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(54) Method for manufacturing a furniture or a support structure for a furniture

(57) Method for manufacturing a piece of furniture or a supporting structure for a piece of furniture on the basis of coconut fibres, whereby starting from the design of the piece of furniture which is to be manufactured, the method comprises the following steps:
- identifying zones in the piece of furniture's design with accompanying desired mechanical qualities;
- building the piece of furniture whereby the coconut fibres are oriented according to appropriate dominant fibre directions as a function of the aforesaid desired mechanical qualities.

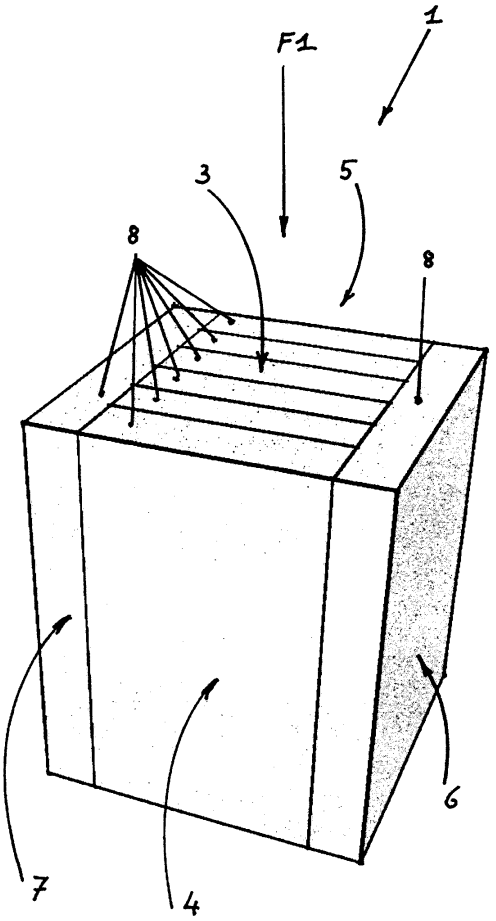

FIG 1

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Description

[0001] The present invention concerns a method for manufacturing a piece of furniture or a supporting structure for a piece of furniture.

[0002] The method according to the present invention is particularly useful for manufacturing furniture to sit or to lie on, but it is not restricted thereto.

[0003] However, the designation 'furniture to sit or to lie on' must be understood in a broad sense within this context, and it comprises any upholstered furniture which is suitable for one or several persons to sit or to lie on, and which essentially consists among others of a part to sit or to lie on, and depending on the case it may be provided with a back, arm rests and/or foot rests or the like.

[0004] Examples thereof are among others a chair or a coach, a sofa, a divan, an armchair, a lounge suite, a car chair, an office chair, a bucket seat, etc.

[0005] The invention also concerns parts of such furniture, such as for example a separate head or foot rest.

[0006] We can distinguish different zones or parts in such furniture on which strongly varying demands are made, among others but not exclusively in the mechanical field.

[0007] Thus, there is the demand for the piece of furniture to have a stable structure as a whole in order to be able to absorb the weight and dynamic loads of one or several persons safely and repeatedly during its whole useful life, without any substantial permanent deformations and without any risk of tipping over.

[0008] Different zones of the piece of furniture, such as for example the foot or base, the back, the seat, and in the present case the head, foot or side rests, are mechanically loaded in very different ways, statically as well as dynamically, depending on the weight, the position and/or the movements of one or several users and the direction of the load exerted thereon.

[0009] On the other hand, the piece of furniture must have a rather soft, springy but nevertheless also supporting structure in certain zones, such as for example the part to lie or sit on, which can provide the user or users with the desired feeling of comfort and which in many cases may also have an embellishing or protective function.

[0010] However, a certain rigidity and non-deformability is simultaneously required from the side, arm, foot or head rests without diminishing the feeling of comfort.

[0011] From the zones which make lengthier contact with the bodies of the users is also required that they have heat, moisture and air-regulating qualities, do not cause any allergies, are preferably sound-insulating and do not stimulate the proliferation of micro-organisms, mould or for example house dust mites.

[0012] Since, according to the present state of the art, there is not a single material available which meets all the above-mentioned and other requirements, said furniture must be composed of different materials.

[0013] This is not only expensive, but also wasteful of energy and environmentally unfriendly.

[0014] Traditionally, such furniture is made on the basis of a support or frame, often made of hardwood such as beech, for example, or of metal.

[0015] Such a frame provides for stability and is usually further provided with softer materials, usually in the form of a synthetic foam, such as for example polyether polyurethane foam.

[0016] Furniture which is entirely made of synthetic material is known as well, whereby a hard synthetic, for example in the form of glass fibre-reinforced composite material, is used for the frame, base or support, which is then subsequently upholstered and/or filled in a similar manner with a softer material such as synthetic foam.

[0017] This furniture is disadvantageous in that it is composed of multiple components, as a result of which the manufacturing of the different constituent parts, their storage and assembly can be complex, labour-intensive, time-consuming and wasteful of energy, and consequently also expensive and environmentally unfriendly.

[0018] A further disadvantage is that, when a wooden or metal supporting structure is used, this must rest on the ground, and when it is moved over a hard floor it will make an annoying contact noise; apart from sound nuisance, it can also easily cause damage, for example to a parquet or laminate floor.

[0019] Moreover, most parts are made of materials which are hard to recycle or of non-renewable materials, in particular synthetics on the basis of petroleum derivatives, or of glass fibre or metal, which is environmentally unfriendly and contributes to the emission of greenhouse gases.

[0020] Some of these synthetics are known to produce toxic gases when being overheated, such as for example hydrocyanic derivatives, resulting in very serious danger for man and beast even outside the immediate seat of the fire.

[0021] Finally, the life of the used synthetics is usually rather limited.

[0022] Thus, for example, polyurethane foam becomes more brittle and darkens under the influence of oxygen, as a result of which it becomes less elastic and will start to crumble.

[0023] The composite materials which are used as a support or frame, for example, may also deform due to creep or delamination, denigrating the stability and bearing power of the piece of furniture in the medium term.

[0024] Flexible seats which are made without any support or frame are known as well. They are essentially formed of a synthetic shell which is filled with smaller synthetic elements, for example expanded polystyrene or polyvinylchloride or sawdust.

[0025] They are also called "bean bag chairs".

[0026] The bag encloses the user's body contours, which results in a comfortable feeling, but as a fixed supporting structure is lacking, it provides insufficient support to the back, which may lead to back complaints in case

of lengthy use. The bean bag chair may also produce, depending on what material is used as a stuffing, disturbing noises when changing one's position.

[0027] Although their construction and composition is simpler than that of the former furniture, they have quite some disadvantages in common, apart from the lacking supporting element, in particular a limited durability and the fact that they are composed of non-recyclable or non-renewable base materials.

[0028] Semi-finished articles for the furniture industry are known as well, for example from DE 1938007, made of fibreboards of rubberized coconut fibres.

[0029] These boards are made by matting a layer of loosely scattered coconut fibres, also called coir, sprinkling them with natural latex in which cross linkers are mixed, and subsequently piercing them with needles provided with barbs.

[0030] This treatment has for a result that coconut fibres which are perfused with latex are drawn to and through the surface via the openings through the top and undersurface, as of the inside of the semisolid board, and are bent there to be finally embedded in the surface.

[0031] Apparently, such a treatment is necessary to increase the capacity of such boards of retaining their shape.

[0032] After some further consolidation whereby a smoother surface and higher density are obtained, the latex is then transformed into rubber by subjecting the boards to an appropriate temperature treatment.

[0033] A major disadvantage is that the construction of these coconut fibre boards is complex and energy and time-consuming, and hence also harmful to the environment.

[0034] Moreover, the material can only be presented in the form of a board and having a certain thickness and hardness, and not as moulded parts.

[0035] Also, they are mainly applied as sound and heat insulators, also in the furniture industry.

[0036] Within this context are also known moulded parts on the basis of rubberized coconut fibres which are manufactured in a pressing mould and which are applied in mattresses, upholstered furniture or in the car industry.

[0037] A disadvantage is that the use of a pressing mould only makes it possible to produce smaller or entirely flat structures at a reasonable price.

[0038] From CN 2922640 is also known the use of rubberized coconut fibres for manufacturing mattresses built according to a sandwich principle by sealing 1 to 30 layers of coir mats having a high density and hardness on the top and undersurface with 1 to 10 layers of coir mats having a lower density and thus also a larger flexibility and softness.

[0039] A disadvantage thereof is that, for their dimensional stability and suspension, the mattresses still require an external supporting structure, usually made of wood or metal.

[0040] The production of such a structure is also disadvantageous in that it is complex and labour-intensive, and less appropriate for manufacturing products having another shape than a flat basic shape.

[0041] The present invention aims to remedy the above-mentioned and other disadvantages by providing a method for manufacturing a piece of furniture or a supporting structure for a piece of furniture on the basis of coconut fibres, whereby, starting from the design of the piece of furniture that must be manufactured, the method comprises at least the steps of identifying zones in the piece of furniture with their accompanying desired mechanical qualities for the aimed piece of furniture, such as for example hardness and/or rigidity with regard to expected loads on the zones concerned; and of building the piece of furniture or the supporting structure of the piece of furniture mainly of fibres, such as coconut fibres, whereby the fibres are oriented according to appropriate dominant fibre directions as a function of the aforesaid desired mechanical qualities.

[0042] A major advantage thereof is that the piece of furniture or the supporting structure for a piece of furniture can be manufactured on the basis of mainly a single basic material, for example coconut fibres, thanks to the appropriate dominant orientation of the fibres in the identified zones.

[0043] Thus, the piece of furniture or the supporting structure can adjust to the load to be expected and the feeling of comfort of the user.

[0044] According to the present state of the art, this is only possible thanks to the combined use of for example metal, wood or glass fibre composites to create a strong supporting structure with on the one hand, and by providing the latter with for example synthetic foam in the desired comfort zones on the other hand.

[0045] A further major advantage is that, as a result, the piece of furniture can be assembled faster, easier and cheaper without any highly skilled workers and/or complex production devices being required.

[0046] Organic fibres are preferably used, more in particular coconut fibres, which is advantageous in that the piece of furniture or the supporting structure has a limited environmental impact.

[0047] When coconut fibres are used, the qualities which are inherently connected to the use of coconut fibres can be optimally put to use, such as among others:

- inexpensive and abundantly available;
- renewable natural product;
- biodegradable;
- durable, elastic and resilient thanks to the very high lignin content, stronger than other natural fibres;
- temperature-resistant to some 70°C;
- very good sound and vibration insulator;
- very good thermal insulation thanks to its hollow fibre structure;
- has an open fibre structure and hence is permeable to air and moisture, i.e. breathable;
- free of dust, chips, fluff and loose fibres;
- their processing is very simple and inexpensive, as

they can be cut for example by means of a saw or a knife, and as connections can be obtained by means of glued joints, screwed joints or nail joints;
- their processing does not cause any irritations;
- does not cause any allergies;
- storage or processing is little critical;
- antistatic;
- mould-resistant, does not contain any spores and is not liable to deterioration or decay;
- characterised by a restricted moisture absorption.

[0048] A particular advantage of the method according to the invention consists in that it offers much freedom in design for the piece of furniture.

[0049] Indeed, one is not restrained by the shape, position or constructive restrictions as are involved with the use of a separate supporting structure made of metal, composites, wood and the like.

[0050] A desired design can optionally be obtained in a simple manner by making use, for example, of conventional woodworking machines.

[0051] In a preferred embodiment, in zones where one of the desired mechanical qualities corresponds to a high rigidity or stiffness with regard to an expected load, the appropriate dominant fibre directions of the coconut fibres are selected such that the coconut fibres are situated mainly in a plane parallel to the direction of the expected load.

[0052] Within the context of the present document, fibres situated mainly in a plane means that the fibres, compared to fibres which are randomly situated within the three-dimensional space, are situated rather in parallel planes to a certain extent. Thus, each fibre can still curl somewhat in the three-dimensional space, and if each individual fibre is replaced by a straight line representing the global direction of the fibre, then many lines will not be parallel to the aforesaid plane, but the angular deviations of these lines in relation to said plane will mainly be eccentric.

[0053] Compared to a volume of fibres which are randomly oriented in the three-dimensional space, a volume of fibres which are situated rather in parallel planes to a certain extent will behave more rigidly with regard to forces directed parallel to said planes and acting on said volume.

[0054] Indeed, of the fibres which are situated rather in parallel planes to a certain extent, even if they are randomly oriented within these planes, a larger fraction will be situated mainly parallel to or within a restricted angular deviation with regard to said load direction. Thus oriented fibres, partly thanks to the mutual connections of the fibres as will be further discussed, offer a higher resistance to compression with regard to a thus oriented load.

[0055] This is advantageous in that one does not need any additional supporting structure. The zones concerned offer an appropriate and sufficient mechanical strength as such, in a simple manner, with regard to static as well as dynamic loads.

[0056] A further advantage is that when, for design reasons, sharp-edged, unrounded angle forms are preferred, these zones will offer more resistance to rounding and local wear.

[0057] In a further preferred embodiment, in zones where one of the desired mechanical qualities corresponds to low rigidity or high flexibility with regard to an expected load, the appropriate dominant fibre directions of the coconut fibres will be mainly oriented in a plane crosswise to the expected direction of load.

[0058] This offers the advantage that an appropriate flexibility and/or softness and the accompanying feeling of comfort can be easily obtained in these zones as such.

[0059] According to a preferred embodiment, the method according to the invention starts with preformed coir mats provided with a top and an undersurface and in which the dominant fibre directions are such that the coconut fibres are oriented mainly parallel to the top and undersurface.

[0060] Instead of choir mats, also moulded parts can be used. Such moulded parts differ from mats in their outer design on the one hand and in their external structure on the other hand.

[0061] The circumferential surfaces of moulded parts may have any shape whatsoever. The dominant fibre directions in a moulded part may be mainly situated in three-dimensional surfaces and the fibre density may vary as a function of the location within the moulded part. The three-dimensional surfaces do not necessarily run parallel through the moulded part.

[0062] Such coir mats or moulded parts can be combined and assembled in an appropriate manner, in particular by possibly cutting these mats or moulded parts to size, joining them and possibly connecting them, whereby the mats or moulded parts and thus the fibres are oriented as a function of the expected load.

[0063] In the case of mats, they are preferably placed with their top and undersurface mainly parallel to the expected direction of load in zones where stiffness is required, and crosswise to the direction of load where flexibility is required.

[0064] Such mats can be manufactured by providing loose coconut fibres in a layer, for example on a conveyor belt, after which they are subjected to a first compression by guiding them through a grooving device.

[0065] When making moulded parts, an appropriate amount of fibres is provided in a first mould part and possibly pressed somewhat.

[0066] For the manufacture of mats as well as moulded parts, the fibres are impregnated or sprinkled for example with natural latex in which netting means have been mixed.

[0067] A first fraction of the natural latex hereby penetrates up to the inner fibres, whereas a second fraction mainly treats the outer layers.

[0068] In a special embodiment, the outer layers are thus largely provided with natural latex mixed with netting

means, making the outer layers extra stiff.

[0069] Before the latex is left to stiffen, the fibres are put at the appropriate thickness and/or in the appropriate shape by calendering or pressing them.

[0070] In view of a very hard or rigid mat, said treatment is performed such that a high degree of density is obtained for the fibres, and vice versa.

[0071] This treatment can be performed in several successive steps.

[0072] In this way, mats or moulded parts can be obtained having a density of for example between 70 and 280 kg/m^3.

[0073] It is clear that mats or moulded parts with a lower density are preferred, especially if they are arranged in the appropriate orientation by applying the method according to the present invention and thus provide for the desired mechanical qualities thanks to the orientation of the fibres. In this way, material is saved and lighter furniture is obtained.

[0074] In the aforesaid method for producing fibre mats or moulded parts, the press direction is important.

[0075] Indeed, the aforesaid condensation has for a result that the fibres which are initially provided randomly in all directions will be orientated more perpendicular to the condensation direction after the compression.

[0076] In other words, in the case of a mat, the fibres are oriented mainly parallel to the top and undersurface.

[0077] In the case of a moulded part, the fibres are oriented mainly crosswise to the direction of compression experienced by the fibres.

[0078] The mould parts may have varying three-dimensional shapes, such that the fibres may locally experience different compressions as a function of the initial filling of the first mould part and as a function of the design of the mould parts and the direction of compression.

[0079] After the compression, the fibres are oriented more perpendicular to the locally experienced direction of condensation, which in many places mainly corresponds to the advance direction of the mould parts, but not necessarily.

[0080] Thus, the fibres are arranged such that the dominant fibre directions run according to three-dimensional surfaces after the compression. In each case, these three-dimensional surfaces are locally mainly directed crosswise to the direction of compression experienced by the fibres and they do not necessarily run parallel.

[0081] Next, during the manufacture of the mats as well as the manufacture of the moulded parts, the impregnated or sprinkled fibres are fixed and dried in the compressed shape. The coconut fibres are elastically fixed in relation to one another by the coagulating latex.

[0082] By means of an appropriate temperature treatment, for example by means of steam or microwaves, up to maximally some 120°C, at least a part of the fibres is mutually connected whereby the coagulated latex is transformed in insoluble rubber.

[0083] The fibres, or at least a part thereof, are mutually connected then so to say by means of rubber strips.

[0084] As mentioned before, a preferred variant of the embodiment of the method according to the invention consists of the appropriate assembly of such mats or moulded parts.

[0085] If need be, the mats or moulded parts are cut or sawed before and/or after the assembly.

[0086] If a certain zone of the piece of furniture requires a high stiffness with regard to the loads to be expected, such as for example the base with regard to vertical loads, such a zone can be built of parts of the aforesaid coir mats which will then have to be assembled mainly vertically, i.e. with the top and undersurfaces directed vertically.

[0087] Vertical and horizontal must be related to the final orientation of the piece of furniture when it is taken into use.

[0088] Often, a zone must offer an increased resistance or rigidity to two possibly crosswise directed loads, such as for example a back with regard to vertical loads on the one hand, and horizontal loads situated in a plane which reaches from the front to the backside of a piece of furniture on the other hand.

[0089] By the front side of a piece of furniture is meant the side situated opposite the possible back. The direction of a plane reaching from the front to the backside of a piece of furniture is further also called the seating direction.

[0090] Arm rests require an increased rigidity with regard to vertical loads on the one hand, and horizontal loads crosswise to the aforesaid seating direction on the other hand.

[0091] Said back can be built of parts of the aforesaid coir mats which are oriented mainly vertically and with the top and undersurfaces parallel to the seating direction.

[0092] Said arm rests can be built of parts of the aforesaid coir mats which are oriented mainly vertically and with the top and undersurfaces crosswise to the seating direction.

[0093] According to an aspect of the invention, special moulded parts are manufactured and used as part of a piece of furniture or of a supporting structure for a piece of furniture.

[0094] These special moulded parts can be obtained by compression of the fibres according to different directions, such that a dominant fibre direction is enforced on the fibres, possibly even variable and as a function of the location in the moulded part, such that the coconut fibres are situated mainly in parallel three-dimensional surfaces, each time mainly crosswise to a first direction of compression used during their production, and whereby the fibres have a preferential direction within these surfaces as well, crosswise to a second direction of compression used during their production.

[0095] A simple variant of these special moulded parts can be manufactured by first following the steps as used for manufacturing fibre mats as discussed, whereby after sprinkling and carrying out a first compression however,

the fibres are additionally compressed according to a second direction crosswise to the first direction of compression.

[0096] Zones where flexibility is required, such as for example at the contact surfaces between the user and the piece of furniture, such as the actual seat or the contact surface on the front side of the back, may be locally provided with a coir mat whose top and undersurfaces are oriented crosswise to the direction of load.

[0097] In this way, the dominant fibre direction is selected such that, after the assembly of the piece of furniture, it will be situated mainly crosswise to the direction of load to be expected.

[0098] The components are thus appropriately assembled in view of the local load to be expected, and possibly they are mutually connected.

[0099] The mutual connection of the coir mats or moulded parts can be realised according to a practical variant of the embodiment by using latex as a binding agent, or another chemical binding agent, or by using mechanical anchoring and connecting means, such as for example nails, screws and the like.

[0100] The final design of the piece of furniture can hereby be realised very easily by further processing the whole mechanically if need be, whereby there are no obstacles nor any restrictions thanks to the absence of a separate supporting structure, for example made of metal, hardwood or composites, as is often the case with furniture according to the present state of the art.

[0101] Such final processing can be done by means of conventional woodworking machines and by the application of woodworking techniques.

[0102] Finally, the piece of furniture can be additionally finished by providing a layer of soft foam rubber in the desired zones, also called comfort layer, for example made of latex foam, and by subsequently providing a protective and decorative cover if need be, for example made of printed cotton or a synthetic material.

[0103] In order to better explain the characteristics of the invention, the following preferred embodiments of furniture or supporting structures for furniture obtained by applying the method according to the invention are described by way of example only without being limitative in any way, with reference to the accompanying drawings, in which:

figure 1 schematically represents a supporting structure for a seat block, obtained by applying the method according to the invention, seen in perspective;
figure 2 schematically represents a supporting structure for a variant of the seat block in figure 1, seen in perspective;
figure 3 schematically represents a preferred spatial arrangement of a series of seat blocks from figure 2, seen in perspective;
figure 4 schematically represents a supporting structure for a piece of furniture to sit on, obtained by applying the method according to the invention, seen in perspective;
figure 5 schematically represents a preferred spatial arrangement of the furniture to sit on from figure 4, seen in perspective;
figure 6 schematically represents the supporting structure of a club seat, obtained by applying the method according to the invention, seen in perspective;
figure 7 schematically represents a preferred spatial arrangement of several club seats from figure 6, seen in perspective.

[0104] Figure 1 schematically represents a supporting structure 1 for a seat block 2, obtained by applying the method according to the invention, seen in perspective.

[0105] The seat block 2, represented in the preferred position of use, has a horizontal seat 3 situated on top, a front 4 and a back 5 which are mutually exchangeable, and two sides 6 and 7.

[0106] The seat block 2 is in this case built of eight coir mats 8.

[0107] These coir mats 8 are provided with a top and an undersurface and the fibres have dominant fibre directions which are mainly parallel to the top and undersurface.

[0108] Six coir mats 8 are assembled with their top and undersurfaces touching, and on either side of the thus formed volume is provided a coir mat 8 directed crosswise to the latter.

[0109] In other words, the seat 3 is formed of the crosscut edges of coir mats 8 fit together.

[0110] Starting from the draft of the aimed design of the piece of furniture, in this case a mainly cubical or beam-shaped seat block 2, the method for manufacturing such a supporting structure 1 comprises the following steps:

- identifying zones in the seat block 2 with accompanying desired mechanical qualities for the aimed piece of furniture, such as in this case, for example, the desired rigidity with regard to the expected mainly vertical load on the seat 3, i.e. according to the direction indicated by arrow F1 on the one hand, and the desired resistance to bending moments resulting from dynamic and/or static forward or lateral loads at the seat on the other hand.

- building the piece of furniture or the supporting structure 1 of the piece of furniture from mainly coconut fibres, in this case on the basis of coir mats 8 manufactured as discussed before, whereby the coconut fibres are oriented according to appropriate dominant fibre directions as a function of the aforesaid desired mechanical qualities.

[0111] All this is realised by means of the vertical assembly of the coir mats 8.

[0112] The two coir mats 8 which protect the volume

formed by the six central coir mats 8 on either side at their crosscut edges additionally provide for resistance to bending moments resulting from dynamic and/or static lateral loads at the seat 3 thanks to the extra stiffness offered by the outer layers of the coir mats 8.

[0113] The coir mats 8 are in this case mutually connected by means of gluing with latex.

[0114] The supporting structure 1 of the seat block 2 may be additionally provided with comfort layers and/or a cover, which are not represented in figure 1.

[0115] Figure 2 schematically shows a variant of a supporting structure 9 for a piece of furniture to sit on, in particular with a mainly L-shaped assembly, seen in perspective.

[0116] This supporting structure 9 can be seen as an assembly of a cubical element 10 as discussed above and represented in figure 1 on the one hand, with a beam-shaped element 11 which is an extended variant provided with eleven central coir mats 8 instead of the six central coir mats of the aforesaid cubical element 10 on the other hand.

[0117] It should be noted, however, that in this special embodiment, the coir mat 8 situated at the back in the drawing, which protects the crosscut edges of the six central coir mats 8 of the cubical element 10, extends further up to the other side wall of the beam-shaped element 11.

[0118] The load to be expected on the seat 3 is in this case also oriented mainly vertically, according to the direction indicated by arrow F1.

[0119] The coir mats 8 and the elements 10 and 11 are mutually connected in this case by means of gluing with latex.

[0120] Figure 3 schematically represents a possible assembly of such L-shaped pieces of furniture to sit on according to figure 2.

[0121] Figure 4 schematically represents a variant of a supporting structure for a piece of furniture to sit on 12, manufactured by applying the method according to the invention, seen in perspective.

[0122] This piece of furniture to sit on 12 is provided with a seat 3 and a back 13 which is in this case built of a back part 14 situated in the rear, a centrally situated core 15 and a supporting element 16 directed towards the user.

[0123] The piece of furniture to sit on 12 is represented in the preferred position of use.

[0124] The seat 3 is in this case built of seven vertically positioned and thus glued coir mats 8 whose top and undersurfaces of the front side are directed towards the backside of the piece of furniture to sit on 12, with a first leg of an L-shaped side wall 17 on either side thereof on the one hand, and of a coir mat 18 situated in the front, crosswise to the crosscut edges of the aforesaid coir mats 8 and the side walls 17 on the other hand.

[0125] The fibres have dominant fibre directions mainly parallel to the top and undersurfaces of the coir mats 8.

[0126] In other words, the seat 3 is formed of the crosscut edges of coir mats 8 fit together.

[0127] The core 15 of the back 13 is in this case built of seven vertically positioned and thus glued coir mats 8 whose top and undersurfaces of the front side are oriented parallel to the side walls of the piece of furniture to sit on 12. These coir mats 8 are on either side surrounded by the second leg of the aforesaid L-shaped side walls 17.

[0128] It is clear that also the L-shaped side walls 17 can be composed of two coir mats 8, or that the intermediate coir mats 8 of the seat 3 and of the core 15 may be L-shaped and formed of integral pieces.

[0129] On the back side, the core 15 is provided with a back part 14 which in this case consists of a coir mat 8 oriented crosswise to the aforesaid coir mats 8, and on the front side the core 15 is provided with a supporting element 16 which in this case consists of a moulded part manufactured from coconut fibres according to the above-described method.

[0130] The fibres have dominant fibre directions mainly parallel to the top and undersurfaces of the coir mats 8 and of the moulded part.

[0131] Starting from the draft of the aimed design of the piece of furniture as represented in figure 4, the method for manufacturing such a supporting structure for a piece of furniture to sit on 12 comprises the following steps:

- identifying zones in the piece of furniture to sit on 12 with accompanying desired mechanical qualities for the aimed piece of furniture, such as in this case, for example, the desired rigidity with regard to the expected mainly vertical load on the seat 3, i.e. according to the direction indicated by arrow F1 on the one hand, and the desired rigidity with regard to the expected mainly horizontal load on the back 13 on the other hand, i.e. according to the direction indicated by arrow F2, and simultaneously the desired local softness at the immediate contact surface between the back of the user and the back 13;

- building the piece of furniture or the supporting structure of the piece of furniture from mainly coconut fibres, in this case on the basis of coir mats 8 and a moulded part manufactured as discussed above, whereby the coconut fibres are oriented according to appropriate dominant fibre directions as a function of the aforesaid desired mechanical qualities.

[0132] All this is realised in this case by the vertical orientation of the coir mats 8 at the seat 3 and in the core 15 of the back 13 as represented on the one hand, and the specific crosswise orientation of the supporting element 16 whereby the coconut fibres are directed mainly crosswise to the direction of load F2 on the other hand.

[0133] The main orientation of the coconut fibres in the back part 14 and in the coir mat 8 provided in the front of the seat 3 is also directed crosswise to the expected direction of load there, such that these surfaces feel soft

and flexible.

[0134] Such a feeling of comfort may be additionally obtained by providing a soft comfort layer, formed for example of latex foam rubber.

[0135] The constituent elements may be joined as discussed above, in the most appropriate manner, for example by chemically gluing the respective elements and/or by mutually anchoring them with appropriate mechanical fixing means.

[0136] Figure 5 schematically represents a preferred spatial arrangement 19 of some furniture to sit on 12 as represented in figure 4, seen in perspective.

[0137] Figure 6 schematically represents the supporting structure of a club seat 20 according to the invention, manufactured by applying the method according to the invention, seen in perspective.

[0138] The club seat 20 is formed of the same structural elements as the piece of furniture to sit on 12 discussed and represented in figure 4, but with two additional arm rests 21 left and right, and with a base 22.

[0139] The base 22 is built of vertically oriented coir mats 8, and hence offers a rigid base for the piece of furniture with regard to loads according to the direction indicated by arrow F1.

[0140] Each arm rest 21 is in this case built of a wall part 23 situated on the outside, a wall part 24 situated on the inside and a central core layer 25.

[0141] The application of the method according to the invention for manufacturing such a club seat, compared to the manufacture of a piece of furniture to sit on 12 according to figure 4, comprises the following additional steps:

- identifying the desired mechanical qualities for the arm rests 21 and for the base 22, i.e. in this case, for example, the desired rigidity of the arm rests 21 with regard to the expected mainly horizontal load on the arm rests 21, i.e. according to the direction indicated by arrow F3, and simultaneously the desired local softness at the immediate contact surface between the user and the arm rests 21 on either side on the one hand, and the desired rigidity and stability of the base 22 with regard to the expected mainly vertical load, i.e. according to the direction indicated by arrow F1, on the other hand.

- building these parts of the piece of furniture or the supporting structure of the piece of furniture from mainly coconut fibres, in this case starting from coir mats 8 manufactured as discussed above, whereby the coconut fibres are oriented according to appropriate dominant fibre directions as a function of the aforesaid desired mechanical qualities.

[0142] All this is realised by means of the orientation and assembly of the coir mats 8 as discussed and as represented in figure 6.

[0143] Figure 7 schematically represents a preferred spatial arrangement 26 of a number of club seats 20 as discussed above and as represented in figure 6, seen in perspective.

[0144] The present invention is by no means restricted to the methods described by way of example, whose resulting supporting structures for a piece or pieces of furniture are represented in the figures; on the contrary, such a method for manufacturing a piece of furniture or a supporting structure for a piece of furniture according to the invention can be realised in all sorts of ways while still remaining within the scope of the invention.

Claims

1. Method for manufacturing a piece of furniture or a supporting structure for a piece of furniture on the basis of coconut fibres, **characterised in that**, starting from the design of the piece of furniture which is to be manufactured, the method comprises the following steps:

   - identifying zones in the piece of furniture's design with accompanying desired mechanical qualities for the aimed piece of furniture, such as for example hardness and/or rigidity with regard to expected loads on the zones concerned;
   - building the piece of furniture or the supporting structure of the piece of furniture from mainly coconut fibres, whereby the coconut fibres are oriented according to appropriate dominant fibre directions as a function of the aforesaid desired mechanical qualities.

2. Method according to claim 1, **characterised in that**, in zones where at least one of the desired mechanical qualities corresponds to a high rigidity or stiffness with regard to an expected load, the appropriate dominant fibre directions of the coconut fibres are such that the coconut fibres are situated mainly parallel to or in a plane parallel to the expected direction of load.

3. Method according to one or several of claims 1 to 2, **characterised in that**, in zones where one of the desired mechanical qualities corresponds to a low rigidity or high flexibility with regard to an expected load, the appropriate dominant fibre directions of the coconut fibres are mainly situated in a plane crosswise to the expected direction of load.

4. Method according to one or several of the preceding claims, **characterised in that** it comprises at least the following steps:

   - providing coir mats with a top and undersurface in which the dominant fibre directions of the coconut fibres are such that the coconut fibres are

situated mainly parallel to the top and/or the undersurface;
- the assembly of such coir mats and/or parts thereof, whereby the appropriate dominant fibre directions are obtained thanks to the appropriate assembly of these coir mats and/or parts thereof.

5. Method according to claim 4, **characterised in that** it comprises the following steps:

- providing moulded parts built of fibres which are oriented according to dominant fibre directions;
- the assembly of such moulded parts with the coir mats and/or parts thereof, whereby the appropriate dominant fibre directions are obtained thanks to the appropriate assembly of these coir mats and/or parts thereof.

6. Method according to any one of claims 4 to 5, **characterised in that** during the assembly of the coir mats, moulded parts and/or parts thereof, at least a part of the constituent parts is mutually connected by means of a chemical connection, for example by using latex which is subsequently transformed into rubber.

7. Method according to any one of claims 4 to 6, **characterised in that** during the assembly of the coir mats, moulded parts and/or parts thereof, at least a part of the constituent parts is mutually connected by means of mechanical anchoring means, for example by means of screws, nails, or the like.

8. Method according to one or several of the preceding claims, **characterised in that** the piece of furniture or the supporting structure for a piece of furniture is finished by providing a latex foam and/or a cover over the latter.

9. Method for manufacturing a coir mat or moulded part as provided in any one of claims 4 to 8, **characterised in that**, starting from an amount of loose coconut fibres, the method comprises at least the following steps:

- compressing and/or shaping the coconut fibres to a desired density, hardness and/or shape, in one or several steps according to one or several directions of compression, whereby the coconut fibres are oriented according to a dominant fibre direction which is mainly crosswise to one or several locally experienced directions of compression;
- sprinkling or perfusing the coconut fibres with natural latex in which are provided netting means;
- drying the sprinkled or perfused coconut fibres whereby the coconut fibres are elastically fixed in relation to one another and whereby at least a part of the fibres mutually adheres by transforming the dried latex into insoluble rubber;

10. Method according to claim 9, **characterised in that** the coconut fibres are compressed or shaped by means of pressing, calendering, drawing, grooving.

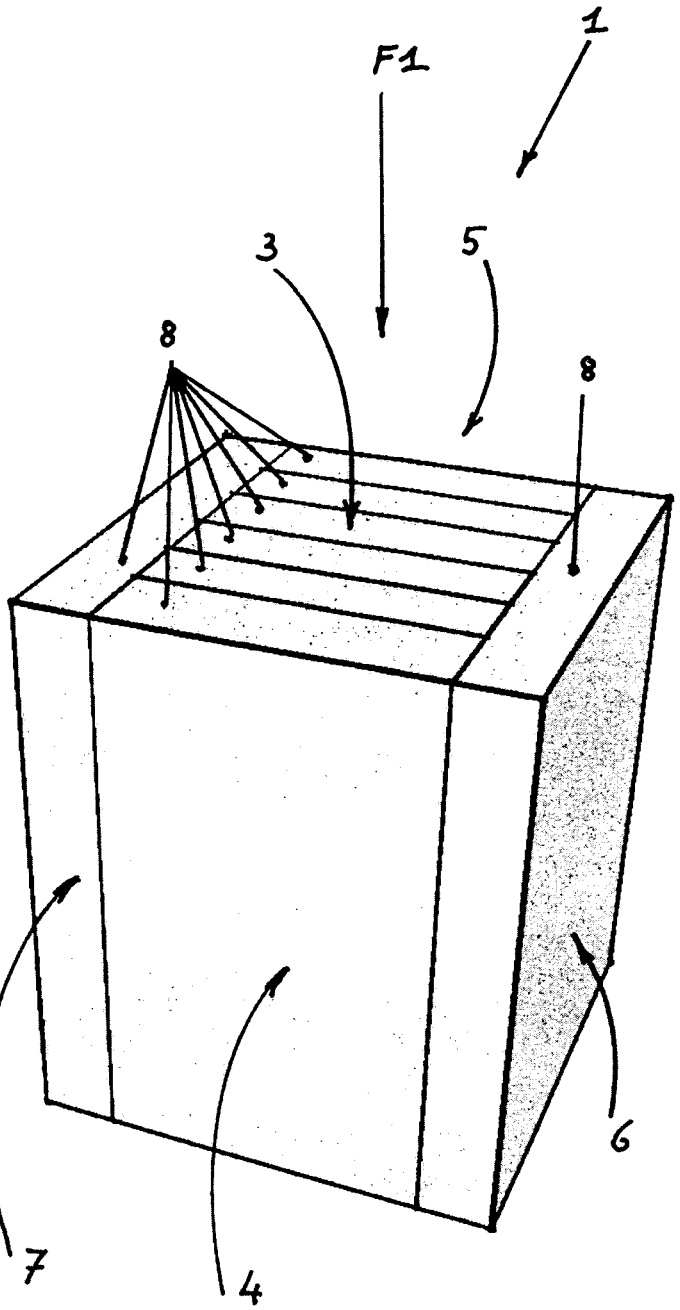

FIG 1

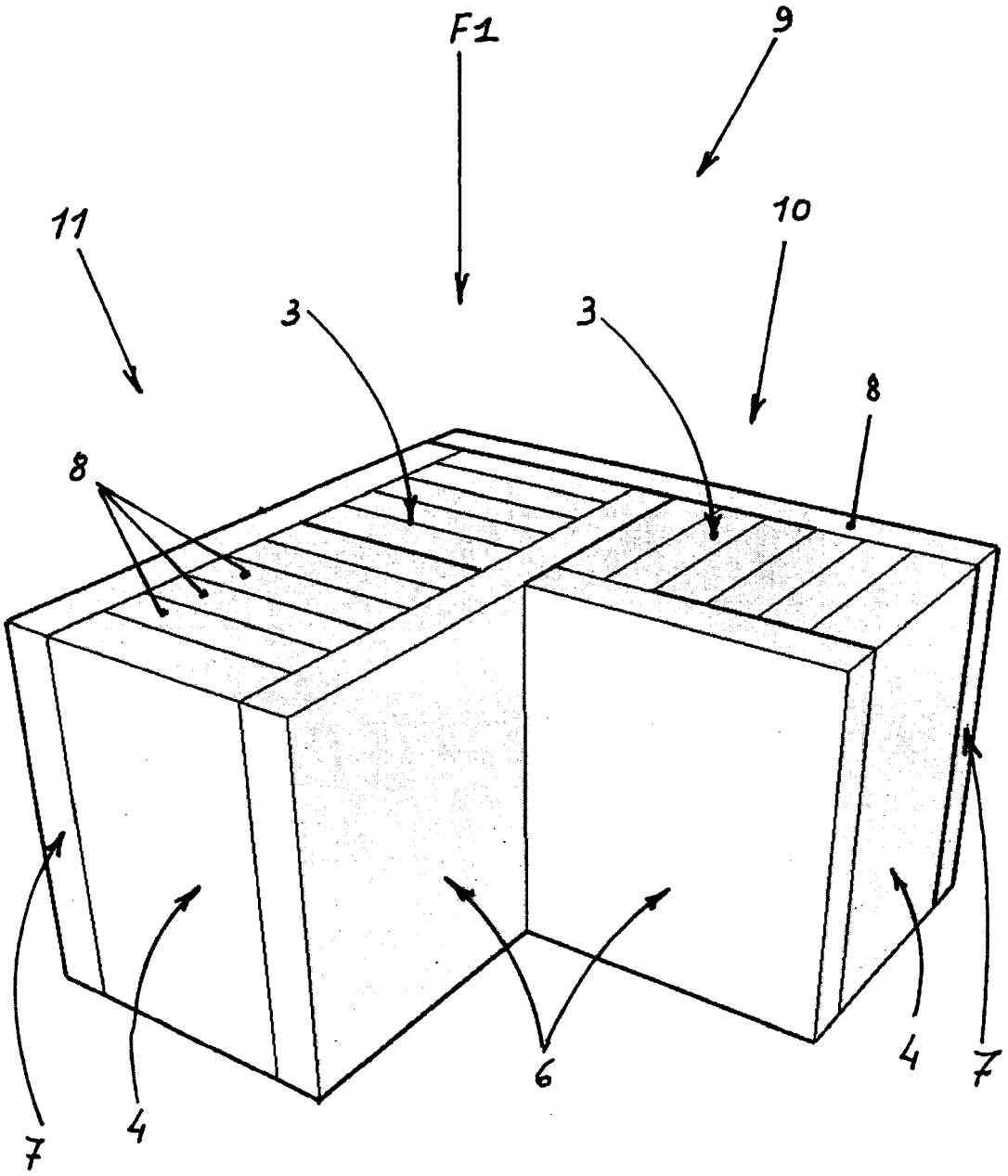

FIG 2

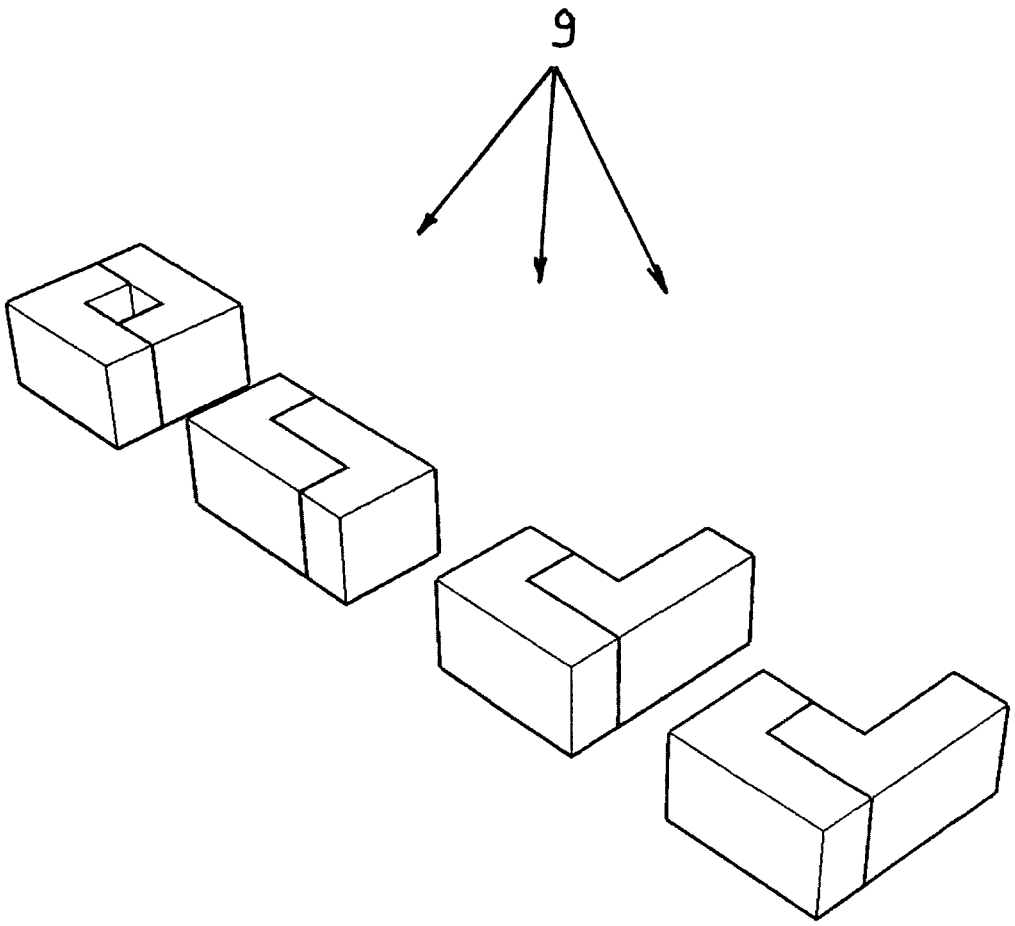

FIG 3

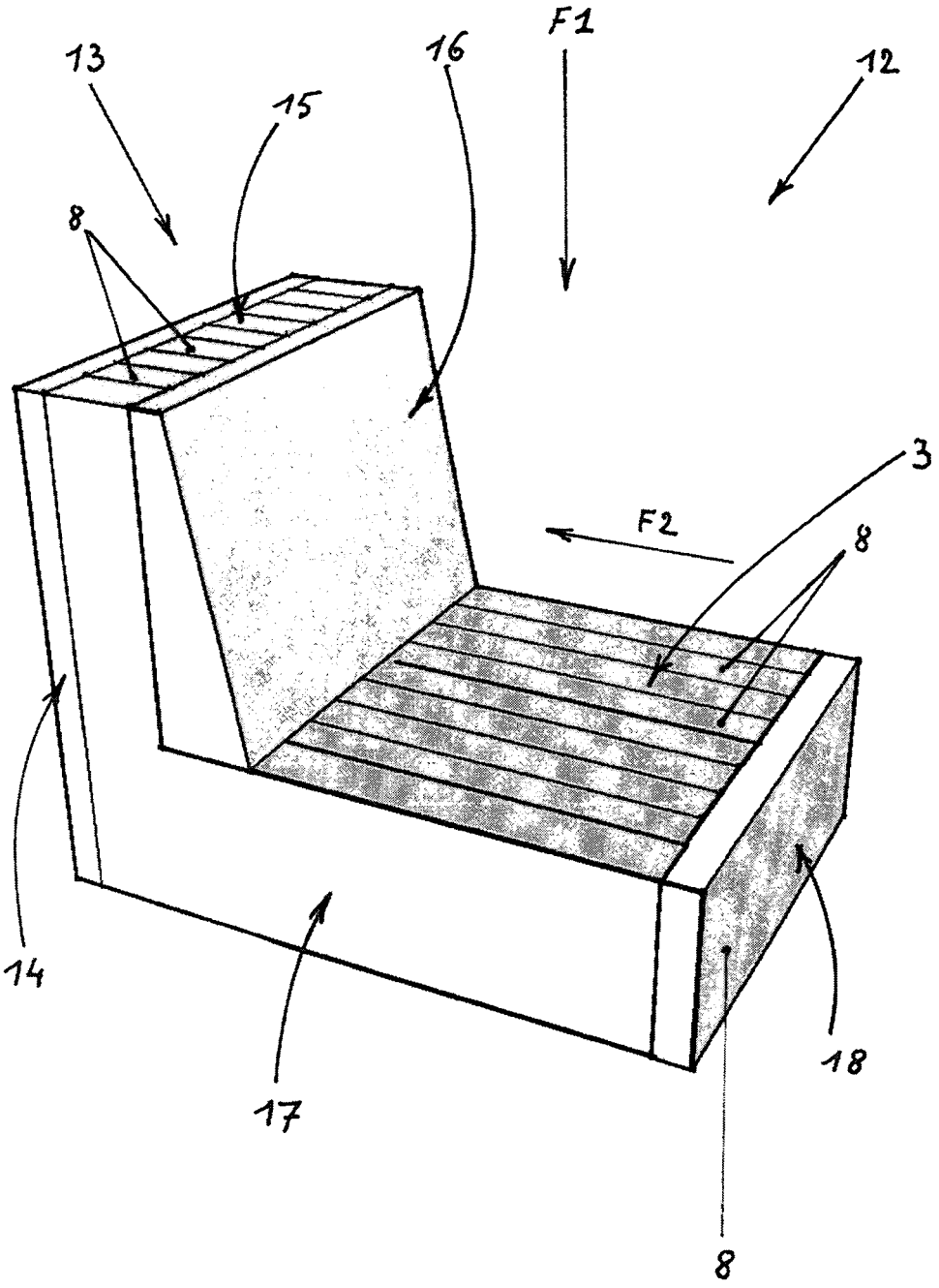

FIG 4

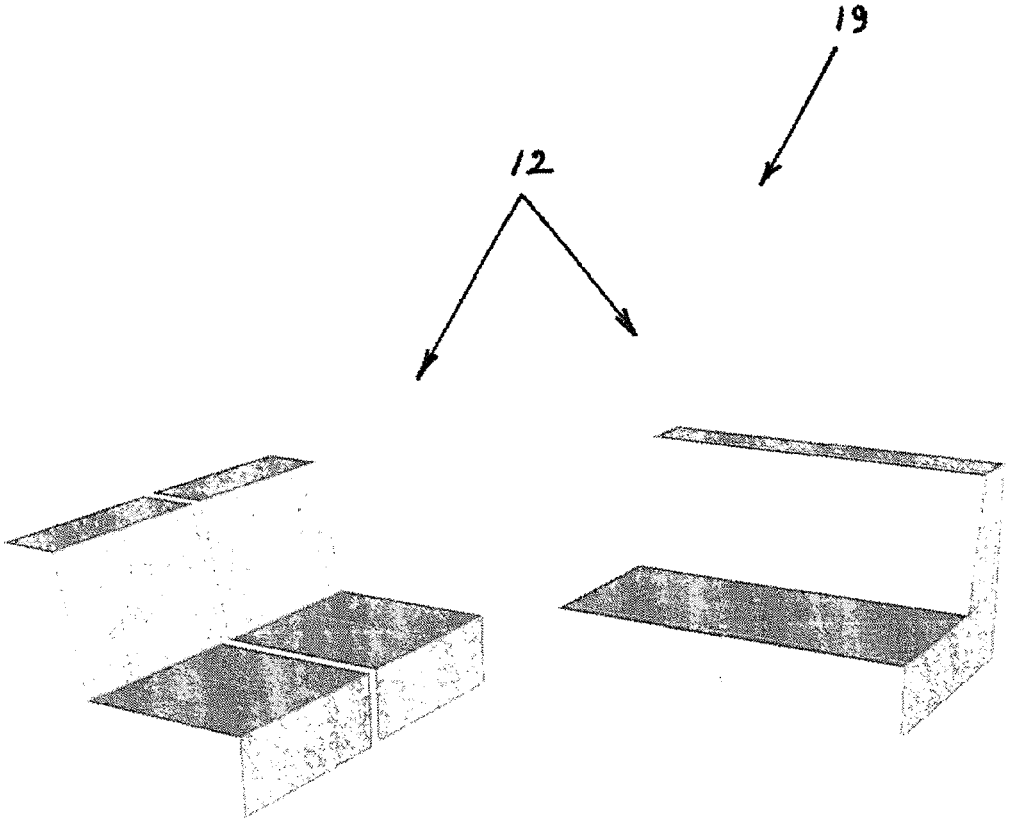

FIG 5

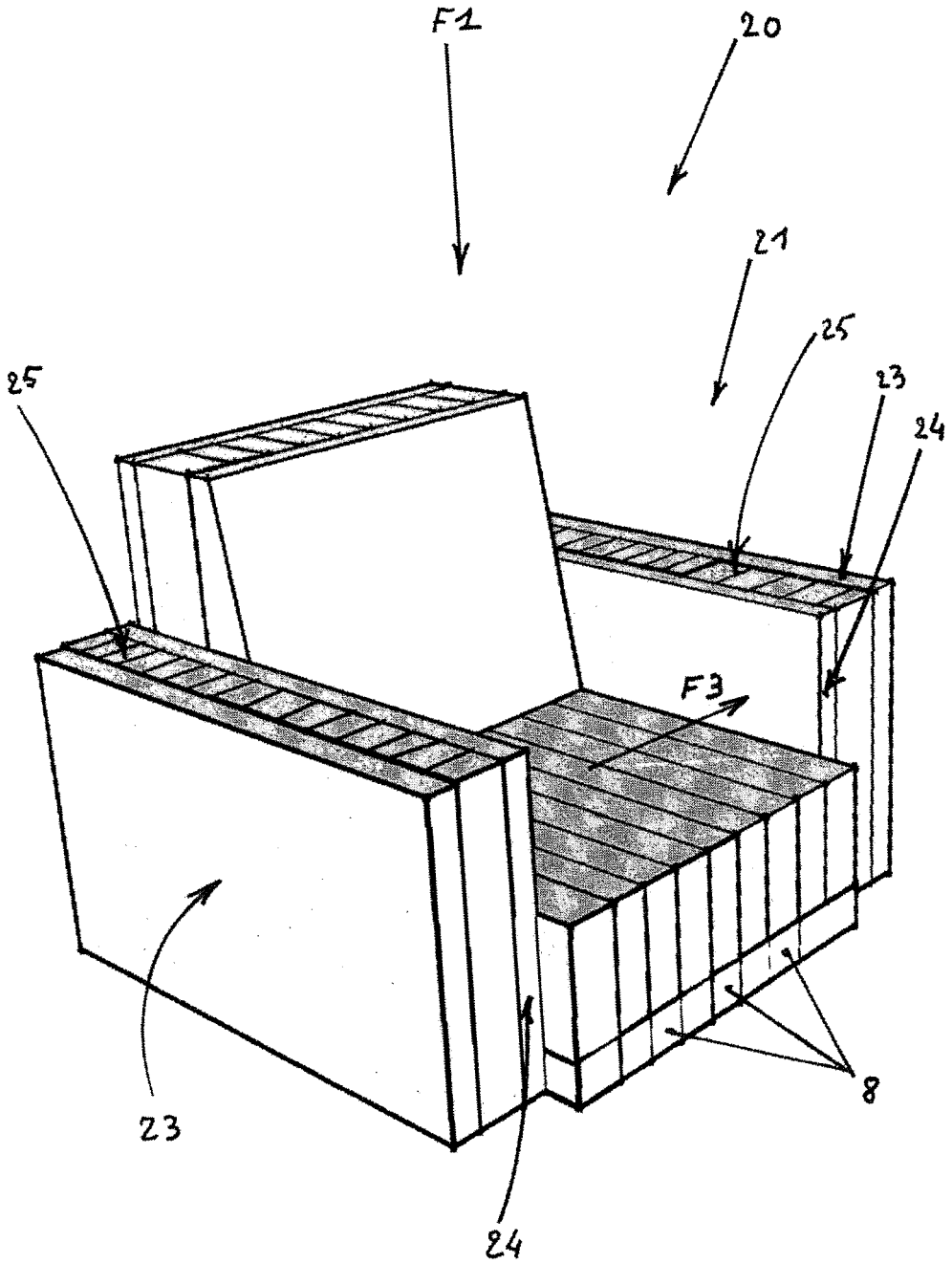

FIG 6

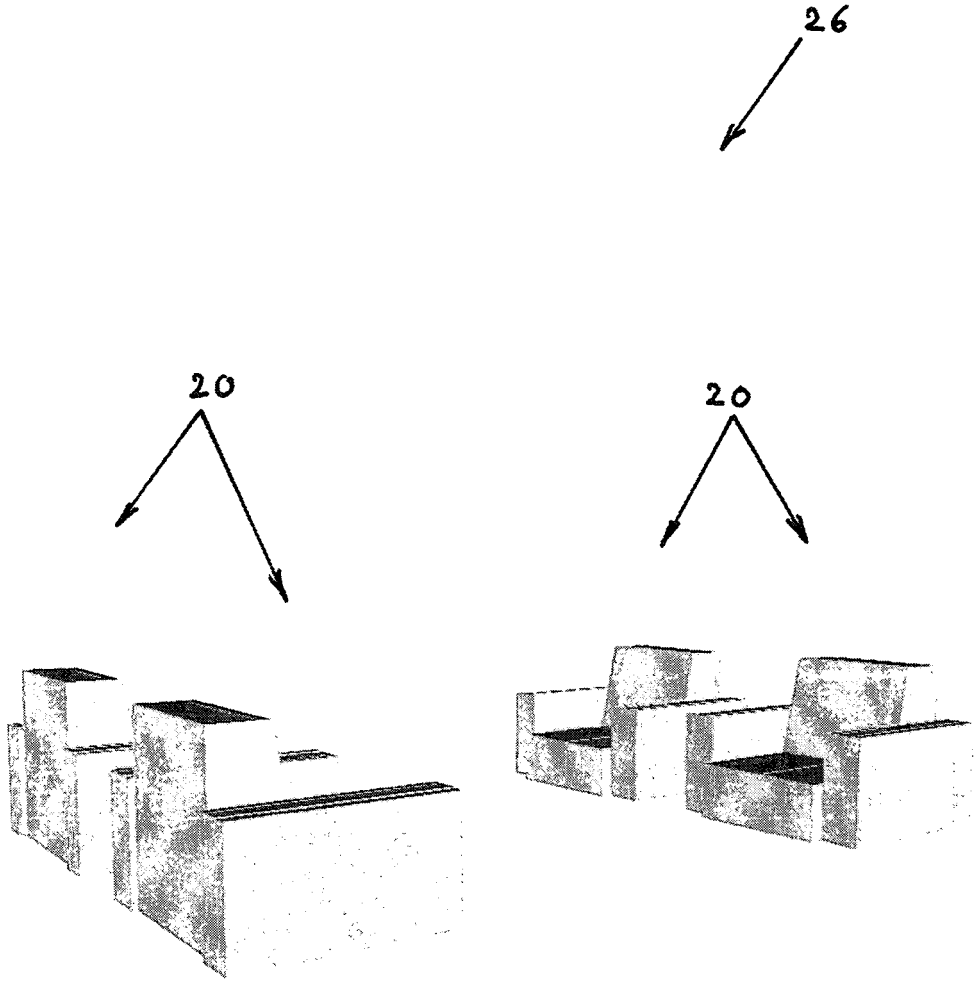

FIG 7

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- CN 2922640 **[0038]**