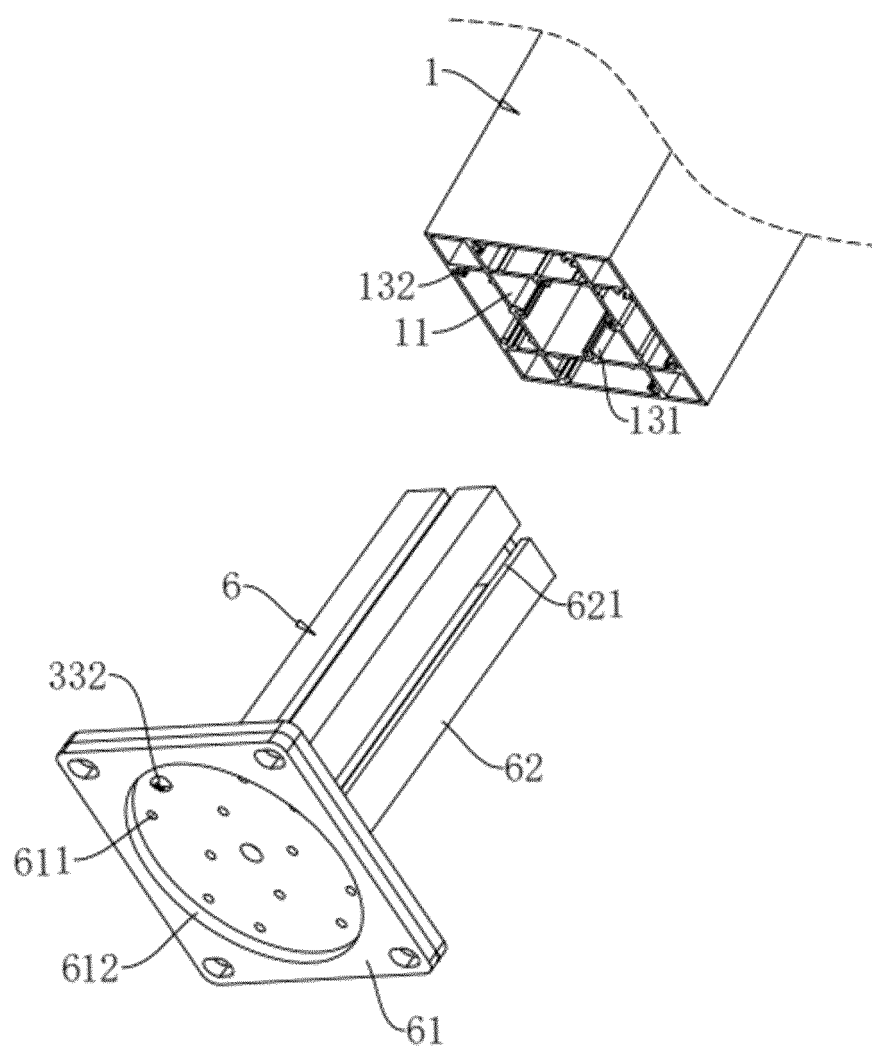


FIG. 9

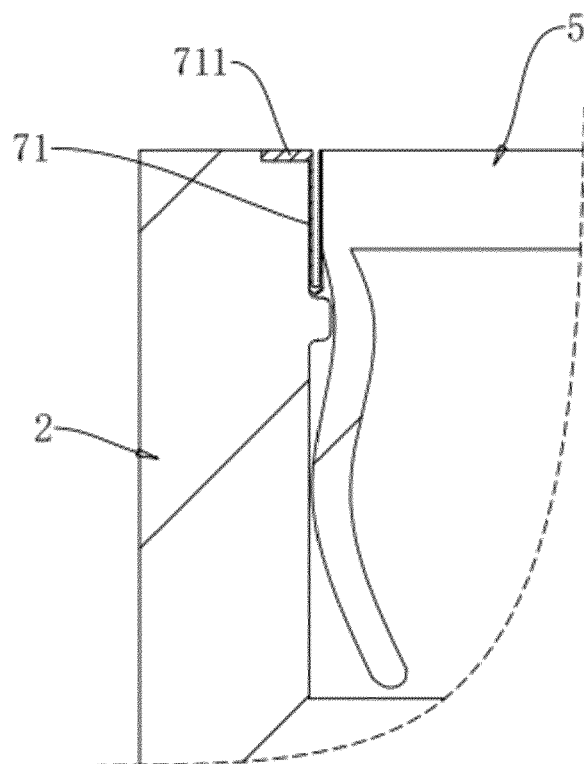


FIG. 10

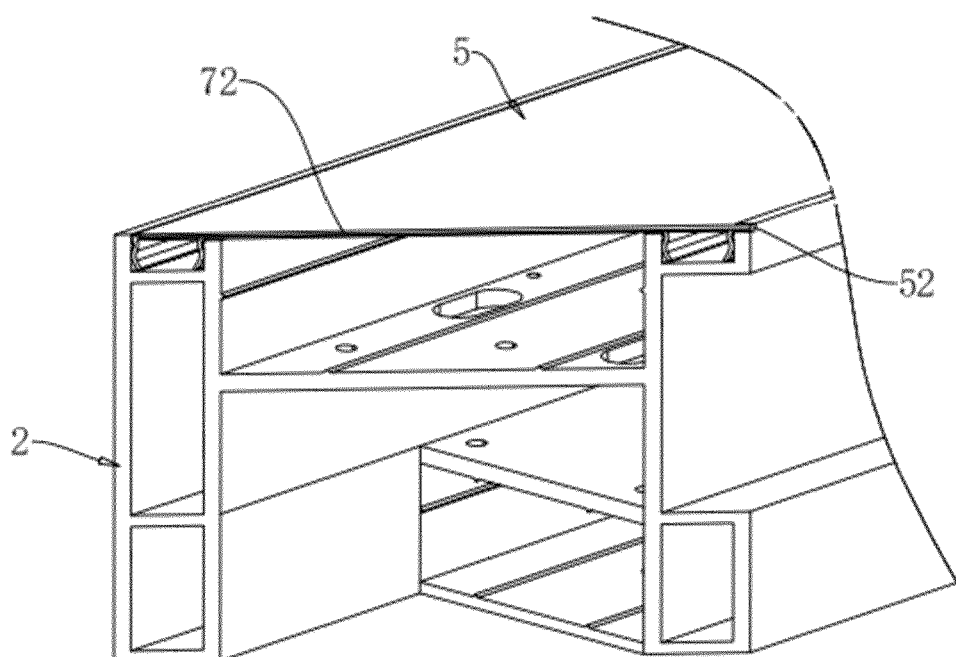


FIG. 11

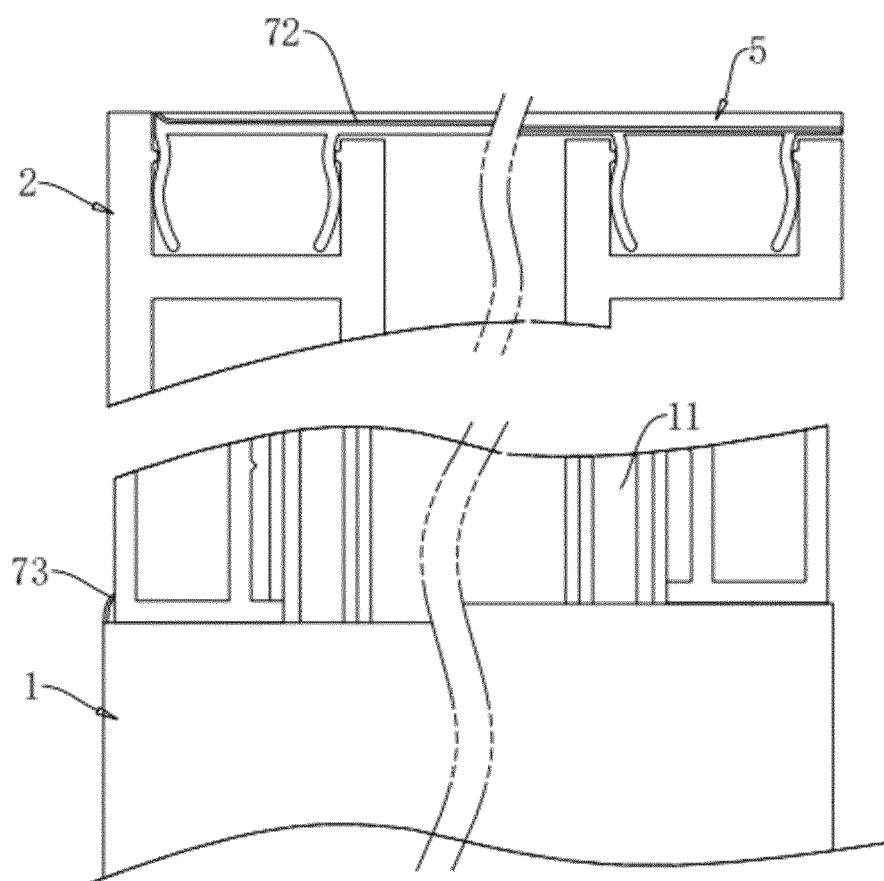


FIG. 12



EUROPEAN SEARCH REPORT

Application Number

EP 25 17 8488

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CN 115 234 046 A (FOSHAN YUGELANG DECORATION MATERIAL TECH CO LTD) 25 October 2022 (2022-10-25)	1,7	INV. E04H15/18 E04B1/00
A	* claims 1,5; figures 1-6 * -----	2-6,8-10	E04F10/00 E04F10/08
X	CN 217 379 902 U (ZHEJIANG YUANMEI ALUMINUM TECH CO LTD) 6 September 2022 (2022-09-06)	1,7	E04H15/58
A	* claims 1,6,7; figures 1-3 * -----	2-6,8-10	ADD. E04B1/24 E04H1/12
			TECHNICAL FIELDS SEARCHED (IPC)
			E04H E04B E04F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		30 October 2025	Rosborough, John
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T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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ON EUROPEAN PATENT APPLICATION NO.

EP 25 17 8488

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30-10-2025

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CN 115234046	A	25-10-2022	NONE

CN 217379902	U	06-09-2022	NONE

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82