



(11) **EP 2 095 740 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.09.2009 Bulletin 2009/36

(51) Int Cl.:
A47B 47/00 ^(2006.01) **F16B 12/24** ^(2006.01)
F16B 12/36 ^(2006.01) **F16B 12/40** ^(2006.01)

(21) Application number: **09002728.5**

(22) Date of filing: **26.02.2009**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR
Designated Extension States:
AL BA RS

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(30) Priority: **28.02.2008 NL 1035101**

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(54) **System for connecting structure members**

(57) System of a first and a second structure member, in particular frame members, and a connecting assembly for connecting said first and second structure members, wherein both said first and second structure members have a first side and a second side, wherein both said first and second structure members are provided with at least one first accommodation space for accommodating a portion of the connecting assembly, said accommodation space debouching in said first side through a first aperture, wherein said connecting assembly comprises a connecting sleeve having an axis and being adapted for accommodation in said first accommodation spaces in both said structure members and provided with first and second connecting portions, which are located at a distance from one another in sleeve axis direction, preferably are located at the opposite ends of said sleeve, and which can assume a connecting position

in which they engage the first and second structure members, respectively, to prevent detachment of said structure members from each other, wherein the connecting assembly further comprises a securing device insertable in said connecting sleeve into a securing position for securing the first and second connecting portions in their connecting position, **characterized in that** the first accommodation space of at least one of said structure members is in communication with a second aperture in the second side of the structure member concerned to enable the insertion of said securing member from said second side into said connecting sleeve and into its securing position and wherein said securing device has a length which is at least approximately the distance between the first and second connecting portions.

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Description

BACKGROUND OF THE INVENTION

[0001] The invention relates to a system for connecting structure members, in particular of structures such as furniture structures like tables, cabinets or chairs, to be used by man, in particular a system for connecting frame members of the structure concerned. In addition, the invention relates to a system for connecting structure members for playing structures such as climbing frames, playing houses and/or toys.

[0002] Connecting systems for structure members are well known.

[0003] An example is disclosed in US 6.322.305, comprising a connecting pin which at both opposite ends is provided with a fastening sleeve. The fastening sleeve has a plurality of resilient arms provided with teeth for engaging in the wall of a hole in a furniture structure member. After the sleeves have been inserted in the holes, the connecting pin is driven into the sleeves, thus urging the arms radially outward and securing the sleeves in the holes. The length of the connection pin determines the distance between the structure members.

[0004] Another example is known from DE 101 18 952, showing a dowel assembly, the opposite ends of the dowel being U-shaped, the legs forming the U extending axially. The space between the legs is destined for accommodating a key. When two members have to be connected to each other, a key is placed into a hole in each of the members, after which the dowel is inserted into the hole by force, so that the key moves in between the legs urging them outwards so as to let the legs firmly engage the wall of the hole.

SUMMARY OF THE INVENTION

[0005] It is an object of the invention to provide a system of the kind mentioned in the preamble, which is versatile.

[0006] It is an object of the invention to provide a system of the kind mentioned in the preamble, which is easy to assemble.

[0007] It is an object of the invention to provide a system of the kind mentioned in the preamble, which can easily be disassembled.

[0008] It is an object of the invention to provide a system of the kind mentioned in the preamble, which is composed of parts that, after the system has been disassembled, can be used again in another structure.

[0009] It is an object of the invention to provide a system of the kind mentioned in the preamble, which can be lightweight.

[0010] In order to achieve at least one of these objects, the invention, from one aspect, provides a system of a first and a second structure member, in particular frame members, and a connecting assembly for connecting said first and second structure members, wherein both

said first and second structure members have a first side and a second side, wherein both said first and second structure members are provided with at least one first accommodation space for accommodating/receiving a portion of the connecting assembly, said accommodation space debouching in said first side through a first aperture, wherein said connecting assembly comprises a connecting sleeve having an axis and being adapted for accommodation in said first accommodation spaces in both said structure members and provided with first and second connecting portions, which are located at a distance from one another in sleeve axis direction, preferably are located at the opposite ends of said sleeve, and which can assume a connecting position in which they engage the first and second structure members, respectively, to prevent detachment of said structure members from each other, wherein the connecting assembly further comprises a securing device insertable in said connecting sleeve into a securing position for securing the first and second connecting portions in their connecting position, **characterized in that** the first accommodation space of at least one of said structure members is in communication with a second aperture in the second side of the structure member concerned to enable the insertion of said securing member from said second side into said connecting sleeve and into its securing position and wherein said securing device has a length which is at least approximately the distance between the first and second connecting portions. Such a system may allow a fast and easy, as well as a secure connection of the structure members with each other. By positioning the trailing end of the securing device in the correct place engaging the one of the first or second connecting portion of the connecting sleeve, it is at the same time ensured that the leading end will properly engage the other of the first or second connecting portion of the connecting sleeve. In its securing position, the securing device engages both first and second connecting portions to secure them in their connecting position. The pin may have a length that is larger than the distance between the first and second connecting portions.

[0011] In one embodiment, the securing device may be formed in two separate parts, in particular halves, wherein the parts or halves are inserted one after the other into the connecting sleeve and abut one another axially. The first inserted part or half can be pushed up to the correct position by the second inserted part or half.

[0012] The simplicity of the connection, however, is further increased in a preferred embodiment in which said securing device is a single securing member, so that only one item has to be inserted into the sleeve. Preferably, the securing member is a solid body. The single securing member can be a massive body. Preferably, the single securing member is pin-shaped so as to facilitate insertion.

[0013] In one embodiment, said first and second connecting portions are radially movable with respect to said

sleeve axis between a free position and the connecting position, wherein, preferably, the first and second portions are resiliently biased towards their connecting position, so that the insertion of the securing member is facilitated.

[0014] In one embodiment, said securing device is removably insertable in said connecting sleeve. By removing the single securing member the connecting sleeve can be removed also in order to disassemble the connection on purpose. This is made particularly easy if both structure members have a second side provided with said second aperture for passage of said securing device, wherein said first and second apertures preferably are substantially aligned with one another. The securing member can then be removed in a direction corresponding to the direction of insertion or in counter direction, depending on what the user prefers. By way of example, in case the securing member has been pushed into the sleeve into its securing position, the securing member need not to be pulled back for disassembling, which might be difficult for lack of grip, but can be pushed further in the same direction or be pushed back in opposite direction, for instance by means of a screwdriver.

[0015] The accommodation spaces can be formed by the material of the structure members. In an alternative development, a system according to the invention comprises, from another aspect, a further item. Specifically, said first accommodation space in at least one of said structure members may be at least in part formed by an insert dimensioned to be included, preferably removably, in said structure member. The use of the insert renders the firmness of the connection less dependent on the material and the shape of the structure members. The materials used for the insert and for the sleeve can be easily adjusted to one another. The structure members may be fabricated in a simple manner. Preferably, said first and/or second structure member form(s) a hollow space for receiving the insert in a snugly fitting manner.

[0016] The first accommodation spaces may be provided with first stop edges, wherein said first and second connecting portions are provided with second stop edges for engaging behind the first stop edges.

[0017] The application possibilities are increased in case said first and/or second structure member is provided with a series of first apertures in its first side, preferably regularly spaced apart from one another. The person assembling the system can then choose the most appropriate location for the connection.

[0018] Preferably, in case said insert is used, said insert is movable, preferably slidable, inside said structure member to be brought in line with a selected one of said first apertures. This facilitates the preparation for the connection or the production of versatile structure members.

[0019] In a further development, resulting in a larger range of application possibilities, said first and/or second structure member is provided with at least one further side, such as said second side, provided with at least one further aperture, which is preferably similar to the

first aperture, and at least one further accommodation space debouching in said further side through said further aperture, wherein said first and further apertures each have an axis, said axis of said further aperture and said axis of said first aperture preferably being in one plane.

[0020] Said further side may be provided with a series of further apertures, preferably regularly spaced apart from one another, preferably with a spacing corresponding to the spacing between the first apertures. The structure member can then be used in many ways.

[0021] In a simple embodiment, said insert forms both said first and said further accommodation spaces. In one embodiment, the insert forms a plurality of said accommodation spaces, oriented in different directions, preferably including two or three orthogonal directions.

[0022] In an advantageous embodiment, the securing member can be inserted through the further side.

[0023] In an embodiment especially suitable for the construction of furniture frames, said first and/or said second structure member being elongated and, preferably, having a polygonal cross-section.

[0024] Preferably, the connecting sleeve and the accommodation spaces have mating edges that are non-circular, in particular polygonal, so that their mutual rotation is prevented and the mutual orientation of the two structure members is fixed.

[0025] From another aspect, the invention provides a system of a first and a second structure member, in particular frame member, and a connecting assembly for connecting said first and second structure member, wherein both said first and second structure members have a first side and a second side, wherein both said first and second structure members are provided with at least one first accommodation space for accommodating a portion of the connecting assembly, said accommodation space debouching in said first side through a first aperture, wherein said connecting assembly comprises a connecting sleeve adapted for accommodation in said first accommodation spaces in both said structure members and being provided with first and second connecting portions which can assume a connecting position in which they engage the first and second structure members, respectively, to prevent detachment of said structure members from each other, and a single securing member insertable in said connecting sleeve to a securing position for securing the first and second connecting portions in their connecting position, wherein the first accommodation space of at least one of both structure members and a second aperture in the second side of the same structure member form part of an internal passage for the securing member permitting the insertion of said securing member from said second side into said connecting sleeve and into its securing position.

[0026] In a further embodiment, said connecting assembly connects the first and second structure member with their first sides abutting one another.

[0027] From another aspect, the invention provides a structure, in particular a utility structure, such as a furni-

ture structure, comprising one or more systems according to the invention.

[0028] The system according to the invention may be designed to be assembled without any special tool.

[0029] The various aspects and features described and shown in the specification can be applied, individually, wherever possible. These individual aspects, in particular the aspects and features described in the attached dependent claims, can be made subject of divisional patent applications.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] The invention will be elucidated on the basis of an exemplary embodiment shown in the attached drawings, in which:

Figures 1A-D show main components for assembling an embodiment of a system according to the invention;

Figure 1E shows an alternative for one of the main components of figures 1A-D;

Figures 2A-C show several stages in the assembling of a system according to the invention using the components of figures 1A-D;

Figures 3A-C show several stages in the assembling of a system according to the invention using the components of figures 1A-D, as viewed in cross-section; Figure 4 shows an example of a piece of furniture that can be made using a system according to the invention; and

Figures 5A-E show several views of alternative embodiments of two components for a system according to the invention.

DETAILED DESCRIPTION OF THE DRAWINGS

[0031] In figure 1A a connecting sleeve 3 is shown, made from a thermoplastic material by injection moulding. The sleeve 3 has an axis S and is symmetrical with respect to a central flange 17 forming a connection between two sleeve halves 15a,b. Each sleeve half 15a,b comprises four lips 18a,b bounding a passage 29 that extends through the flange 17. The lips 18a,b are resiliently bendable in direction E and are provided with stop edges 19a,b at their outer ends. The distance between the stop edges 19a,b is L1 and the length of the sleeve halves 15a,b is L2. The diameter of the flange 17 is D1 and the outer diameter of the sleeve halves 15a,b is D2, at locations between the stop edges 19a,b and the flange 17.

[0032] In figure 1B, a securing pin 5 is shown, which is dimensionally stable (retains its shape) and made from a rigid material and having a cylindrical outer surface 20 with axis T and opposite ends 21a,b. The pin 5 has a diameter D3 that corresponds to the inner diameter of the passage 29 and the cylindrical outer surface has a length L3 that corresponds to L1 or is larger. The maxi-

imum length is about twice B2 (figure 1D).

[0033] In figure 1C, an insert 4 is shown, made in two parts from a thermoplastic material by injection moulding and dimensionally stable. The insert 4 is a regular body composed of six rings 23 and twelve small plates 25, the plates 25 connecting adjacent rings 23 to each other. The insert 4 is of an open construction, therefore lightweight, leaving spaces 24 free between adjacent rings 23. The rings 23 are cylindrical with outer diameter D4 and inner diameter D5 and have outer edges 26 and inner edges 27 and form at least part of accommodation or receiving spaces 22. The distance L4 between the edges 26 and 27 corresponds to the distance L2 between the flange 17 and the stop edges 19a,b of sleeve 3. The edges 26 are flush with the edges of the plates 25. The distance between the outer edges of the plates 25 on opposite rings 23, equal to the distance between the edges 26 of these rings 23, is the outer width B1, in all three orthogonal directions. Pairs of opposite rings 23 are aligned according to axis U and are spaced from one another, thereby forming an inner space 40 with the two other pairs of rings 23.

[0034] In figure 1D, one (2a) of two similar frame structure members 2a,b are shown, both elongated and hollow, made from aluminium, for example, by extrusion. The members 2 are box-shaped having a square cross-section with four sides 6-9 having an inner width B2. Apertures 11-14 have been made in the sides 6-9, forming a connection between the outside of the members 2 and their hollow inner space 10. The apertures 11-14 in the sides 6-9 are evenly spaced apart along the sides and are in register with one another. The apertures are circular and have a diameter D6. Their axis V lie in common cross-sectional planes, so that it does not matter which longitudinal side is used for connection to another structure member. The members 2 have open opposite ends 28, which can be closed off by a plate 30, vide figures 2A and 3A-C, which plate may be provided with an aperture 31 similar to apertures 11-14 or otherwise. The inner spacing L5 from the inner surface 32 of the plate 30 inserted in the end 28 to the centre of each adjacent one of the apertures 11-14 corresponds to the inner spacing between the centre of said 11-14 to the adjacent longitudinal edge of the member 2a, so that at that member end five apertures 11-14,31 lie on the faces of an imaginary cube. L5 corresponds to half B1.

[0035] The afore mentioned outer width B1 corresponds to the inner spacing B2 between opposite sides 6,8 or 7,9 of member 2. As a consequence, the insert 4 fits snugly inside the member 2 in the inner space 10 thereof in a stable manner, the edges of the plates 25 contacting the inner surfaces of the sides 6-9. Yet, the inserts 4 can be inserted into the inner space 10 through the outer ends 28 of the member 2 and be slid up to the selected location. Thus, a series of inserts 2 can be introduced into a member 2. Each following insert 4 will urge the previously introduced inserts to move on within the inner space 10. Because the dimension B1 also cor-

responds to the spacing B3 between two adjacent apertures 11, 12, 13, 14 in a side 6, 7, 8, 9, in a series of inserts 2 within the inner space 10, the edges 26 will be concentric to the respective apertures 11-14. The edges 26 of the rings 23 connect to the apertures 11-14. In addition, at the end of the member 2a,2b, the insert 4 located there will also connect to the aperture 31 with the edge 26 of one of its ring 23, due to the fact that L5 corresponds to half B1.

[0036] Without using special tools, two frame structure members 2 can be connected to one another to form a system 1, by means of insert 4, sleeve 3 and securing pin 5. This is illustrated in figures 2A-C and 3A-C.

[0037] In figure 2A, it is shown that a series of three inserts 4 is introduced (arrow A) into the inner space 10 of the members 2 until they all have their edges 26 aligned with the edges of the apertures 11-14. The outer ends of the members 2 are closed off by end plates 30 (arrow P), for instance by means of a press-fit or adhesive. In figure 2B, the sleeve 3 is first inserted (arrow B) with its half 15a into an aperture 12 in side 7 of member 2a and into accommodation space 22, wherein the stop edges 19a engage behind the edge 27. Thereafter, the assembly of member 2a, inserts 4 and sleeve 3 is moved (arrow C) towards and against the end of member 2b. In this movement, the sleeve half 15b is introduced into aperture 31 of member 2b and into the accommodation space 22 present there, until the side 7 of member 2a abuts the end face of member 2b and the stop edges 19b engage behind stop edge 27 of the ring 23 which connects to aperture 31. As will be explained below, the flange 17 fits into apertures 12 and 31.

[0038] In order to secure this position, the securing pin 5 is inserted, arrow D, figure 2C, through an aperture 14 in side 9 of member 2a, which side is opposite the side 7 that abuts the end plate 30 of member 2b, through the accommodation space 22 debouching in aperture 14 and through the inner space 40 in insert 4. Securing pin 5 is then pushed (possibly by using an ordinary tool such as a screwdriver or by using one's index finger) into the passage 29 in sleeve 3 until all lips 18a,b are engaged by surface 20 of the pin 5 and are thereby fixed against a radially inward bending movement. As a consequence, both members 2a,b are connected to one another in a reliable manner to form part of a piece of furniture, such as a chair, or possibly a playing house or a dog house. In case the length L 3 is larger than the spacing between the edges 27 of two opposite rings 23, the pin 5 will be guided by the rings 23 when passing through inner space 40.

[0039] A similar process of connecting can be seen in detail in figures 3A-C. The accommodation space 22 connecting to (first) aperture 11 communicates with (second) aperture 13 by the inner or central space 40 of the insert 4 and a further accommodation space 22 at aperture 13, so that a passage 50 inside the member 2a,b is created for pin 5. During insertion of sleeve 3 into aperture 11 and space 22 (arrow C), the lips 18a bend inwardly, arrow

E. As soon as the edges 19a have moved beyond the edge 27 of ring 23, they will move radially outwards, arrow F, figure 3B, after which the edges 19a engage behind the edge 27. Due to the fact that the outer diameter D2 of sleeve half 15a corresponds to the inner diameter D5 of ring 23, the sleeve fits into the ring 23 without play. Due to the fact that the outer diameter D1 of the flange corresponds to the diameter D6 of the aperture 11, the flange 17 can move into the aperture 11. The inner diameter D5 of the edges 26 is smaller than the diameter D6, so that a step is formed against which the flange 17 abuts. Then, the flange 17 fits for half its thickness in the aperture 11. The sleeve 3 is now secured against axially movement in two opposite directions.

[0040] Next, the other member 2b is moved against member 2a, during which the aperture 11 is moved over the lips 18b of sleeve 3, until the stop edges 19b engage behind edge 27 of insert 4 in member 2b and the flange 11 is received for the other half of its thickness in the aperture 11 of structure member 2b. The sides 6 of both structure members 2a,b then abut one another. Thereafter, the securing pin 5 is inserted through aperture 13 (arrow D), moved through passage 50 towards and into sleeve 3 and pushed into sleeve 3, for instance using a finger or an ordinary screwdriver, until end plane 21b is at the location of the stop edges 19b, which can be seen by the user. Since the length L3 of the cylindrical surface of the pin 5 corresponds to the length L1, the user can be sure that the other, leading end is at the location of the stop edges 19a. Due to the fact that the outer diameter D3 of pin 5 corresponds to inner diameter of the passage 29, the pin fits snugly in the sleeve 3 and a radially inward movement of the lips 18a,b is prevented. The axis S,T, U and V are aligned.

[0041] In the event of the members 2a,b having to be disconnected again, one can take a screw driver and push it in the direction D into the aperture 13 of member 2b, so as to push pin 5 in the direction G and out of the sleeve 3. After removal of pin 5, it is easy to remove the members 2a,b from one another. Similarly, a screw driver can be inserted through the aperture 13 in member 2a, to push securing pin 5 back again.

[0042] In figure 4, a table 100 is shown, composed of four structure members 102 and four structure members 102', as well as a plate 101. The members 102, 102' and 102" correspond to members 2a,b. The connection between members 102 and 102' can be realized as described above.

[0043] In figures 5A,B, an alternative embodiment of an insert, 204, is shown, in which the edges 226 have an inner circumference that is not round, in this example polygonal, octagonal. In figures 5C,D, a sleeve 203 is shown, in which the sleeve halves 215a,b are provided with two thin flanges 217 and with unround circumferential edges 240a,b, in this example polygonal, octagonal, to match edges 226. In the assembled state of the system, the edges 226 and 240a,b will interengage, as a result of which a relative rotation about axis S,U is pre-

vented and the members 2a,b cannot rotate with respect to one another, also due to the strength against torsion of sleeve 203 and the fixed position of the inserts 204 in members 202a,b.

[0044] Instead of a hollow structure member 2a,b and an insert 4, a solid structure member can be used, for instance structure member 102 shown in figure 1E. Here, the accommodation spaces 122 have been milled, as well as a central space 140 extending in longitudinal direction starting at aperture 130 in end plane 128. The inner edges 127 of the inner walls 123 of the spaces 122 form the stop edges for the stop edges 19a,b of the sleeve 3.

[0045] Securing pin 5 can be provided in two parts, in which case their combined length can be L3, their end planes axially abutting one another after both pin halves have been inserted into the sleeve 3. In this case, however, the user has to place two securing parts.

[0046] It is also possible to use sleeves corresponding to a half of the sleeve 3 or the like, and provided with a connection portion as mentioned above, wherein such a half-sleeve is provided with a part having a particular function, such as a closing plate, preferably flush fitting into the aperture, in a desired colour, so that other, exposed apertures 11-14 can be closed. It is also possible to combine such half-sleeves with other useful parts, such as a hook for clothes, a support for a shelf, a hinge blade, a screw or bolt. The half-sleeve may be provided with the above mentioned lips with stop edges for engaging stop edges in the structure member concerned, in particular provided on an insert in the structure member. The connection of the half-sleeve to the structure member may be secured by a securing device, such as a pin, adapted for that purpose.

[0047] A connection system for structures, in particular for pieces of furniture and their components, has been described herein. This and other variations, which will be appreciated by those skilled in the art, are within the intended scope of this disclosure as claimed below. As previously stated, detailed embodiments of the present disclosure are disclosed herein; however, it is to be understood that the disclosed embodiments are merely exemplary of the disclosure that may be embodied in various forms.

Claims

1. System of a first and a second structure member, in particular frame members, and a connecting assembly for connecting said first and second structure members, wherein both said first and second structure members have a first side and a second side, wherein both said first and second structure members are provided with at least one first accommodation space for accommodating a portion of the connecting assembly, said accommodation space debouching in said first side through a first aperture,

wherein said connecting assembly comprises a connecting sleeve having an axis and being adapted for accommodation in said first accommodation spaces in both said structure members and provided with first and second connecting portions, which are located at a distance from one another in sleeve axis direction, preferably are located at the opposite ends of said sleeve, and which can assume a connecting position in which they engage the first and second structure members, respectively, to prevent detachment of said structure members from each other, wherein the connecting assembly further comprises a securing device which is insertable in said connecting sleeve into a securing position for securing the first and second connecting portions in their connecting position, **characterized in that** the first accommodation space of at least one of said structure members is in communication with a second aperture in the second side of the structure member concerned to enable the insertion of said securing member from said second side into said connecting sleeve and into its securing position and wherein said securing device has a length which is at least approximately the distance between the first and second connecting portions.

2. System according to claim 1, wherein said securing device is a single securing member, preferably a unitary body and/or a solid body, in particular pin-shaped.
3. System according to claim 1 or 2, wherein said first and second connecting portions are radially movable with respect to said sleeve axis between a free position and the connecting position, wherein, preferably, the first and second portions are resiliently biased towards their connecting position.
4. System according to claim 1, 2 or 3, wherein said securing device is removably insertable in said connecting sleeve, wherein, preferably, both structure members have a second side with said second aperture, wherein said first and second apertures preferably are substantially aligned with one another.
5. System according to the preamble of claim 1 or according to any one of the preceding claims, wherein said first accommodation space in at least one of said structure members is at least in part formed by an insert dimensioned to be included, preferably removably, in said structure member.
6. System according to claim 5, wherein said first and/or second structure member form(s) a hollow space for receiving the insert in a snugly fitting manner.
7. System according to any one of the preceding

- claims, wherein said first accommodation spaces are provided with first stop edges and wherein said first and second connecting portions are provided with second stop edges for engaging behind the first stop edges. 5
8. System according to claims 5 or 6, and 7, wherein said first stop edges are formed by material of said insert. 10
9. System according to any one of the preceding claims, wherein said first and/or second structure member is provided with a series of first apertures in its first side, preferably regularly spaced apart from one another. 15
10. System according to claim 9 and any one of the claims 5-8, when dependent from claim 5, wherein said insert is movable, preferably slidable, inside said structure member to be brought in line with a selected one of said first apertures. 20
11. System according to any one of the preceding claims, wherein said first and/or second structure member is provided with at least one further side, such as said second side, provided with at least one further aperture, which is preferably similar to the first aperture, and at least one further accommodation space debouching in said further side through said further aperture, wherein said first and further apertures each have an axis, said axis of said further aperture and said axis of said first aperture preferably being in one plane. 25
30
12. System according to claims 9 and 11, wherein said further side is provided with a series of further apertures, preferably regularly spaced apart from one another, preferably with a spacing corresponding to the spacing between the first apertures. 35
40
13. System according to claim 5 and claim 11 or 12, wherein said insert forms said first and said further accommodation spaces, the insert forming preferably, at least in part, a plurality of said accommodation spaces, oriented in different directions, in particular including two or three orthogonal directions. 45
14. System according to any one of the preceding claims, wherein said first and/or said second structure member is elongated and, preferably, has a polygonal cross section, and/or wherein said connecting assembly connects the first and second structure member with their first sides abutting one another. 50
15. Structure, in particular a utility structure, such as a furniture structure, comprising one or more systems according to any one of the preceding claims. 55

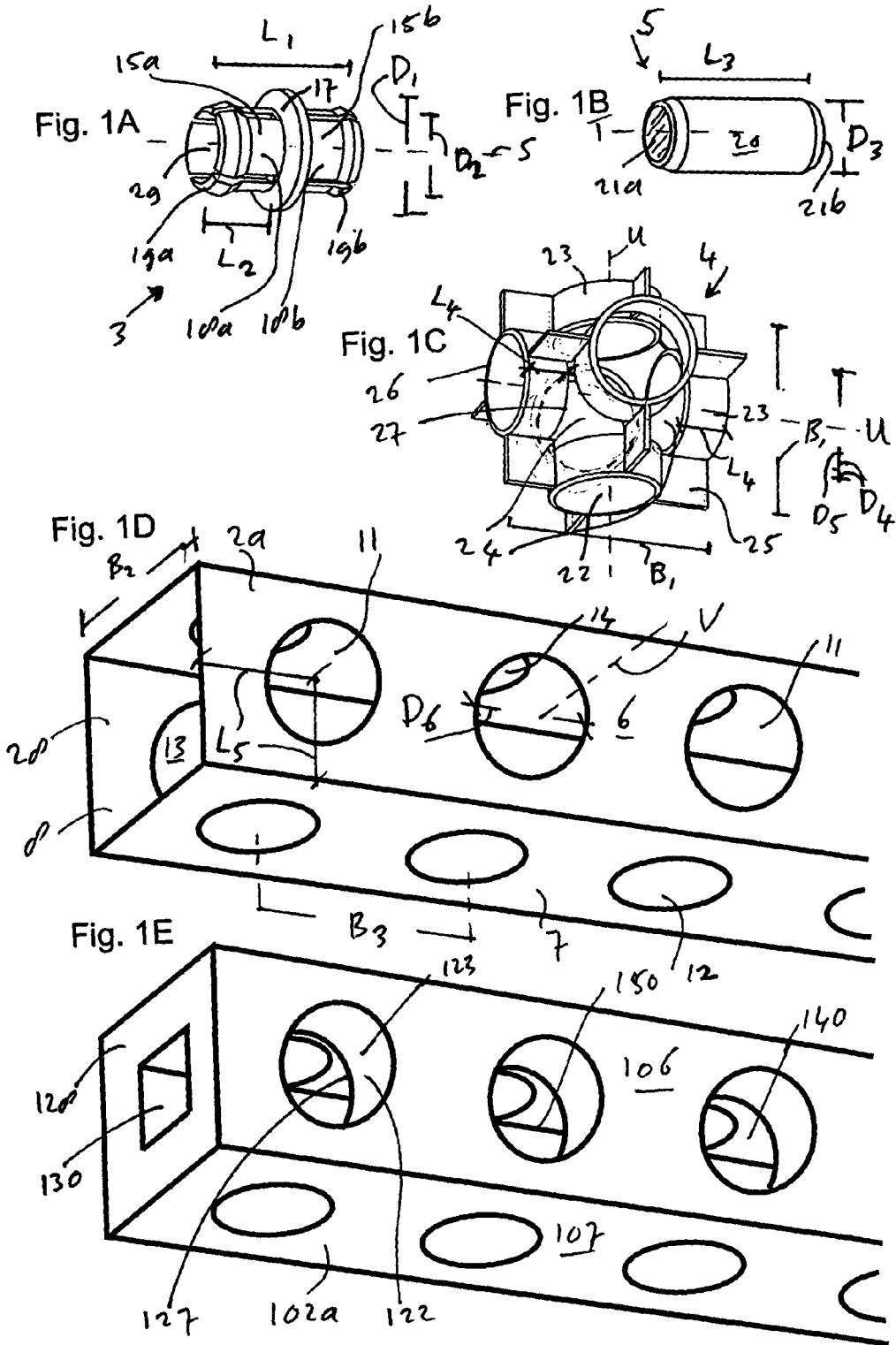


Fig. 2A

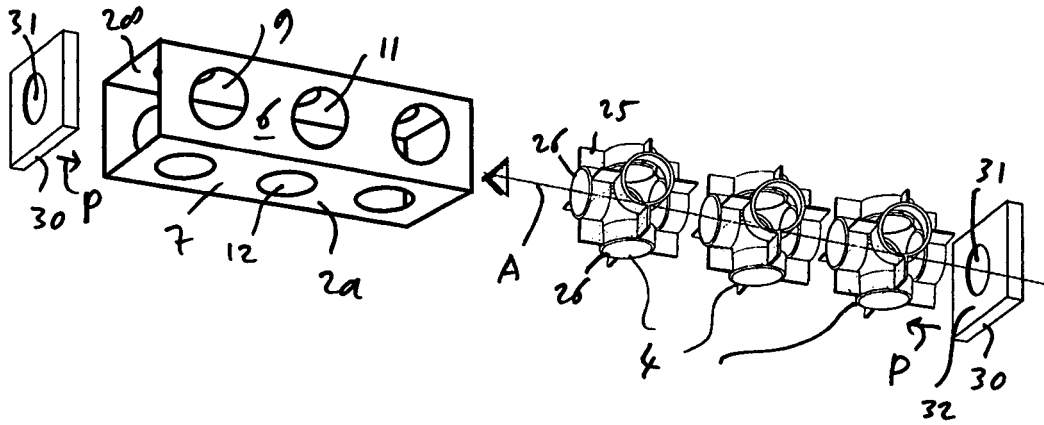


Fig. 2B

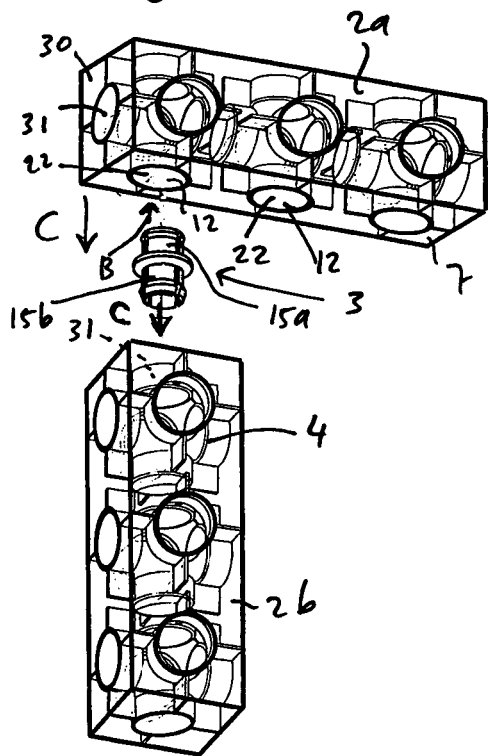
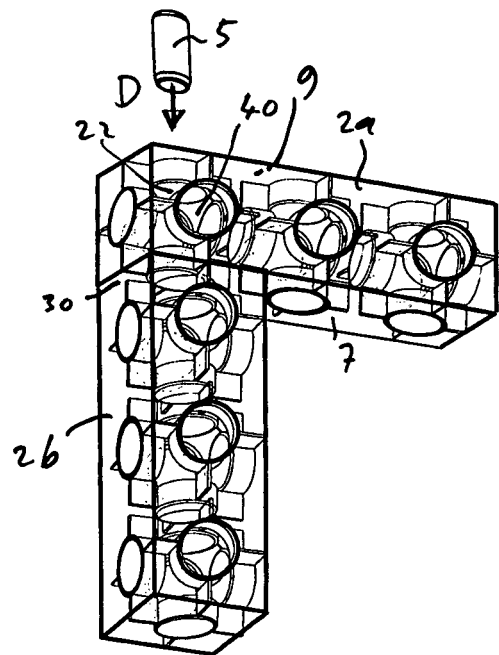
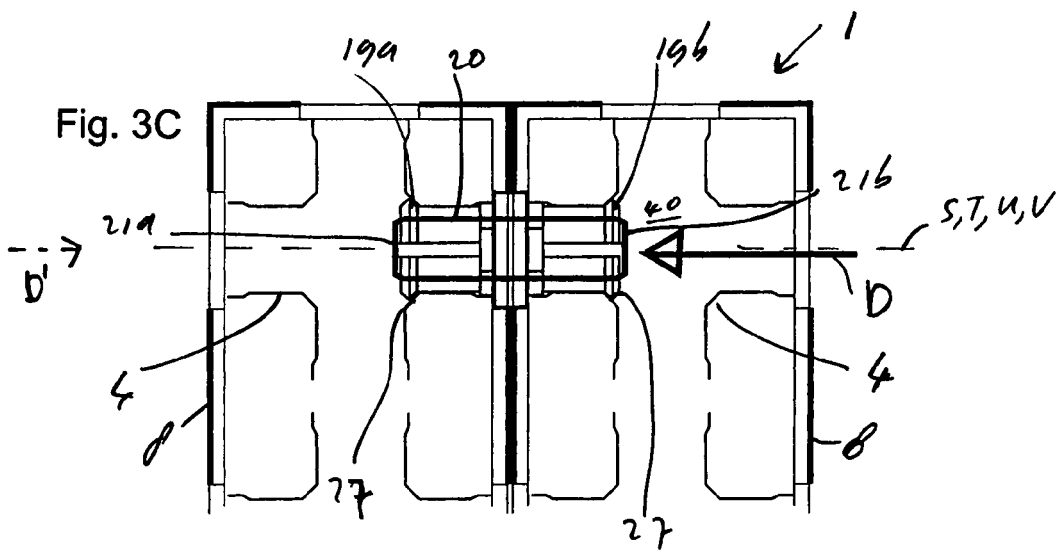
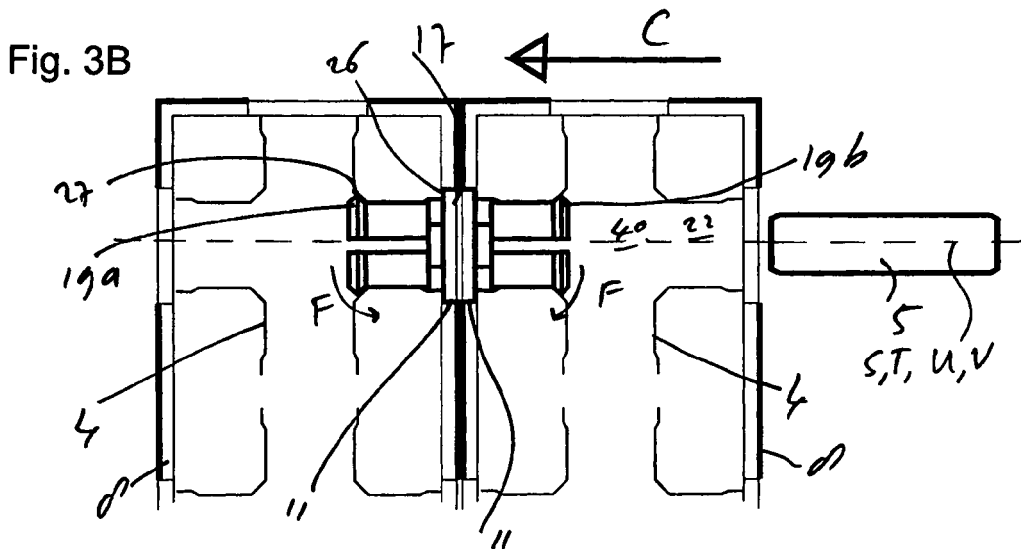
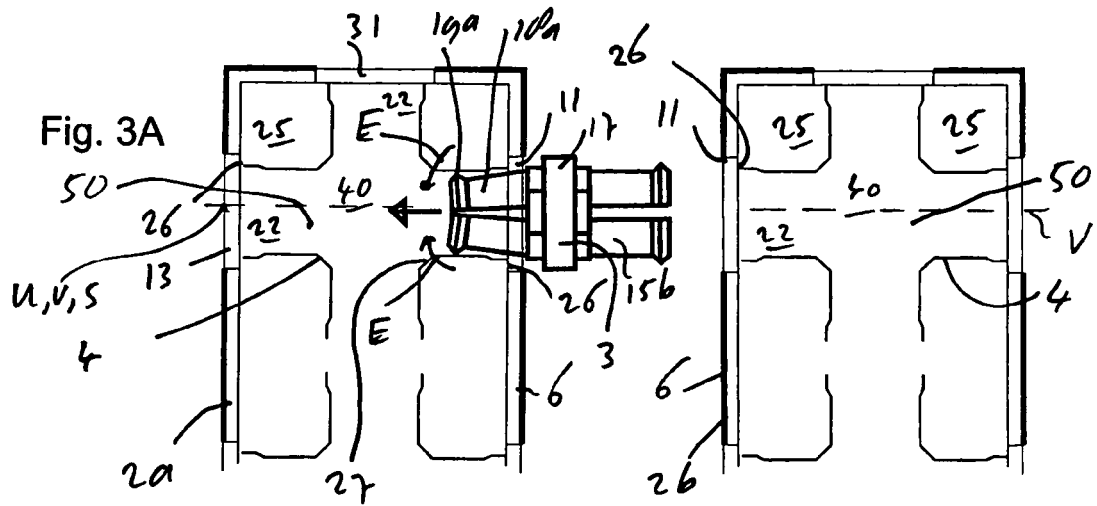


Fig. 2C





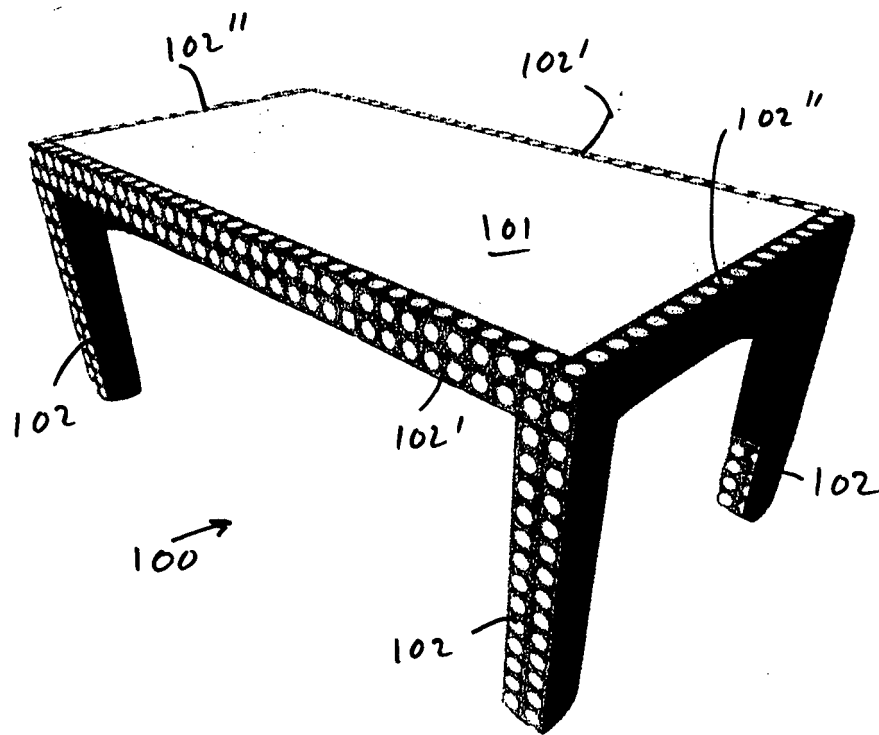
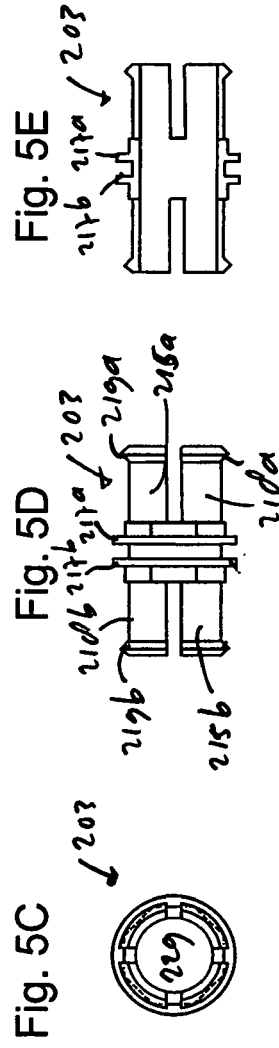
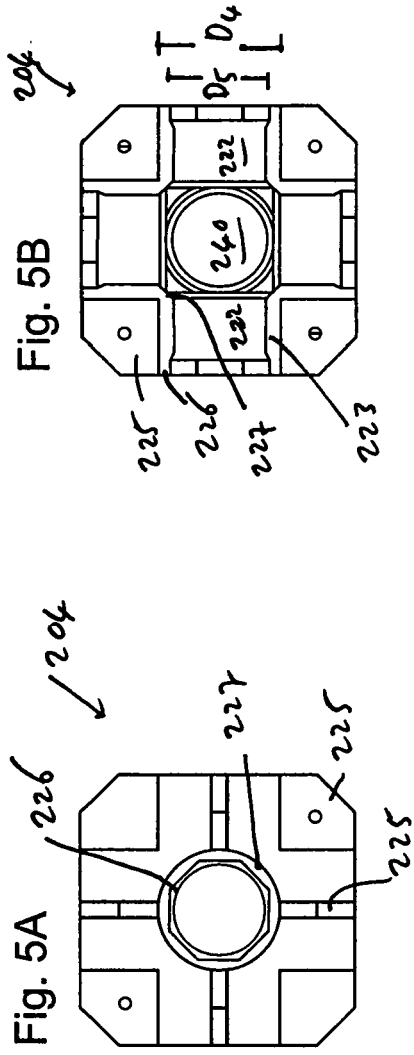


Fig 4





EUROPEAN SEARCH REPORT

Application Number
EP 09 00 2728

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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