FURNITURE ASSEMBLY SYSTEM AND A METHOD FOR THE SAME

FIELD

[0001] The present disclosure relates to furniture assembly systems. The present disclosure also relates to an assembled furniture piece, and a method of assembling a furniture piece using the furniture assembly system.

BACKGROUND ART

[0002] The following discussion of the background to the disclosure is intended to facilitate an understanding of the present disclosure only. It should be appreciated that the discussion is not an acknowledgement or admission that any of the material referred to was published, known or part of the common general knowledge of the person skilled in the art in any jurisdiction as at the priority date of the disclosure.

[0003] Assembling furniture may be complicated. Present technology for assembling furniture is labor and part intensive. A piece of furniture will have many component parts and require several tools for assembly. Because of the complexity of assembling, most furniture is assembled by the seller presently. Furniture that is fully or most fully assembled usually takes up a considerable amount of space and causes difficulty in handling and transportation.

[0004] More recently, ready-to-assemble furniture systems are seen where furniture components (with the necessary tools) are shipped to a user and that the user assembles the furniture on site. However, most of the existing ready-to-assemble furniture systems utilize location dependent connectors and brackets that multiply the effort needed to assemble the furniture components and intensify the complexity of the assembly process.

[0005] The present disclosure contemplates that it would be desirous to provide a system and method for assembling a furniture piece to at least alleviate or mitigate the afore-mentioned problems.

SUMMARY

[0006] According to one aspect of the present disclosure, there is provided a furniture assembly system, comprising:

- a plurality of cross panels, wherein each cross panel comprises a plurality of engaging apertures of a right-angle cross shape arranged in one or more rows and one or more columns, with each engaging aperture being separated from an adjacent engaging aperture at a predetermined distance,

- at least one top panel comprising a plurality of lock-down apertures,

- at least one support member, wherein the or each support member comprises a first interaction edge and a second interaction edge connectable to the cross panel, and a third interaction edge connectable to the top panel, the first interaction edge and the second interaction edge being substantially perpendicular to the third interaction edge, and

wherein each of the first interaction edge and the second interaction edge comprises at least one hook joint shaped and sized to be insertable into the engaging aperture of the cross panel and to extend beyond the cross panel forming a cantilevered projection, the third interaction edge comprises one or more protruding portions shaped and sized to fit in the plurality of lock-down apertures of the top panel.

[0007] In some embodiments, the furniture assembly system may further comprise a plurality of locking members, the locking member is shaped and sized to fit into the engaging aperture to secure the support member on the cross panel.

[0008] In some embodiments, the cross panel may further comprise a plurality of auxiliary apertures for receiving an attachment means.

[0009] In some embodiments, the furniture assembly system may further comprise one or more accessories attachable to the cross panel and/or top panel.

[0010] In some embodiments, the top panel may be configured to weave in a flexible material to form a support surface.

[0011] In some embodiments, the first interaction edge and the second interaction edge of the or each support member may comprise two or more said hook joints configured to be coupled to into two or more said engaging apertures on the cross panel.

[0012] In some embodiments, the components of the furniture assembly system may be customizable by an end-user.

[0013] According to another aspect of the present disclosure, there is provided an assembled furniture piece made from components of a furniture assembly system, comprising:

- a first cross panel and a second cross panel forming two opposing side surfaces of the furniture piece,

- a first support member and a second support member perpendicularly disposed with respect to the first cross panel and/or the second cross panel, each of the first support member and the second support member being connected to the first cross panel along a first interaction edge and being connected to the second cross panel along a second interaction edge,

- a top panel forming a top surface of the furniture piece, the top panel being connected to the first support member along a third interaction edge of the first support member and connected to the second support member along a third interaction edge of the second support member.

[0014] In some embodiments, the assembled furniture piece may further comprise a plurality of locking members, each locking member being coupled to an engaging aperture where a hook joint on the first or the second interaction edge of the support member is inserted so as to secure the support member on the cross panel.

[0015] In some embodiments, the assembled furniture piece may further comprise one or more accessories attached to the cross panel.

[0016] In some embodiments, a flexible material may be woven into the top panel to form a support surface.

[0017] In some embodiments, components of the assembled furniture piece may be customizable by an end-user.

[0018] According to a further aspect of the present disclosure, there is provided a method of assembling a furniture piece using a furniture assembly system, comprising the steps of:

- connecting by hand a first support member to a first cross panel, wherein one or more hook joints on a first interaction edge of the first support member are inserted into one or more corresponding engaging apertures of the first cross panel and are set to extend beyond the first cross panel to form a cantilevered projection,

- connecting by hand a second support member to the first cross panel, wherein one or more hook joints on a first interaction edge of the second support member are inserted into one or more corresponding engaging apertures of the first cross panel and are set to extend beyond the first cross panel to form a cantilevered projection,

- connecting by hand the first support member to a second cross panel, wherein one or more hook joints on a second interaction edge of the first support member are inserted into one or more corresponding engaging apertures of the second cross panel and are set to extend beyond the second cross panel to form a cantilevered projection,

- connecting by hand the second support member to the second cross panel, wherein one or more hook joints on a second interaction edge of the second support member are inserted into one or more corresponding engaging apertures of the second cross panel and are set to extend beyond the second cross panel to form a cantilevered projection, and

- connecting by hand a top panel to the first support member and the second support member, wherein one or more protruding portions on a third interaction edge of the first support member and of the second support member are fit into one or more corresponding lock-down apertures of the top panel.

[0019] In some embodiments, the method may further comprises securing the first support member and the second support member on the first cross panel and the second cross panel using a plurality of locking members, wherein each locking member is fitted into an engaging aperture where a hook joint is inserted.

[0020] In some embodiments, the method may further comprise a step of weaving a flexible material is into the top panel to form a support surface.

[0021] In some embodiments, the method may further comprise a step of attaching one or more accessories to the cross panel.

[0022] According to yet another aspect of the present disclosure, there is provided a cross panel of a furniture assembly system, comprising:

a plurality of engaging apertures of a right-angle cross shape arranged in one or more rows and one or more columns, and each engaging aperture is separated from an adjacent engaging aperture at a predetermined distance,

wherein the cross panel is configured to connect to a support member, the support member comprising a first interaction edge and a second interaction edge connectable to the cross panel, and a third interaction edge connectable to a top panel, the first interaction edge and the second interaction edge being substantially perpendicular to the third interaction edge, and

wherein each of the first interaction edge and the second interaction edge comprises at least one hook joint shaped and sized to be insertable into the engaging aperture of the cross panel and to extend beyond the cross panel forming a cantilevered projection, the third interaction edge comprises one or more protruding portions shaped and sized to fit in a plurality of lock-down apertures of the top panel.

[0023] Other aspects of the disclosure will be apparent to those of ordinary skill in the art upon review of the following description of specific embodiments of the disclosure in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] Various embodiments are described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 illustrates a furniture assembly system according to one embodiment;

Figure 2 illustrates a furniture piece assembled from components of the furniture assembly system;

Figure 3 illustrates a cross panel of the furniture assembly system according to one embodiment;

Figure 4A illustrates a support member of the furniture assembly system according to one embodiment;

Figure 4B illustrates a support member of the furniture assembly system according to another embodiment;

Figure 5A illustrates a top panel of the furniture assembly system according to one embodiment;

Figure 5B illustrates a top panel of the furniture assembly system according to another embodiment;

Figure 5C illustrates a top panel of the furniture assembly system according to another embodiment;

Figure 6A to 6D illustrate furniture pieces assembled from components of the furniture assembly system according to some embodiments; and

Figure 7 illustrates a user interface of a digital platform for designing a furniture piece and ordering components of the furniture assembly system.

DETAILED DESCRIPTION

[0025] In the following description, details are provided to describe the embodiments of the specification. It shall be apparent to one skilled in the art, however, that the embodiments may be practiced without such details.

[0026] Similar parts of the embodiments may have the same names, similar part numbers, or similar part numbers with an alphabet symbol or prime symbol. The description of one part applies by reference to another similar part, where appropriate, thereby reducing repetition of text without limiting the disclosure.

[0027] Throughout this specification, unless otherwise indicated to the contrary, the terms ‘comprising’, ‘consisting of’, ‘having’ and the like, are to be construed as non-exhaustive, or in other words, as meaning ‘including, but not limited to’.

[0028] Throughout the specification, unless the context requires otherwise, the word ‘include’ or variations such as ‘includes’ or ‘including’ will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

[0029] Throughout the specification, the singular form "a", "an" and "the" include plural references unless the context clearly dictates otherwise. For example, the term "a plant" or "at least one plant" may include a plurality of plants.

[0030] Unless defined otherwise, all other technical and scientific terms used herein have the same meaning as is commonly understood by a skilled person to which the subject matter herein belongs.

[0031] In accordance to various embodiments of the invention and with reference to Figure 1 to Figure 5C, there is a system 10 for assembling a furniture piece 20, including but not limited to, a stool, a chair, a table, a cabinet and a shelf. The system 10 is also referred to as a furniture assembly system 10 which comprises components required for assembling furniture pieces 20 of various types and designs. The furniture assembly system 10 could serve as a storage and organization solution and yet be broken down into smaller modules that could be assembled together to form different furniture pieces.

[0032] In various embodiments, the furniture assembly system 10 comprises a plurality of cross panels 100, a plurality of support members 200, at least top panel 300, and a plurality of locking members 400. Each cross panel 100 comprises a plurality of engaging apertures 102 arranged in one or more rows and one or more columns, and each engaging aperture 102 has a right-angle cross shape and is separated from an adjacent engaging aperture at a predetermined distance (denoted as D1 in Figure 3). The at least one top panel 300 comprises a plurality of lock-down apertures disposed at pre-determined locations on the at least top panel 300. The support member 200 comprises a first interaction edge 201 and a second interaction edge 202 connectable to the cross panel 100, and a third interaction edge 203 connectable to the top panel 300, the first interaction edge 101 and the second interaction edge 102 being substantially perpendicular to the third interaction edge 203.

[0033] Each of the first interaction edge 201 and the second interaction edge 202 comprises at least one hook joint 210 shaped and sized to be insertable into the engaging aperture 102 of the cross panel 100, and wherein, when inserted, the at least one hook joint 210 is configured to extend beyond the cross panel 100 to form a cantilevered projection such that the support member 200 is interlocked with the cross panel 100. The third interaction edge 203 comprises one or more protruding portions 220 shaped and sized to fit in the plurality of lock-down apertures 304 of the top panel 300.

[0034] Figure 3 depicts an exemplary cross panel 100 of the furniture assembly system 10 and the engaging apertures 102 disposed thereon. The cross panel 100 may be of a rectangular or near rectangular shape. The corners of the cross panel 10 may be rounded for

safety. The plurality of engaging apertures 102 are disposed on the cross panel 100 in an orderly arrangement or in an array of multiple rows and columns, and adjacent engaging apertures 102 are spaced apart by a pre-determined distance of D_1. In an assembled furniture piece, at least two cross panels are used and may act to support the furniture piece 20 on a ground surface.

[0035] It is to be appreciated that the cross panel 100 may be of other suitable shapes different from that of the cross panel 100 of Figure 3, and that it may be populated with various numbers of engaging apertures 102 depending on the design of the furniture piece to be assembled. For example, the cross panel 100 may comprise engaging apertures 102 arranged in a 4x4 array as shown in Figure 3. In other cross panel, the engaging apertures 102 may be arranged in a 6x8 array, a 3x4 array, a 12x5 array and etc. Further, an end-user may design their own furniture piece and to customize the cross panel 100 as well as the arrangement of the engaging apertures 102 on the cross panel 100 accordingly, which will be illustrated in a later part of the description in further details.

[0036] The engaging aperture 102 is of a right-angle cross shape. More specially, the engaging aperture 102 is formed of two slots 102a, 102b which extends along a horizontal axis (or an x-axis as denoted in Figure 3) and a vertical axis (or a y-axis as denoted in Figure 3) respectively. The two slots 102a, 102b may be of an equal length (D2 as denoted in Figure 3). The engaging apertures 102 acts as to receiving a coupling structure on another furniture component so as to form connection with the other furniture component.

[0037] Various suitable shaping and forming techniques may be used to form the engaging apertures 102 where a uniform grid may be used for providing coordinates for introducing the plurality of engaging apertures 100 at desired locations on the cross panel 100. It is to be appreciated that the size and shape of the cross panel 100, and the size of the engaging aperture 102 and the distance D1 may be determined according to the type and design of the furniture piece 20 desired. In some embodiments, an end-user may customize the cross panel 100 and the arrangement of the engaging apertures 102 thereon through a digital platform, which will be illustrated in further details below.

[0038] In some embodiments, the cross panel may further comprise a plurality of auxiliary apertures 103 for receiving an attachment means. Non-limiting examples of an attachment means may be a screw, a nail, or a bolt, which allows other components of the

furniture assembly system 10 or accessories or other items to be fixedly attached onto the cross panel 100. The auxiliary aperture 103 may be a hole of a suitable size so that it is compatible with a standard screw/nail/bolt (e.g. a standard M6 screw). The standard screws/nails/bolts and other attachment means are easily accessible at most hardware stores.

[0039] In one embodiment, each engaging aperture 102 may be provided with four auxiliary apertures 103 symmetrically arranged with respect to the cross-shape engaging aperture 102, as shown in Figure 3. The auxiliary apertures 103 may be formed at the same time when forming the engaging apertures 102 using various suitable shaping and forming techniques. It is to be appreciated that the auxiliary aperture 103 may also be introduced in other parts of the cross panel 100 depending on the design and type of furniture piece 20 desired.

[0040] Figure 4A and 4B depict two exemplary the support members 200 of the furniture assembly system 10. Functionally, the support member 200 acts to connect other components of the furniture assembly system 10 to assemble into a furniture piece 20. The support member also acts to provide structural stability of the assembled furniture piece 20.

[0041] In one embodiment as shown in Figure 4A, the support member 200 may resemble an inverted U shape, with a horizonal beam portion and two elongate members that are vertically extending from two ends of the horizonal beam portion. In another embodiment as shown in Figure 4B, the support member 200 may comprise a beam portion of a “x” or a cross shape which may provide an enhanced structural stability.

[0042] The support member 200 comprises a first interaction edge 201, a second interaction 202, and a third interaction edge 203 integrally formed thereon. The third interaction edge 203 is substantially perpendicular to the first interaction edge 201 and the second interaction edge 202. Each of the first, second and third interaction edges 201, 202, 203 is formed with structures allowing the support member 200 to be coupled to or connected with other components of the furniture assembly system 10.

[0043] In various embodiments, the first interaction edge 201 and the second interaction 102 are configured to connect to a corresponding cross panel 100. Each of the first interaction edge 101 and the second interaction edge 202 comprises at least one hook joint 210 shaped and sized to be insertable into the engaging aperture 102 of the cross panel 100.

It is to be appreciated that the hook joint 210 may be inserted into any one of the two slots 102a, 102b of the engaging aperture 102.

[0044] After the hook joint 210 is inserted into the engaging aperture 102, the hook joint 210 may be displaced along the longitudinal axis of the slot 102a or 102b until the hook joint 210 is rested on a lower surface of the slot 102a or 102b. Consequently, the hook joint 210 extends beyond the cross panel 100 to form a cantilevered projection such that the support member 200 is connected to and interlocked with the cross panel 100.

[0045] In some embodiments, the first interaction edge 201 and the second interaction edge 202 may each comprise two or more hook joints 210 which may be coupled to two or more engaging apertures 102 of the cross panel 100. As shown in Figure 4A, two adjacent hook joints 210 are separated by a distance D3, which corresponds to D1 (i.e. the distance between two adjacent engaging apertures 102 on the cross panel 100) or multiples of D1. With more than one hook joints 210 on the first interaction edge 101 and the second interaction edge 102, the support member 200 may and the cross panel may form a firm connection.

[0046] In various embodiments, the furniture assembly system 10 may further comprise a plurality of locking members 400. The locking member 400 is shaped and sized to fit into the engaging aperture 102 to secure the support member 101 on the cross panel 100 in position. As shown in Figure 1, the locking member 400 may be slotted into an engaging aperture 102 where the hook joint 210 of the support member 200 is inserted, such that movement of the inserted hook joint 210 inside the engaging aperture 102 may be minimized. Advantageously, the locking member 400 serves as a finishing piece to lock the hook joint 210 and to prevent the hook joint 210 from slotting out from the engaging aperture 102.

[0047] In various embodiments, the third interaction edge 203 is configured to connect to the top panel 300. The third interaction edge 203 comprises one or more protruding portions 220 shaped and sized to fit in the plurality of lock-down apertures 304 of the top panel 300.

[0048] Figure 5A to 5C depict three exemplary top panels 300 of the furniture assembly system 10. The top panel 300 may be of a rectangular or near rectangular shape,

and may be sized according to the dimension of the cross panels 100 and the support members 200 used for assembling the furniture piece 20.

[0049] In some embodiments as shown in Figure 5B , the lock-down aperture 304 on the top panel 300 may be an elongated slot. In some embodiments as shown in Figure 5A and 5C, the lock-down aperture 304 on the top panel 300 may be of a right-angle cross-shape resembling that of the engaging aperture 102 of the cross panel 100. This allows the manufacturing process to be simplified as the same set of machining protocols may be used to form the engaging aperture 102 and the lock-down aperture 304.

[0050] In use, after the cross panels 100 are connected by the support member 200, the top panel 300 may be mounted onto the support member 200. The one or more protruding portions 220 on the third interaction edge 203 of the support member 200 and the corresponding lock-down apertures 304 form a mortise and tenon joint connection so as to secure the top panel 300 in position.

[0051] In some embodiments, the top panel 300 is further configured to weave in a flexible material 350 for forming a support surface 380. The flexible material 350 may be a woven material to form a cushioned support surface on the top panel 300.

[0052] In a stool or a chair assembled using the components of the furniture assembly system 10, the top panel 300 with the cushioned support surface may be used as the seat top, providing comfortability to a user. In one embodiment as shown in Figure 5C and 6A, the top panel 300 may comprise a plurality of parallelly extending ribs 310 for the flexible material to weave in. In another embodiment as shown in Figure 6B, the top panel 300 may comprise a plurality of openings 320 for receiving the flexible material 350 to form the support surface 380.

[0053] In some embodiments, the furniture assembly system 10 may further comprise one or more accessories 500 connectable to an assembled furniture piece 20. Non-limiting examples of the accessory 500 may be a holder, a hook, a shelving unit, a caster wheel, a back panel or other accessories of a customized design, as shown in Figure 6C and 6D.

[0054] In some embodiments, the accessory 500 may be configured with a coupling structure resembling that of the hook joint 210 such that it may be inserted into the engaging aperture 102 and form an interlocking connection with the cross panel 10 in a similar manner

as the support member 200 does. Advantageously, the engaging apertures 102 populated on the cross panel 10 may both act as a joint for structural stability and also a receiver for accessories.

[0055] In some embodiments as shown in Figure 6B and Figure 6C, the accessory 500 (in these two embodiments, a back panel acting as a sit back) may also be coupled to a top panel 300 via the one or more lock-down apertures 304.

[0056] It is to be appreciated that other components of the furniture assembly system 10 may also be configured with one or more sockets resembling that of the engaging aperture 102 or the lock-down aperture 304 for receiving the accessory 500.

[0057] The furniture assembly system 10 may be powered with a digital platform that empowers end-users with the flexibility of customization, configuration and personalization. An exemplary user interface 600 of the digital platform is shown in Figure 7. The first section 610 of the user interface 600 shows a catalog of components and accessories available in the digital platform. The user may select the components required for assembling the furniture piece 100. In a second section 620 of the user interface 600, the user may visualize and customize the assembled furniture piece that can be formed using the selected components and accessories.

[0058] The digital platform may be further configured to allow the user to visualize and customize the size, color, material and accessory according to their need and preference. Thereafter, the user may place an order on the digital platform for the selected components and accessories to be shipped to a designated place for assembly. The components of the furniture assembly system 10 may be manufactured on demand, i.e. upon receiving an order from an end-user of the digital platform.

[0059] The digital platform will consist of 3 core features, namely the prototyping canvas feature, the e-commerce feature, and the community feature. Through the prototyping canvas feature provided on the digital platform, users are able to customise and personalise existing templates provided by the digital platform, with regards to its size and with various accessories for their intended usage. These may for example storage, gaming and other usages. Users are also able to configure their own furniture through their access to a library of panels, connectors and accessories, all of which will be compliant to the main frame for their intended usage. The accessories made available on the prototyping canvas may consist

of accessories designed by the Applicant as well as accessories designed by our community of users which will be compliant to Applicant's main frame. Then the digital platform (i.e. the community feature) aims to create a sense of belonging and facilitate the sharing of knowledge and exchange of creative ideas amongst our community of users who will be able to share what they have assembled, designed or created (with/without the prototyping canvas). E-manuals regarding assembly methods can be uploaded via the digital platform reducing the need to print paper manuals. The e-commerce platform will facilitate the sales of any element of creation authorised by the Applicant.

[0060] In various embodiments, the cross panel 100, the support member 200, and the top panel 300 may be formed from various suitable panel materials including, but not limited to, acrylic, MDF (or Medium-density fiberboard) and wood (such as birch plywood).

[0061] Digital fabrication techniques may be used for manufacturing the various components of the furniture assembly system 10. The cross panel 100, the support member 200, and the top panel 300 may be manufactured using a forming machine with a CNC (Computer Numerical Control) router and an end mill (or other cutting tools) of a suitable size.

[0062] The CNC router is set to cut out cross profiles from a panel material so as to form the engaging apertures 102 on the cross panel 100. The cutting is performed to populate the engaging apertures 102 throughout the entire cross panel which follow a uniform grid where center of each cross-shape engaging aperture 102 is separated from the next one in the x and y axes by a pre-determined distance D1. The panels are also populated with auxiliary apertures 103 that follow a uniform grid spacing of D2.

[0063] In a non-limiting example, a panel material at 15mm in thickness is used for forming the cross panel 100. A ¼ inch end mill may be used to form a plurality of engaging apertures 102 which are equally spaced apart by a distance of 100mm, and a plurality ¼ inch holes as the auxiliary apertures 103 following a uniform grid distance of 50mm. The ¼ inch auxiliary aperture 103 is compatible with M6 screws/nails/bolts.

[0064] It is to be appreciated that tolerances of each joint connection (including the joint connection formed between the engaging aperture 102 and the hook joint 210, and the joint connection formed between the lockdown aperture 304 and the protruding portions 220)

are factored in the cutting and forming process so as to allow the coupling components to be easily connected together.

[0065] It is also to be appreciated that other suitable forming techniques may also be used for manufacturing the components of the furniture assembly system 10. For example, the locking member 400 and the accessories 500 may also be produced using a molding technique (for example, a cast molding technique) or a 3D printing technique (for example, using a Fused Deposition Modeling or FDM 3D printer).

[0066] In accordance to another aspect of the invention and with reference to Figure 1 to Figure 2 and Figure 6A to 6C, there is provided an assembled furniture piece 20 that is assembled using components of the furniture assembly system 10 as described above.

[0067] In various embodiments, the assembled furniture piece 20 comprises an a first cross panel 100a and a second cross panel 100b forming two opposing side walls of the furniture piece 20, a first support member 200a and a second support member 200b perpendicularly disposed with respect to the first cross panel 100a and/or the second cross panel 100b, each of the first support member 200a and the second support member 200b being connected to the first cross panel 100a along a first interaction edge 201 and being connected to the second cross panel 100b along a second interaction edge 202.

[0068] In various embodiments, the assembled furniture piece 20 further comprises a top panel 300 forming a top surface of the furniture piece 20, the top panel 300 being connected to the first support member 200a along a third interaction edge 203 of the first support member 200a and connected to the second support member 200b along a third interaction edge 203 of the second support member 200b.

[0069] In various embodiments, the assembled furniture piece 20 further comprises a plurality of locking members 400. Each locking member 400 is coupled an engaging aperture 102 of the cross panel 100 where a hook joint 210 on the first or the second interaction edge of the support member 200 is inserted so as to secure the support member 200 on the cross panel 100.

[0070] In some embodiments, a flexible material is woven into the top panel 300 so as to form a support surface. As shown in Figure 5C, the top panel 300 may comprise a plurality of parallelly extending ribs 310 for the flexible material to weave in. The flexible

material may be a soft material such as a woven material so that a cushioned support surface may be formed on the top panel 300. The top panel 300 with the cushioned support surface may be used as the seat top in an assembled stool or chair, providing comfortability to a user.

[0071] In some embodiments, the assembled furniture 10 may further comprise one or more accessories attached to the cross panel 100. The accessories may be configured with a coupling structure resembling that of the hook joint 210 such that it may be inserted into the engaging aperture 102 and form an interlocking connection with the cross panel 10 in a similar manner as the support member 200 does.

[0072] In accordance to a further aspect of the invention, there is provided a method of assembling a furniture piece 20 using the furniture system 10 as described above. There method comprises the following steps.

[0073] In a first assembly step, a first support member 200a is connected to a first cross panel 100a by hand. One or more hook joints 210 on a first interaction edge 201 of the first support member 100a are inserted into one or more corresponding engaging aperture 102 of the first cross panel 100a and set to extend beyond the first cross panel to form a cantilevered projection.

[0074] It is to be appreciated that the hook joint 210 may be inserted into any one of the two slots 102a, 102b of the engaging aperture 102. After the hook joint 210 is inserted into the engaging aperture 102, the hook joint 210 may be displaced or move along a longitudinal axis of the slot 102a or 102b until the hook joint 210 is rested on a lower surface of the slot 102a or 102b. Consequently, the first support member 200a is connected to and interlocked with the cross panel 100.

[0075] In further assembly step, a second support member 200b is connected to the first cross panel 100a by hand. One or more hook joints 210 on a first interaction edge 201 of the second support member 200b are inserted into one or more corresponding engaging apertures 102 of the first cross panel 100a and are set to extend beyond the first cross panel 100a to form a cantilevered projection.

[0076] In a further assembly step, the first support member 200a is connected to a second cross panel 100b by hand. One or more hook joints 210 on a second interaction edge 202 of the first support member 200a are inserted into one or more corresponding engaging

apertures 102 of the second cross panel 100b and are set to extend beyond the second cross panel 100b to form a cantilevered projection.

[0077] In a further assembly step, the second support member 200b is connected to the second cross panel 100b. One or more hook joints 210 on a second interaction edge 202 of the second support member 200b are inserted into one or more corresponding engaging apertures 102 of the second cross panel 100b and are set to extend beyond the second cross panel 100b to form a cantilevered projection.

[0078] After completing the above assembly steps, the first cross panel 100a and a second cross panel 100b forms two opposing side walls of the furniture piece 20, which supported by the first support member 100 and the second support member 200 connected therebetween. Each of the first support member 200a and the second support member 200b are perpendicularly disposed with respect to the first cross panel 100a and/or the second cross panel 100b.

[0079] In a further assembly step, a top panel 300 is connected to the first support member 200a and the second support member 200b by hand. One or more protruding portions 220 on a third interaction edge of the first support member 200a and of the second support member 200b are fit into one or more corresponding lock-down apertures 304 of the top panel 300. In this manner, the top panel 300 is secured in position by the support members 200a and 200b.

[0080] In a further assembly step, the first support member 200a and the second support member 200b are secured on the first cross panel 100a and on the second cross panel 100b using a plurality of locking members 410. Each locking member 410 is coupled to an engaging aperture 102 on the cross panel 100a, 100b where the hook joint 210 is inserted. In this manner, the hook joint 210 is locked within the engaging aperture 102 and is prevented from slotting out. Structural integrity is improved.

[0081] As shown in Figure 2, the assembled furniture piece 20 comprises two cross panels 100a, 100b and a top panel, which may be used as a stool or a table. The two cross panels 100a, 100b acts as the legs of the stool or the table, and the top panel 300 acts as a support surface for a user to sit thereon or to place items thereon.

[0082] In some embodiments, the method further comprises a step of weaving a flexible material 250 into a plurality of ribs on the top panel 300 to form a support surface. The plurality of ribs 310 may be parallelly extending along an axis of the top panel 300, as shown in Figure 5C. The flexible material 350 may be a woven material to form a cushioned support surface on the top panel 300. The top panel 300 with the cushioned support surface may be used as a seat top of a stool or a chair (i.e. the assembled furniture piece 20).

[0083] The furniture assembly system 10 and the method of assembly is advantageous in at least the following aspects:

[0084] Firstly, a furniture piece 20 may be easily assembled and disassembled without the need of tools. The system 10 comprises primarily of panels (i.e. the cross panel 100 and the top panel 300) and beams (i.e. the support member 200) which can form joint connection based on a combination of slot/aperture and hook joints, tenor and mortise joints. As compared with existing ready-to-assemble furniture systems which uses rods and connectors to build framed structures, the furniture assembly system 10 allows a furniture piece to be assembled with few components and in a relatively shorter time. The assembly method is easy to understand and intuitive enough for users of all ages including children. Safety is achieved as no tools are needed for assembling the furniture pieces 20.

[0085] Secondly, the assembled furniture piece 20 is structurally stable and lighted weighted (thus with an improved mobility). This is achieved by using a hook joint 210 and a locking member 400 that may be fitted into the engaging aperture of the cross panel to create an interlocking joint connection between the support member 100 and the cross panel 100.

[0086] The cross-profile engaging aperture 102 on the cross panel 100 is a simple structure that may serve multiple functions, i.e. it allows the support member 200 to be connected onto the cross panel 100 to provide the structural stability, and at the same time it may also act as a receiver for any accessories with a similar hook joint. In addition, as the cross panel 100 is populated with the engaging apertures 102, support members 200 and accessories may be attached to the cross panel 100 at any position across the cross panel 100. A user may adjust the position of the attached support members 200 depending on the type and design of the furniture piece desired, and may also move the accessories to different

positions on the cross panel (i.e. by attaching the accessories to different engaging apertures 102) when needed.

[0087] Through the prototyping canvas provided on the digital platform, a user can visualize and create their own furniture piece and their own accessories based on the intended purpose (for example, for storage, for gaming and etc.). The digital platform also provides convenience for the user to modify their panels or to create new accessories onto their panels wherever needed.

[0088] Further, a set of standards may be created and used by the CNC router to manufacture cross panels and top panels with engaging apertures 102, the auxiliary aperture 103, and lock-down apertures 210 of standard sizes. A cross panel 100 from a disassembled furniture piece may be reused for assembling another furniture piece without modification. Further, two or more furniture pieces may be connected using standard support members 200 to form a furniture of a larger size and scale. The components of the furniture assembly system 10 may be manufactured on demand by digital fabrication techniques. This creates a sustainable business model and a flexibility supply chain by reducing the need for stocked inventory. Also, it enables large-scale furniture assemblies (such as outdoor/indoor installations and even playscapes) to be assembled and disassemble with relative ease and flexibility.

[0089] It is to be appreciated that certain features of the invention, which are, for clarity, described in the context of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features of the invention, which are, for brevity, described in the context of a single embodiment, may also be provided separately or in any suitable sub-combination or as suitable in any other described embodiment of the invention. Certain features described in the context of various embodiments are not to be considered essential features of those embodiments, unless the embodiment is inoperative without those elements.

[0090] It is to be appreciated by the person skilled in the art that variations and combinations of features described above, not being alternatives or substitutes, may be combined to form yet further embodiments falling within the intended scope of the disclosure.

CLAIMS

1. A furniture assembly system, comprising:

- a plurality of cross panels, wherein each cross panel comprises a plurality of engaging apertures of a right-angle cross shape arranged in one or more rows and one or more columns, with each engaging aperture being separated from an adjacent engaging aperture at a predetermined distance,

- at least one top panel comprising a plurality of lock-down apertures,

- at least one support member, wherein the or each support member comprises at least a first interaction edge and a second interaction edge connectable to the cross panel, and a third interaction edge connectable to the top panel, the first interaction edge and the second interaction edge being substantially perpendicular to the third interaction edge, and

wherein each of the first interaction edge and the second interaction edge comprises at least one hook joint shaped and sized to be insertable into the engaging aperture of the cross panel and to extend beyond the cross panel forming a cantilevered projection, the third interaction edge comprises one or more protruding portions shaped and sized to fit in the plurality of lock-down apertures of the top panel.

2. A furniture assembly system according to claim 1, further comprisinga plurality of locking members, the locking member is shaped and sized to fit into the engaging aperture to secure the support member on the cross panel.

3. The furniture assembly system according to claim 1 or 2, wherein the cross panel further comprises a plurality of auxiliary apertures for receiving an attachment means.

4. The furniture assembly system according to any one of the preceding claims, further comprising one or more accessories attachable to the cross panel and/or top panel.

5. The furniture assembly system according to any one of the preceding claims, wherein the top panel is configured to weave in a flexible material to form a support surface.

6. The furniture assembly system according to any one of the preceding claims, wherein the the first interaction edge and the second interaction edge of the or each support member comprises two or more said hook joints configured to be coupled to into two or more said engaging apertures on the cross panel.

7. The furniture assembly system according to any one of the preceding claims, wherein components of the furniture assembly system are customizable by an end-user.

8. An assembled furniture piece made from components of a furniture assembly system, comprising:

- a first cross panel and a second cross panel forming two opposing side surfaces of the furniture piece,

- a first support member and a second support member perpendicularly disposed with respect to the first cross panel and/or the second cross panel, each of the first support member and the second support member being connected to the first cross panel along a first interaction edge and being connected to the second cross panel along a second interaction edge,

- a top panel forming a top surface of the furniture piece, the top panel being connected to the first support member along a third interaction edge of the first support member and connected to the second support member along a third interaction edge of the second support member.

9. The assembled furniture piece of claim 8, further comprisinga plurality of locking members, each locking member being coupled to an engaging aperture where a hook joint on the first or the second interaction edge of the support member is inserted so as to secure the support member on the cross panel.

10. The assembled furniture piece of claim 8 or 9, further comprises one or more accessories attached to the cross panel.

11. The assembled furniture piece of any one of claims 8 to 10, wherein a flexible material is woven into the top panel to form a support surface.

12. The assembled furniture piece of any one of claims 8 to 11, wherein components of the assembled furniture piece are customizable by an end-user.

13. A method of assembling a furniture piece using a furniture assembly system, comprising the steps of:

- connecting by hand a first support member to a first cross panel, wherein one or more hook joints on a first interaction edge of the first support member are inserted into one or more corresponding engaging apertures of the first cross panel and are set to extend beyond the first cross panel to form a cantilevered projection,

- connecting by hand a second support member to the first cross panel, wherein one or more hook joints on a first interaction edge of the second support member are inserted into one or more corresponding engaging apertures of the first cross panel and are set to extend beyond the first cross panel to form a cantilevered projection,

- connecting by hand the first support member to a second cross panel, wherein one or more hook joints on a second interaction edge of the first support member are inserted into one or more corresponding engaging apertures of the second cross panel and are set to extend beyond the second cross panel to form a cantilevered projection,

- connecting by hand the second support member to the second cross panel, wherein one or more hook joints on a second interaction edge of the second support member are inserted into one or more corresponding engaging apertures of the second cross panel and are set to extend beyond the second cross panel to form a cantilevered projection, and

- connecting by hand a top panel to the first support member and the second support member, wherein one or more protruding portions on a third interaction edge of the first support member and of the second support member are fit into one or more corresponding lock-down apertures of the top panel.

14. A method according to claim 13, further comprising

- securing the first support member and the second support member on the first cross panel and the second cross panel using a plurality of locking members, wherein each locking member is fitted into an engaging aperture where a hook joint is inserted.

15. The method according to claim 13 or 14, further comprising a step of weaving a flexible material is into the top panel to form a support surface.

16. The method according to any one of claims 13 to 15, further comprising a step of attaching one or more accessories to the cross panel.

17. A cross panel of a furniture assembly system, comprising:

a plurality of engaging apertures of a right-angle cross shape arranged in one or more rows and one or more columns, and each engaging aperture is separated from an adjacent engaging aperture at a predetermined distance,

wherein the cross panel is configured to connect to a support member, the support member comprising a first interaction edge and a second interaction edge connectable to the

cross panel, and a third interaction edge connectable to a top panel, the first interaction edge and the second interaction edge being substantially perpendicular to the third interaction edge, and

wherein each of the first interaction edge and the second interaction edge comprises at least one hook joint shaped and sized to be insertable into the engaging aperture of the cross panel and to extend beyond the cross panel forming a cantilevered projection, the third interaction edge comprises one or more protruding portions shaped and sized to fit in a plurality of lock-down apertures of the top panel.