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(72) Inventor: **Tirronen, Tero**
57200 Savonlinna (FI)

(74) Representative: **Helke, Kimmo Kalervo**
Kespat Oy
P.O. Box 601
40101 Jyväskylä (FI)

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(71) Applicant: **Tirronen, Tero**
57200 Savonlinna (FI)

(54) **Furniture structure, component for a furniture structure, and method for manufacturing a furniture structure**

(57) The invention relates to a furniture structure (10, 30, 40, 50), which is formed from components (13, 31.1, 31.2, 42, 44, 51.1, 51.2) of a single piece, which are attached to each other in one direction (W), and in which furniture structure there are bends (60). At least one surface (15.1, 15.2, 32, 43, 52) of the furniture structure is

arranged to be formed of a machined surface, which is created when the components are manufactured. In addition, the invention also relates to components for a furniture structure and a methods for manufacturing a furniture structure and for designing components for a furniture structure.

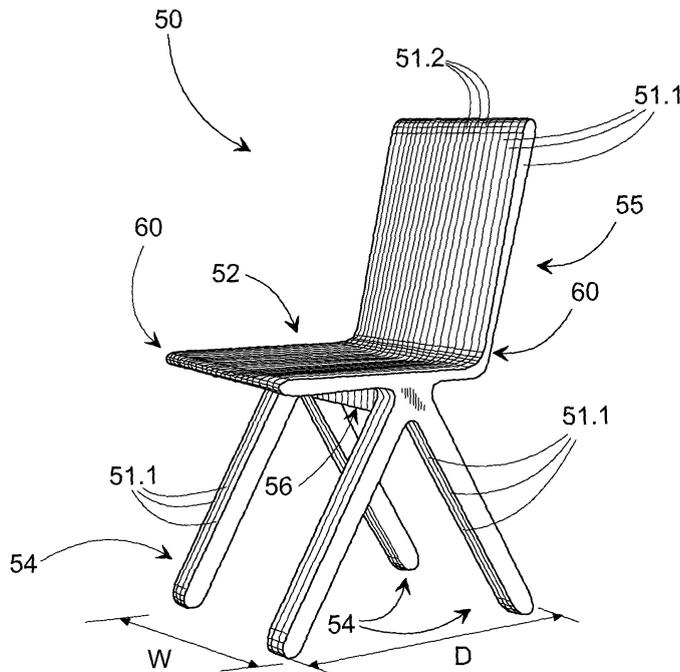


Fig. 6

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Description

[0001] The present invention relates to a furniture structure, which is formed from components of a single piece, which are attached to each other in one direction, and in which furniture structure there are bends. In addition, the invention also relates to a component for a furniture structure and a method for manufacturing a furniture structure according to the invention and for designing components for the furniture structure.

[0002] Various types of furniture structure are known from the prior art. Structures formed from planar elements are known from numerous different fields of technology, ranging from packaging boxes to products of the furniture and building industries. In these, a wall, or a load-bearing surface of the structure is formed by an essentially planar surface that is of a single piece.

[0003] Also known are various types of veneered furniture structure. In these, a special surface layer, which forms a functionally and aesthetically acceptable furniture surface, is formed on top of the body of the furniture structure.

[0004] Furniture structures are known from the prior art, which are assembled from slices, which are formed into a pack and attached to each other in one direction in the furniture structure. Patent publication CA - 1 240 564 discloses the manufacture of a structural body from components attached to each other. In this case, the components are essentially of two materials and have a layered construction. The core of the components is formed of foamed plastic and the surface is formed of a metal film attached to at least one side of the core layer. An essential feature of this structural solution is that the body of the structure requires a special surface layer, in order to improve the mechanical strength of the body. This increases the manufacturing costs of the furniture.

[0005] A hippopotamus figure of layered structural components, a special application of which is a bar-table functionality, is known from publication FR 2 444 424. In this case, the components are attached to each other on rods, relative to which the component halves can be turned, in order to open the figure, in order to present the bar-table functionality. Due to the two-part nature of the figure, an individual component layer is thus formed, at least locally, of two essentially separate components. For this reason, the structure opening in the stacking direction of the components is unstable and thus unable to bear, for example, the loadings characteristic of furniture. In addition, the components can rotate relative to each other and the rods can be permitted even a small flexibility, which further weakens the stiffness and durability of the structure.

[0006] Also known are various types of furniture structures formed from mould-pressings. One significant drawback of these is single thickness, i.e. the thickness of the body of the furniture cannot have variable thickness. This limits, for example, the shaping of the furniture.

[0007] The invention is intended to create a furniture

structure, which is simple to manufacture relative to the prior art. In addition, the invention is intended to create a corresponding method for manufacturing a furniture structure, in which the end product is manufactured in a simple manner. The characteristic features of the furniture structure according to the invention appear in the accompanying Claim 1. Correspondingly, the characteristic features of the method according to the invention appear in the accompanying Claim 12.

[0008] At least one surface of the body of the furniture structure is arranged to be formed of a machined surface, which is formed when manufacturing the component. Thus the surface in question forms the final furniture surface. According to one embodiment, the machined surface in question, can also be load-bearing, when the furniture is used. By this feature the manufacture of the furniture is substantially simplified as, for example, the final surface need not be formed, for example, by veneering.

[0009] According to one embodiment, the components can be essentially of a single material in their stacking direction. The single-material nature achieves a simple and solid furniture construction. In addition, according to one embodiment, the components forming the furniture could have been attached to each other seamlessly. The surface is then made exceptionally solid.

[0010] One example of the manufacturing material of the furniture components is laminated veneer lumber. In the case of laminated veneer lumber, which is already itself a single-material laminated structure, a special feature is that when assembled as a piece of furniture the components form their own layered laminated structure. When using laminated veneer lumber, the components remaining on the machined surface form the functional surface of the furniture, which is also aesthetically acceptable. In addition, laminated veneer lumber ensures that the furniture will also have good stiffness and strength properties.

[0011] The components of the furniture structure being of a single piece locally in a selected direction, and in addition also single-material, the furniture structure will have considerable stiffness and strength. In addition, because the components are attached directly to each other in one direction to form a continuous structure, the furniture structure is seamless or jointless in the transverse direction to the direction of attachment of the furniture structure in a manner that does not weaken the structure. Attaching the components directly to each other improves the stiffness of the furniture structure.

[0012] The furniture structure according to the invention is surprisingly easy to manufacture and assemble. The components of a even complex furniture structure formed from relatively narrow slices relative to the width of the entire structure are surprisingly simple to manufacture. The manufacturing operations of the components forming the furniture structure can easily be automated, so that the manufacturing costs of the components are minimized.

[0013] Through the invention, it is also possible to min-

imize material waste relating to the manufacture of the components forming the furniture structure. If, for example, a series of furniture structures of diminishing size are manufactured, the manufacture of the components can start, for example, from a machining blank corresponding to the largest furniture structure. The material blank remaining from the machining of the largest component can surprisingly form a machining blank for a component of a furniture structure of a smaller size. This form of machining procedure also leads to the logistical advantage that a series of similarly shaped furniture structures of diminishing sizes can be packed inside each other. The advantage achieved is that the structure series can be transported inside each other within the transportation volume of only the largest structure.

[0014] The furniture structure according to the invention can be of the most various kinds. The features characteristic of the invention appear in the accompanying Claims while more other advantages achieved by means of the invention are stated in greater detail in the description portion.

[0015] In the following, the invention is described in detail with reference to the accompanying drawings showing some embodiments of the invention, in which

- Figure 1 shows one example of the structure according to the invention, being a table equipped with a box property,
- Figure 2 shows the manufacture of the components in stages, for a construction series, which corresponds to the table according to Figure 1,
- Figure 3 shows the table according to Figure 1 when opened,
- Figure 4 shows a second embodiment of the furniture structure according to the invention, being a chair,
- Figure 5 shows a third embodiment of the furniture structure according to the invention, being table,
- Figure 6 shows a second embodiment of a chair, and
- Figure 7 shows the method according to the invention, as a flow chart.

[0016] Figure 1 shows one example of the furniture structure 10, which is now a table or stool equipped with an internal storage property. As basic parts, the table can include in this case a square prismatic part 10 open at both ends and comprising bends 60, which forms the self-supporting body of the furniture 10, and end parts 12 closing the ends of the body, of which only one is visible in Figure 1. The end pieces 12 form a closed space inside the furniture structure 10. Of course, the table 10 can equally be without ends.

[0017] In this case, the table 10 consists of ingeniously assembled, identical, single-piece seamlessly continuous structural components 13. In one selected direction D of the furniture 10, the structural components 13 are

of a single piece and thus essentially manufactured from a single piece. In themselves, the structural components 13 are jointless and seamless totalities. In other words, the furniture 10 is of a single-piece in the direction of the local cross-section W. The table 10 is assembled by attaching to each other components 13 set next to each other and thus bundled together, in a selected manner in the direction W. When bundled together and attached to each other, the components 13 form a tube 10 enclosed by a jacket with two sides, i.e. a visible outside 15.1 and an inside 15.2 (Figure 3).

[0018] One way to attach the single-piece structural components 13 to each other by their side surfaces 17 (Figure 2) is to use an adhesive, stated more generally a chemical bond, or wooden dowels, threaded rods extending from end to end of the prismatic part 10 or over part of it, or combinations of these. If the components are, for example, of laminated veneer lumber, an adhesive joint will then be the preferred manner of attachment, because the timber material may expand due to moisture. Some examples of adhesives are PVAc adhesives and woodworker's glues.

[0019] In the right-hand lower corner of Figure 2, an example of the structural component 13 is shown, from which the table structure 10 according to Figure 1 can be assembled by joining together a large number of structural components 13 placed parallel to, and on top of each other. In other words, the components 13 form a pack-like arrangement in the direction W arranged in a laminated structure. The structural components are, in the case of the table 10, loops i.e. profile pieces 13, cut to shape and forming a closed perimeter, in which there is an opening 14 in the centre and in which there is at least one bend 60. More generally, the shape of the component 13 is machined to correspond to the local cross-section of the furniture structure 10 in the selected direction W, which is the direction in which the furniture structure 10 is sliced. In the case of the table 10, the term bend 60 refers to a corner.

[0020] The profile pieces 13 have unmachined side surfaces 17 on each side of the component 13, arranged to be placed against each other when joined to each other in parallel. In this way, a tight seamless surface is achieved without sanding and special surface layers. In other words, the components 13 are frames, which can be manufactured, for example, by using a selected technique, for example, by cutting them from sheet-like machining pieces.

[0021] According to one embodiment, the components 13 can be, for example, of laminated veneer lumber (LVL) 20. In that case, the components 13 will be, on a macroscopic level, essentially single-material, for example, in the direction W of joining the components 13. Due to their single-material nature, the components 13 can be joined to each other seamlessly. The material thickness of the machining blank 20 of the components 13 can be, for example in the case of laminated veneer lumber, 10 - 90 mm and, in the case of plywood, 4 - 60 mm. The material

thickness can be selected on the basis of the slice division of the structure and individual components can even be made from machining blanks of different material thicknesses. Concerning the relative dimensions of the components, it can be generally stated that the dimensions of a component in two directions can be multiples of the third direction W , which is the direction of joining the components to each other. If the components are of laminated veneer lumber, for example, their specific bending strength can be 20 - 50 MN/m², more particularly 30 - 40 MN/m². Additional advantages of laminated veneer lumber are its dimensional stability and its straightness. In the pieces of furniture shown in Figures 1 - 6, the joints of the components are shown for illustrative purposes. In reality, the joints of the components will scarcely be noticed, as they will be lost in the multi-layer laminated structure of the laminated veneer lumber, which is not shown in Figures 1 - 6.

[0022] Figure 2 shows an example of the manufacture in stages of the components 13.1 - 13.4. If a sheet blank 20 of dimensions of the most suitable size possible is selected to manufacture the component, material waste will be minimal. Manufacture can take place, for example, using a CNC machining centre, using, for example, 20-mm end mills to cut the components 13.1 - 13.4 out of the blank 20. Cutting can comprise forming the surfaces 15.1, 15.2 on the opposite sides of the component 13. Cutting forms a straight and even surface on the component 13.1 - 13.4, which is suitable almost as such as the outer surface of, for example, a piece of furniture or similar, for example, a table or seat surface 32, 43, 53 (Figures 4 - 6).

[0023] In Figure 2, the cutting lines of the components 13.1 - 13.4 are shown by broken lines. Using an end mill for cutting leaves a small machining allowance between the components 13.1 - 13.4. Now four frame components 13.1 - 13.4 are made from a single sheet blank 20. The components 13.1 - 13.4 can be used to manufacture four differently sized tables, so that tables can be manufactured in series. As a consequence, an empty table, with no internal structures, assembled from the frame series 13.1 - 13.4 diminishing in size according to Figure 2 can be transported inside each other when empty. Such a modularity of furniture is a significant logistical advantage. In the manufacture of the frames 13, it is possible to start from any frame size whatever.

[0024] The sheet 21 remaining from the cutting is still entirely usable and can be used as desired, for example, to make a second product manufactured according to the invention. Thus, from a single machinable material blank 20, components can be obtained even for different types of structure and thus gain the greatest possible benefit through minimized material waste.

[0025] Once the components 13 forming the furniture structure 10 are ready, they are joined in parallel to each other. As a result of joining, at least one side 15.1 or surface of the body of the furniture structure 10 is surprisingly formed of a machined surface, which has mainly

arisen during the manufacture of the component 13 that forms the side 15.1 or surface by cutting the machining blank 20 across the grain. In this connection, machining can include not only cutting, but possibly also sanding, which can be performed, for example, once the piece of furniture 10 has been finished.

[0026] The surface 15.1 can be load-bearing and, in addition, also be an external or internal surface visible in connection with using the piece of furniture 10. The grain is formed, for example in the case of laminated veneer lumber, of material layers, from which the blank 20 is formed. Thus, when the furniture structure 10 is assembled, the side surfaces 17 of the components 13 joined parallel to, and set opposite to each other are surprisingly the planar surfaces of the sheet blank 20, from which conventionally it is usual to form the main surfaces of an interior fitting or a piece of furniture. In addition, the joint surfaces of the components 13 are all parallel to each other. When manufacturing the furniture structure 10 from layered pieces 13, an aesthetic patterning is also obtained for its outer surface, which improves its usefulness in interior decoration. In the components 13 there can be grooving (not shown), which allows the tables to be stacked more securely on top of each other.

[0027] In Figure 1, the table is shown when closed. According to one embodiment, the table furniture structure can have two states; the closed state according to Figure 1 and the opened state according to Figure 3. In the closed state, the table structure can form storage furniture for articles 18 and, in the opened state, display furniture for the articles, when they can be placed inside the table or taken out from it. There can be hinging 19.1, a locking closure 19.2, or similar elements in the table, for the opening and closing operations. The table 10 can open in the middle, for example, in a manner analogous to that known from dolls' houses. Inside the table structure there can be support structures 16 for arranging a box property for several product items 18. Inside the table there can be, for example, a fixed or collapsible shelving structure 16 or similar, which is supported on the furniture 10. One application for the table can be, for example, a hall table.

[0028] Figure 4 shows a second embodiment of the furniture structure 30, which is now a chair. Instead of the closed frame 13, at least some of the components can also be open structural-profile pieces 31.1, 31.2 cut to shape, from which it is possible to assemble, by bundling them together in the direction W , for example a chair 30, or some other piece of furniture (a table 40 according to Figure 5, a bed, a shelf, a work top, a chair according to Figure 6, etc.). For example, in the case of the chair 30 the pieces 31.1, 31.2 are joined directly together in the direction W of the chair. Examined in direction W , both pairs of legs 34 of the chair 30 are formed of either one or two pieces 31.1 cut out and joined together. Between the pair of legs 34 there is a seat/backrest part of several identical components 31.2 layered in the direction W . The components are pieces cut from a material

blank into a shape with the side profile of the relevant part 31.2. In other words, the cutting surface of the material blank now forms both the seat 32 and the backrest 32, which in this case are also load-bearing visible external surfaces of the piece of furniture 30.

[0029] Figure 5 shows a second embodiment of the piece of furniture, which is now also a table 40. Correspondingly, in the case of the table 40, the pair of legs 41 at both ends of the table 40 are formed from, example, two cutout profiles 42 while the table top 43 remaining between the ends is again a layered cutout profile of several components 44 parallel to each other and joined directly to each other, but without legs. In the case of this piece of furniture, the bends are corners 60, at which the direction of the surface changes.

[0030] Figure 6 shows a second embodiment of the chair 50. In this case, the outermost components 51.1 of the chair 50 possess seat, leg, and also backrest properties 52, 54, 55. The components 51.2 in the centre of the chair 50 possess only a seat and backrest component 52, 55. On the side opposite to the seat surface 52 of the chair 50 it is possible to leave a rib shape 56 integrated in the essentially single-material components 51.1, 51.2, which, for its part, reinforces and stiffens the structure 50. The rib 56 too runs in the direction W. As can be clearly seen from Figure 6, the single-material laminated veneer lumber permits surprisingly a variable material thickness in the furniture 50. In the chair 50 according to the figure, the junction between the backrest 55 and the seat part 52 at the bend 60 has been made surprisingly narrow, without the strength of the chair 50 suffering however.

[0031] The bundling and joining direction of the components does not limit the applicability of the invention. In its position when in use, the piece of furniture can also be bundled and joined vertically. One example of this is a furnishing box, in which the component rings are stacked on top of each other vertically and a bottom and cover are attached to the tubular body (not shown).

[0032] On the basis of the above it is obvious that the essential feature of the embodiments referred to above is the assembly of the piece of furniture 10, 30, 40, 50 that takes place by bundling together components 13, 31.1, 31.2, 42, 44, 51.1, 51.2, which are single pieces, in which the bundling takes place essentially in only one direction W, in which direction the dimension of the component is generally the smallest. In other words, if the assembled furniture 10, 30, 40, 50 is sliced in the relevant direction W, then each slice component 13, 31.1, 31.2, 42, 44, 51.1, 51.2 is a single-piece, continuous, solid, and seamless structure, for example, in the transverse direction to the direction W, or even more generally, in a main direction D differing from the direction W. A construction of this kind gives the piece of furniture 10, 30, 40, 50 considerable strength and stiffness.

[0033] The invention also relates to a method for manufacturing a furniture structure 10, 30, 40, 50. Figure 7 shows a flow chart of one example of the implementation

of the method. Before the furniture structure 10, 30, 40, 50 is manufactured, it is designed (stage 701). Next, the designed furniture structure 10, 30, 40, 50 is sliced in the selected direction W (stage 702) and work directions are made from the slices for the manufacture of the 13, 31.1, 31.2, 42, 44, 51.1, 51.2, 13.1' - 13.4' (stage 703). Once a suitable work blank has been selected, each component is made from it according to the work directions (stage 704). The furniture structure 10, 30, 40, 50 is assembled by joining together in the direction W the single-piece components 13, 31.1, 31.2, 42, 44, 51.1, 51.2, 13.1' - 13.4' with bends (stage 5).

[0034] According to one embodiment, the joining can take place, for example, by gluing, in which case the components will be irremovably attached to each other. The adhesive is spread onto the side surfaces 17 of the components 13, 31.1, 31.2, 42, 44, 51.1, 51.2. After spreading, the adhesive is allowed surprisingly to harden/solidify for a set waiting time, for example, of a few minutes. Once the adhesive has solidified, the furniture structure 10, 30, 40, 50 is assembled from the components 13, 31.1, 31.2, 42, 44, 51.1, 51.2, when a pack is formed from the components. After this, a compressive force is directed onto the components 13, 31.1, 31.2, 42, 44, 51.1, 51.2 in the direction W, for a set length of time.

[0035] Though the invention is described above as a furniture structure, which is formed solely of laminated veneer lumber, it is also possible to use several materials in the same piece of furniture. The invention also permits furniture to be manufactured in such a way that the components can be of different materials in the same piece of furniture. Besides laminated veneer lumber, it is also possible to apply, for example, solid wood, birch plywood, coniferous plywood, and/or laminated timber. In any event however, in each case the actual components will still be essentially single-material.

[0036] Besides or instead of the milling described above as an application example, the cutting to shape of the components can also be performed, for example, using a laser or water-jet technique. Though by using these techniques high cutting speeds will not be reached, their use does permit the minimization of cutting waste. However, compared to these techniques the milling technique has the advantage of being able to be used to run relatively thick sheets, in which case the time taken to manufacture the components will be shortened, due to the reduced number of machining runs.

[0037] The use of the invention achieves the advantages of long spans, but nevertheless also a stiff and strong furniture structure. Besides simple manufacture and good stiffness and strength properties, the furniture structure is also stylish. In addition, pieces of furniture according to the invention have durable strength properties while it is also easy to automate the machining techniques for the structures.

[0038] It must be understood that the above description and the related figures are only intended to illustrate the present invention. The invention is thus in no way

restricted to only the embodiments disclosed or stated in the Claims, but many different variations and adaptations of the invention, which are possible within the scope on the inventive idea defined in the accompanying Claims, will be obvious to one versed in the art.

Claims

1. Furniture structure, which is formed from components (13, 31.1, 31.2, 42, 44, 51.1, 51.2) of a single piece, which are attached to each other in one direction (W), and in which furniture structure (10, 30, 40, 50) there are bends (60), **characterized in that** at least one surface (15.1, 15.2, 32, 43, 52) of the furniture structure (10, 30, 40, 50) is arranged to be formed of a machined surface, which is created when the components (13, 31.1, 31.2, 42, 44, 51.1, 51.2) are manufactured.
2. Furniture structure according to Claim 1, **characterized in that** the components (13, 31.1, 31.2, 42, 44, 51.1, 51.2) are essentially of a single material.
3. Furniture structure according to Claim 1 or 2, **characterized in that** the components (13, 31.1, 31.2, 42, 44, 51.1, 51.2) are joined to each other seamlessly.
4. Furniture structure according to any of Claims 1 - 3, **characterized in that** the components (13, 31.1, 31.2, 42, 44, 51.1, 51.2) are profile pieces cut to shape, which have side surfaces (17) arranged to be placed against each other when the components (13, 31.1, 31.2, 42, 44, 51.1, 51.2) are joined to each other.
5. Furniture structure according to any of Claims 1 - 4, **characterized in that** at least some of the components (31.1, 31.2, 42, 44, 51.1, 51.2) are open profile pieces cut to shape.
6. Furniture structure according to any of Claims 1 - 5, **characterized in that** the specific bending strength of the components (13, 31.1, 31.2, 42, 44, 51.1, 51.2) is 20 - 50 MN/m².
7. Furniture structure according to any of Claims 1 - 6, **characterized in that** the components (13, 31.1, 31.2, 42, 44, 51.1, 51.2) are joined to each other by a chemical bond.
8. Furniture structure according to any of Claims 1 - 7, **characterized in that** the material thickness of the components (13, 31.1, 31.2, 42, 44, 51.1, 51.2) in the direction (W) is 10 - 90 mm.
9. Furniture structure according to any of Claims 1 - 8, **characterized in that** the components (13, 13.1, 13.2, 42, 44, 51.1, 51.2) are of laminated veneer lumber, LVL.
10. Furniture structure according to any of Claims 1 - 9, **characterized in that** the reinforcement shaping (56) is integrated in the components (51.1, 51.2).
11. Component for manufacturing a furniture structure (10, 30, 40, 50), according to any of Claims 1 - 10, in which there are bends (60), **characterized in that** the component (13, 31.1, 31.2, 42, 44, 51.1, 51.2) has a set material thickness and its shape is machined to correspond to the local cross-section of the furniture structure (10, 30, 40, 50) in the selected direction (W) and in which at least one surface (15.1, 15.2, 32, 43, 52) of the component (13, 31.1, 31.2, 42, 44, 51.1, 51.2) is arranged to be formed of a machined surface, which is created in the manufacturing of the component (13, 31.1, 31.2, 42, 44, 51.1, 51.2).
12. Method for manufacturing a furniture structure, in which method the furniture structure (10, 30, 40, 50) is assembled by joining together in one direction (W) single-piece components (13, 31.1, 31.2, 42, 44, 51.1, 51.2), in which there are bends (60), **characterized in that** at least one surface (15.1, 15.2, 32, 43, 52) of the furniture structure (10, 30, 40, 50) is formed of a machined surface, which is created when manufacturing the component (13, 31.1, 31.2, 42, 44, 51.1, 51.2).
13. Method according to Claim 12, **characterized in that** two or more components (13.1 - 13.4) are manufactured from a single material blank (20), for example, for a series of furniture structures of diminishing size.
14. Method according to Claim 12 or 13, **characterized in that**
 - adhesive is spread on the side walls (17) of the components (13, 31.1, 31.2, 42, 44, 51.1, 51.2),
 - the adhesive is allowed to harden for a set time,
 - the furniture structure (10, 30, 40, 50) is assembled from the components (13, 31.1, 31.2, 42, 44, 51.1, 51.2),
 - a compressive force is directed onto the components (13, 31.1, 31.2, 42, 44, 51.1, 51.2) in the direction (W).
15. Method for designing a component according to Claim 11 for a furnishing structure, **characterized in that**
 - the designed furniture structure (10, 30, 40, 50) is sliced in a selected direction (W),

- work instructions for the manufacture of components (13, 31.1, 31.2, 42, 44, 51.1, 51.2) are formed from the slices.

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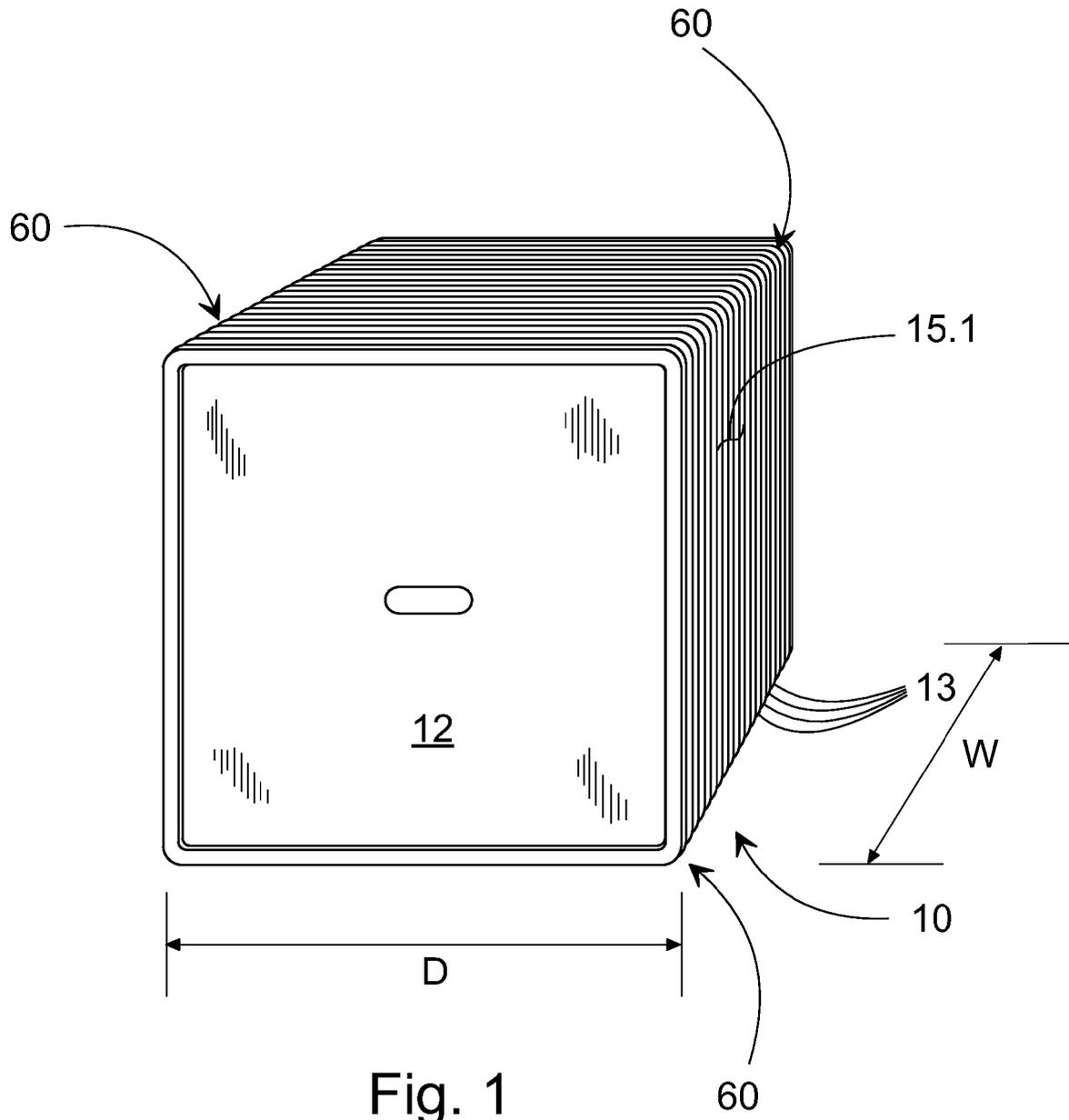


Fig. 1

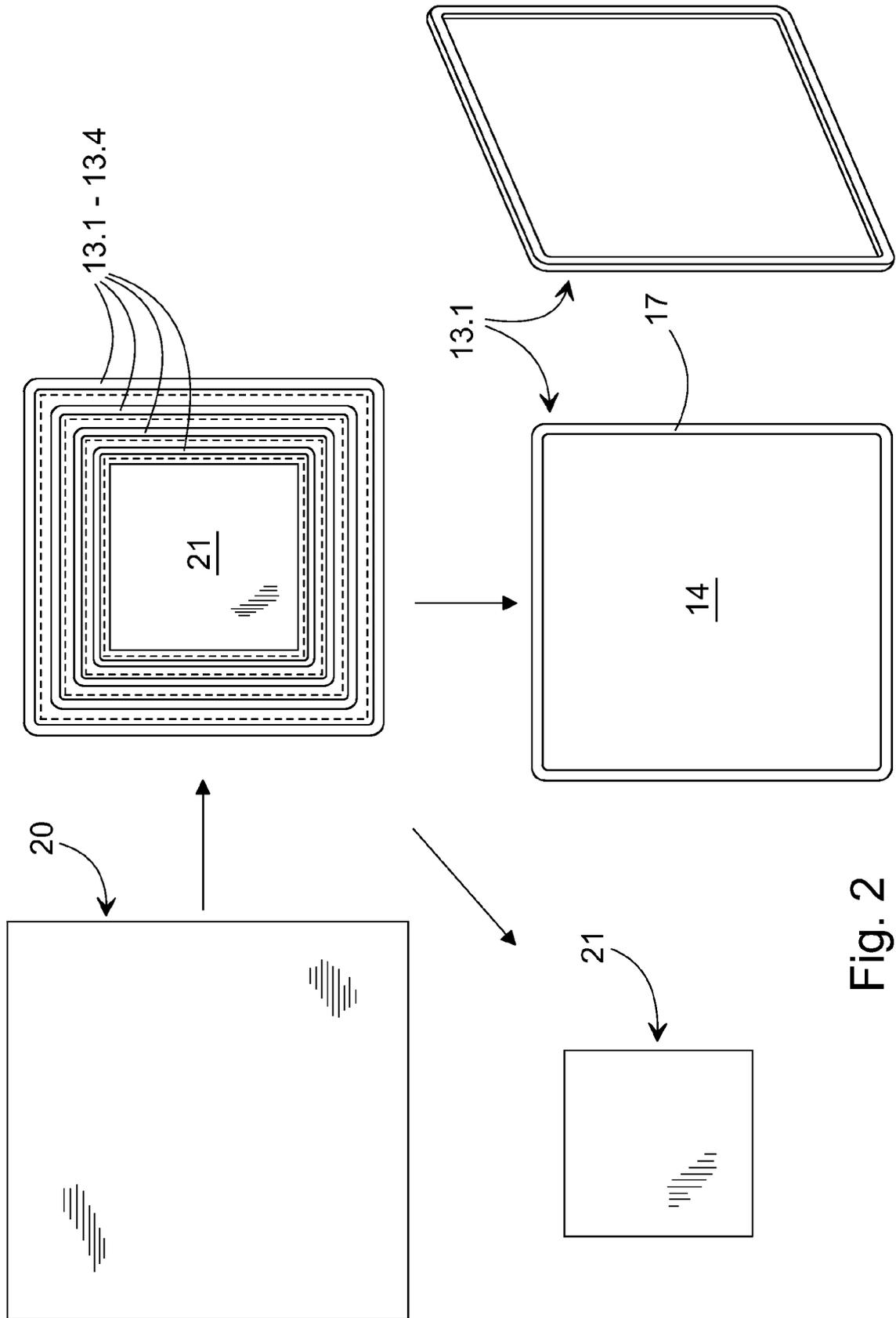


Fig. 2

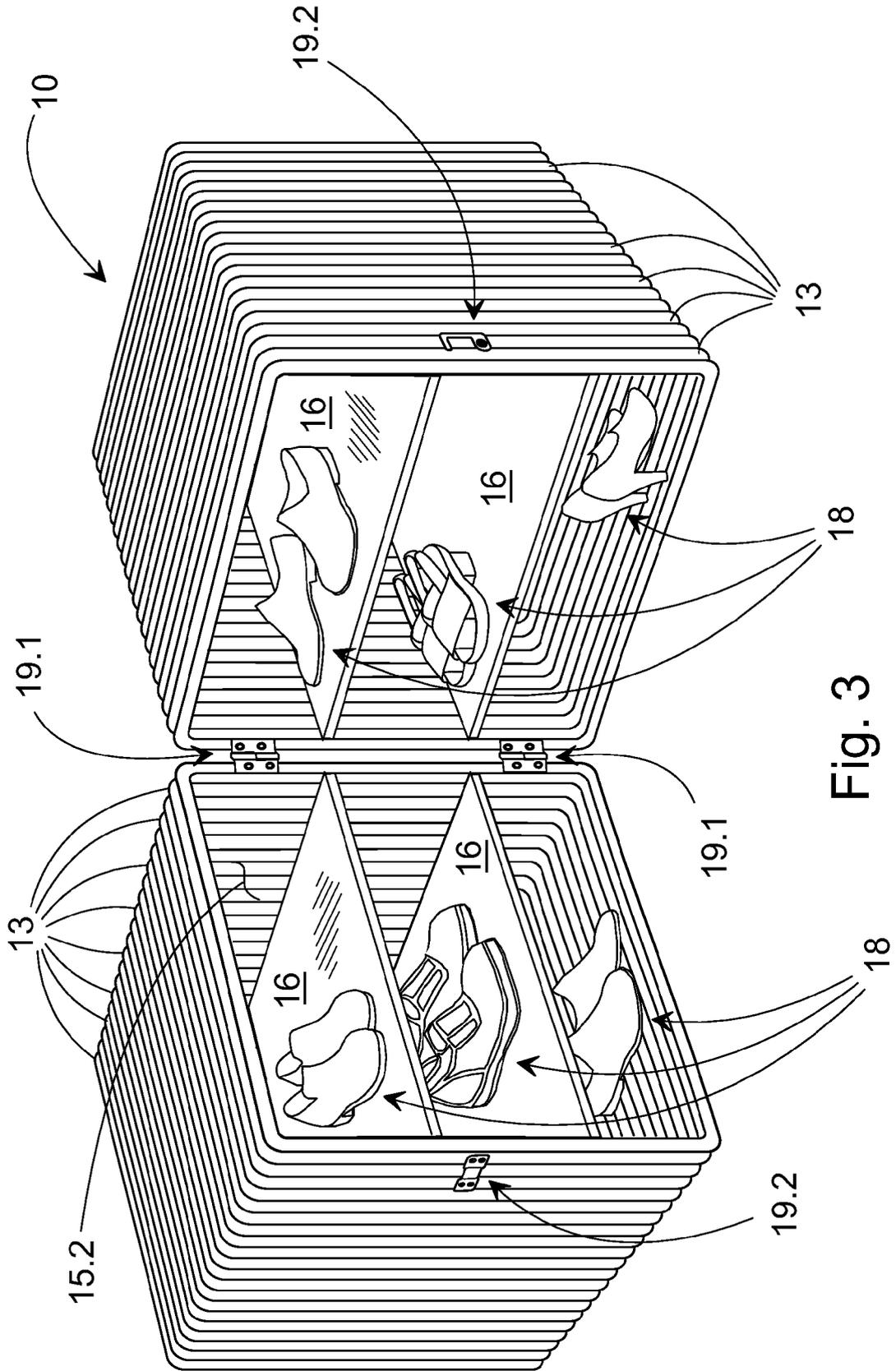


Fig. 3

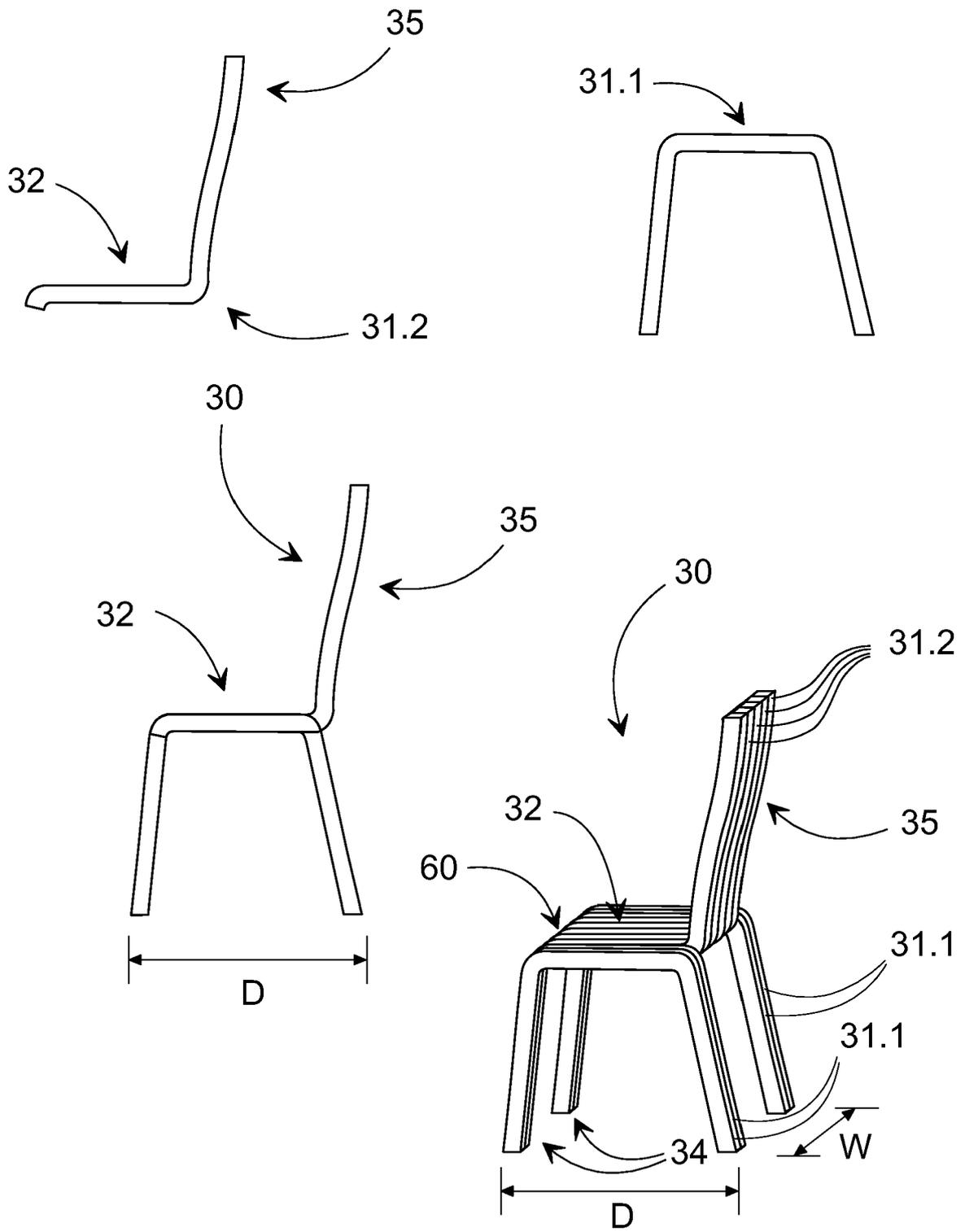


Fig. 4

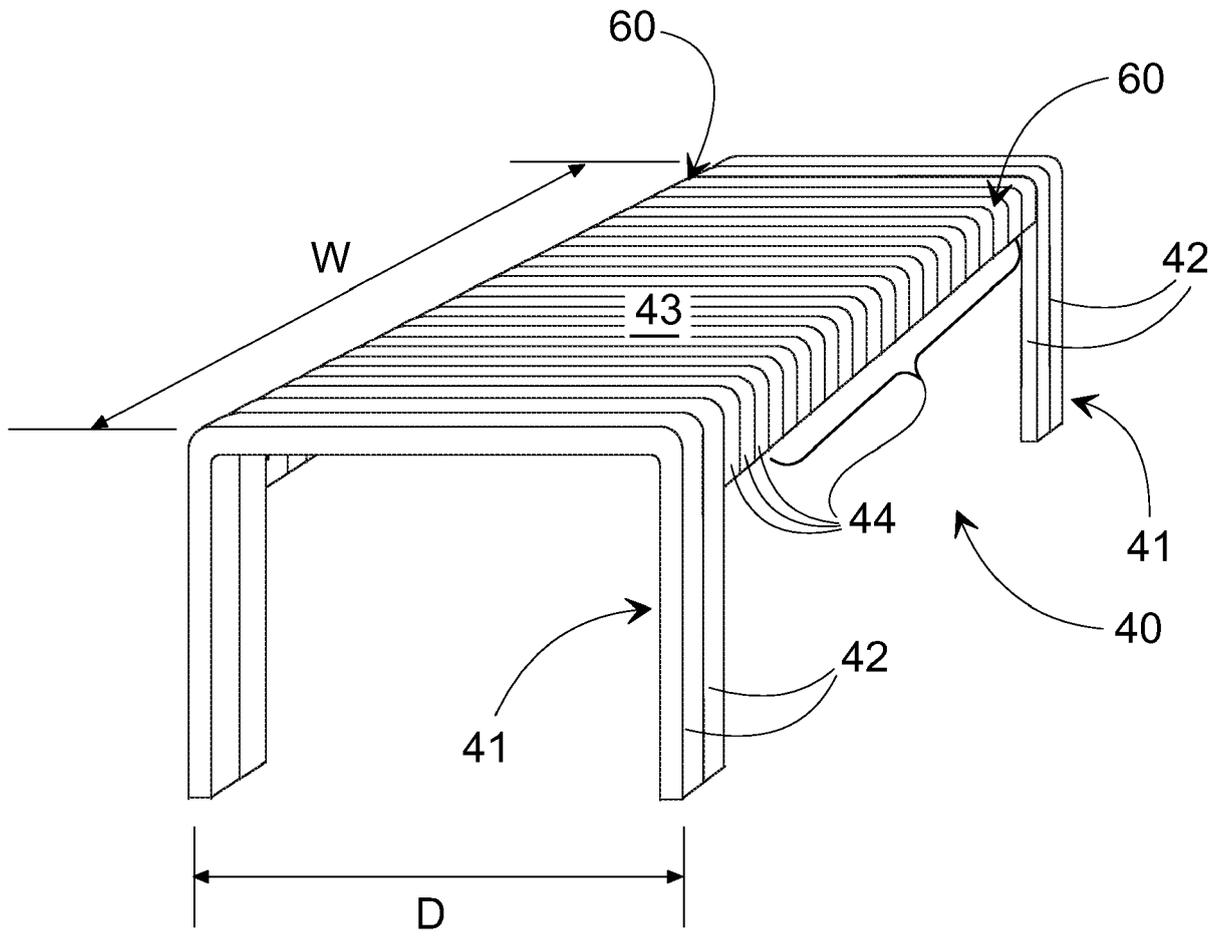


Fig. 5

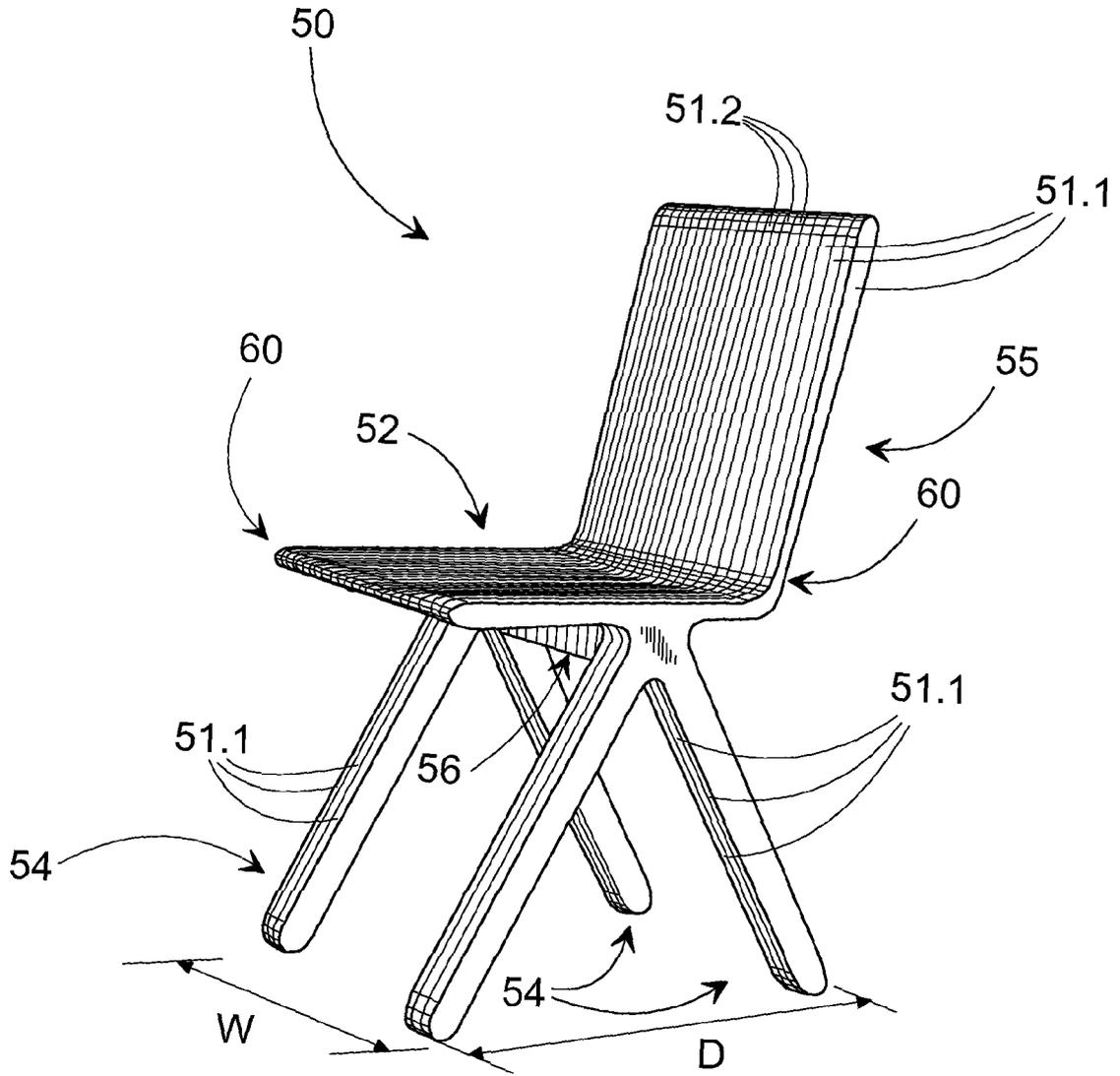


Fig. 6

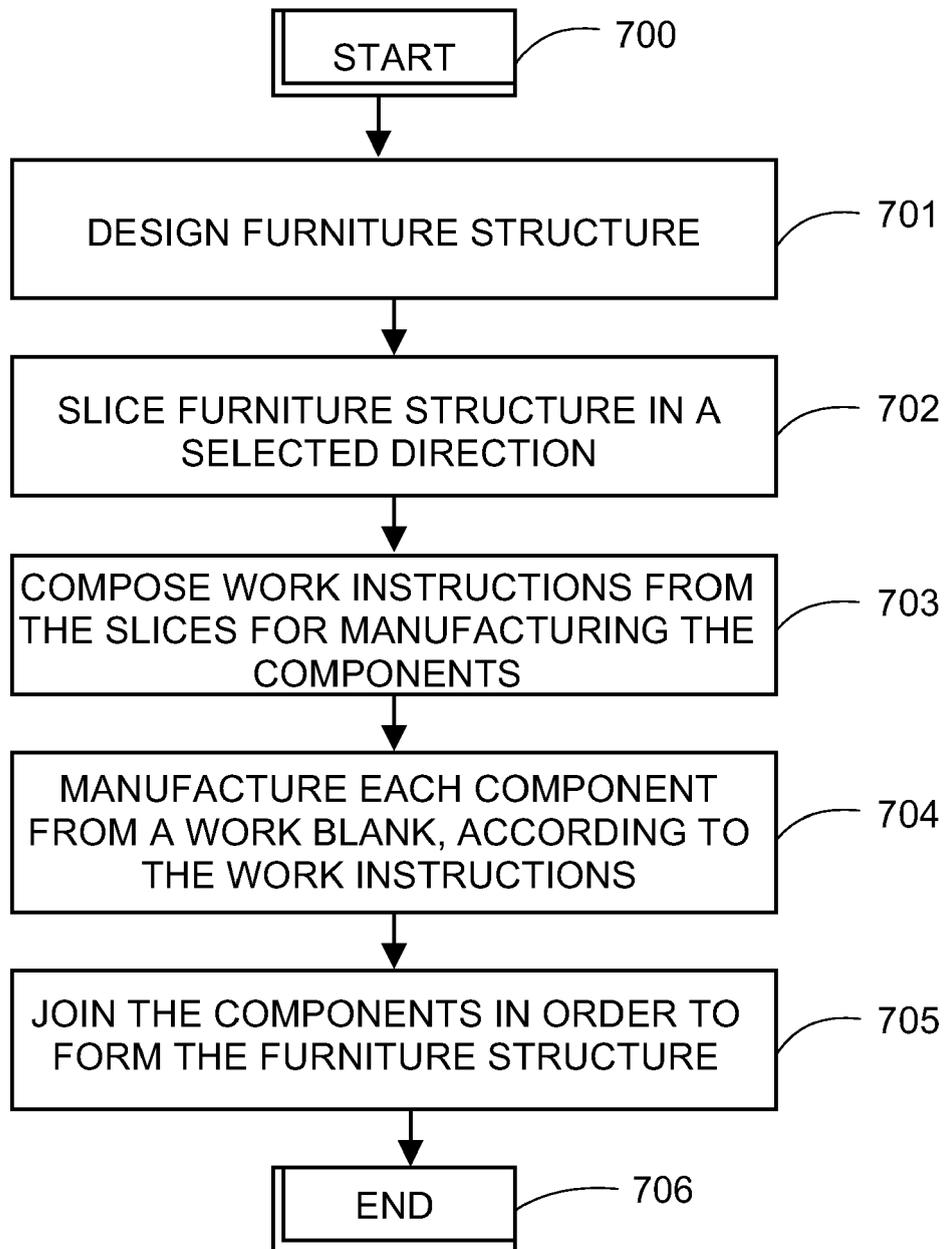


Fig. 7



EUROPEAN SEARCH REPORT

Application Number
EP 09 16 1518

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	DE 360 706 C (GIUSEPPE MORANDI) 6 October 1922 (1922-10-06) * page 2 * * figure 4 *	1-12,14, 15	INV. A47C7/00
X	DE 100 46 797 A1 (DANNER KURT [DE]) 18 April 2002 (2002-04-18) * abstract; figures *	1-8, 10-12	
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