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(54) **FURNITURE BOW BEAM STRUCTURE**

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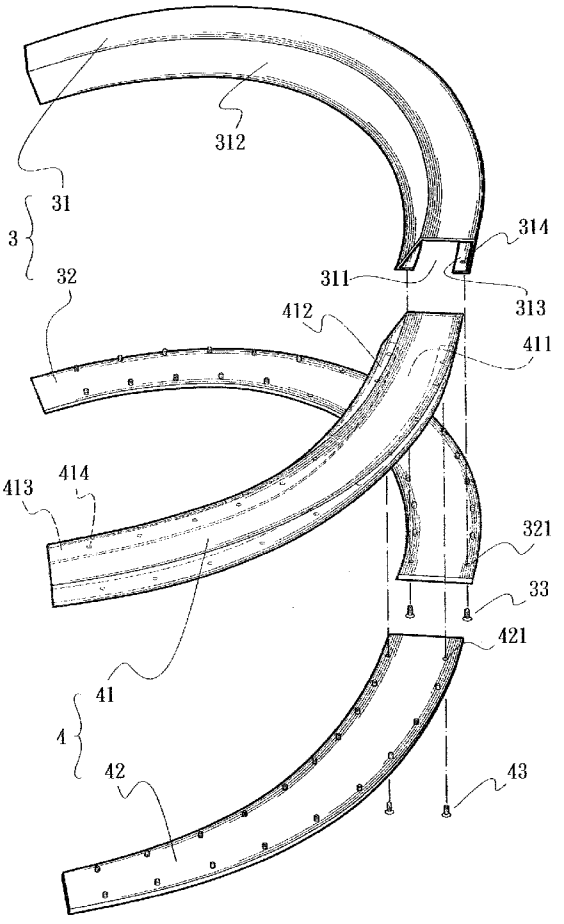
(57) **ABSTRACT**

A furniture bow beam structure. By means of pressing, metal board materials are processed into different assembling members and connecting members. The same assembling member and connecting member are respectively formed with varied curvatures and cross-sectional shapes in at least different parts in conformity to different sections of the beam structure. Each assembling member has an opening that obliquely diverges to one side in width. The connecting member is connected to the opening and mated with the assembling member to form multiple hollow tubular supports with closed peripheries. The multiple supports are then connected with each other. Especially, the correspondingly connected end sections of the supports are formed with identical curvature and cross-sectional shape so that the supports can be continuously and smoothly connected with each other.



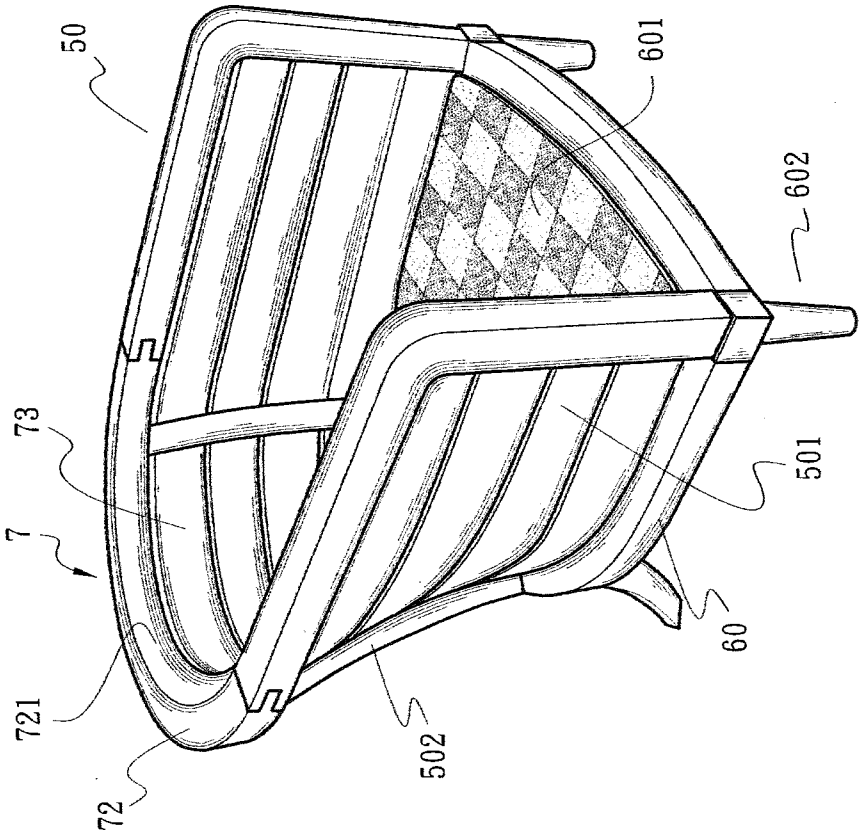



Fig. 1
PRIOR ART

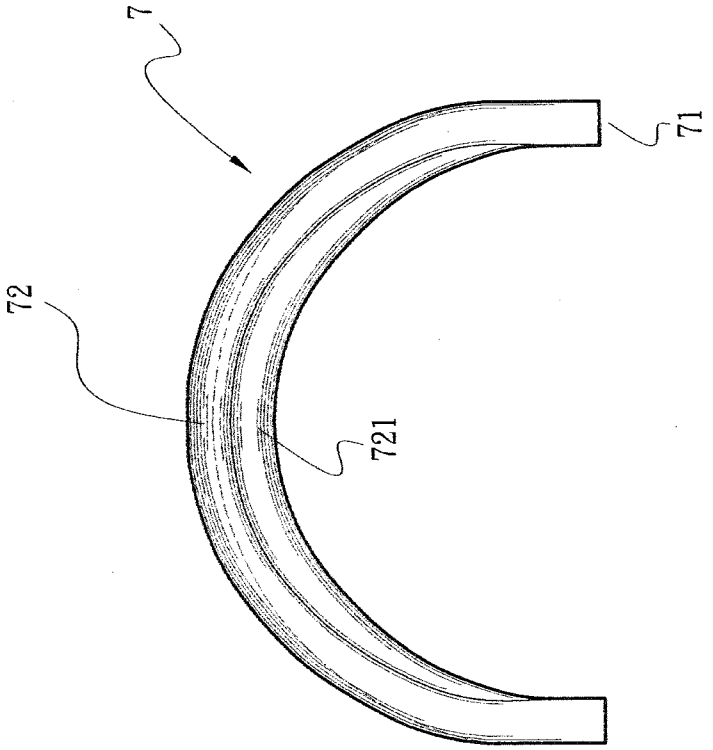



Fig. 2
PRIOR ART

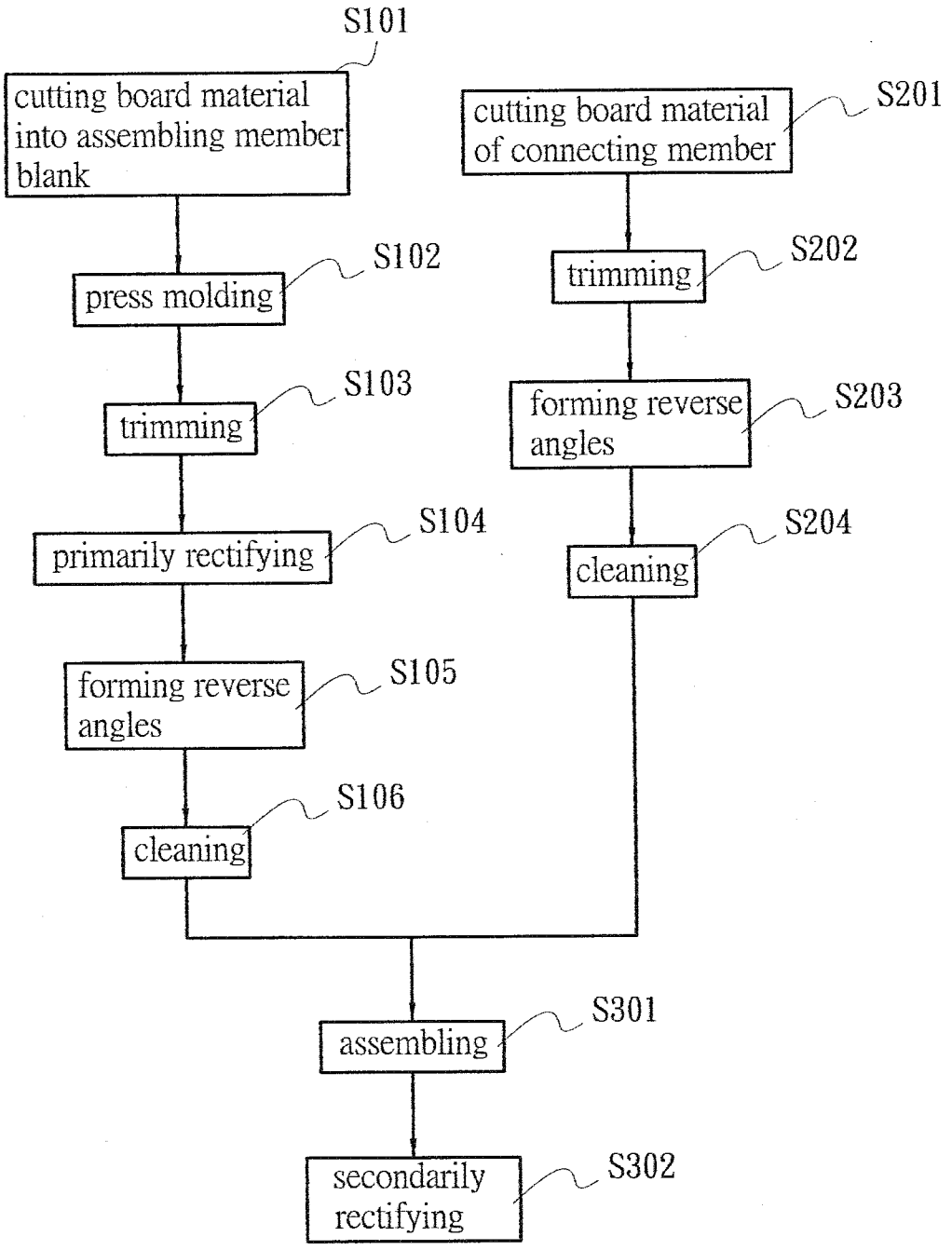

S101
cutting board material into assembling member blank
S102
press molding
S103
trimming
S104
primarily rectifying
S105
forming reverse angles
S106
cleaning
S201
cutting board material of connecting member
S202
trimming
S203
forming reverse angles
S204
cleaning
S301
assembling
S302
secondarily rectifying

Fig. 3

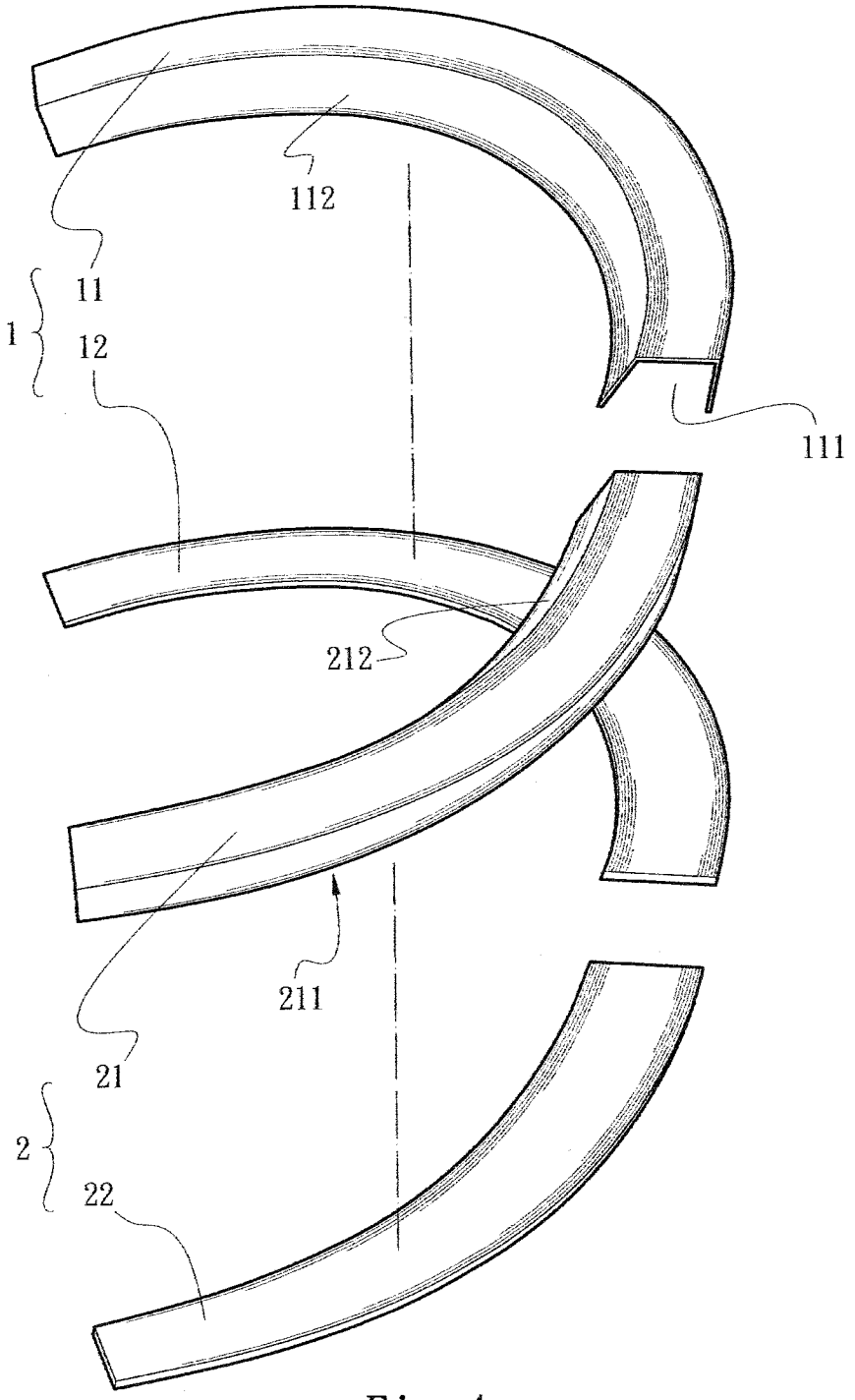



Fig. 4

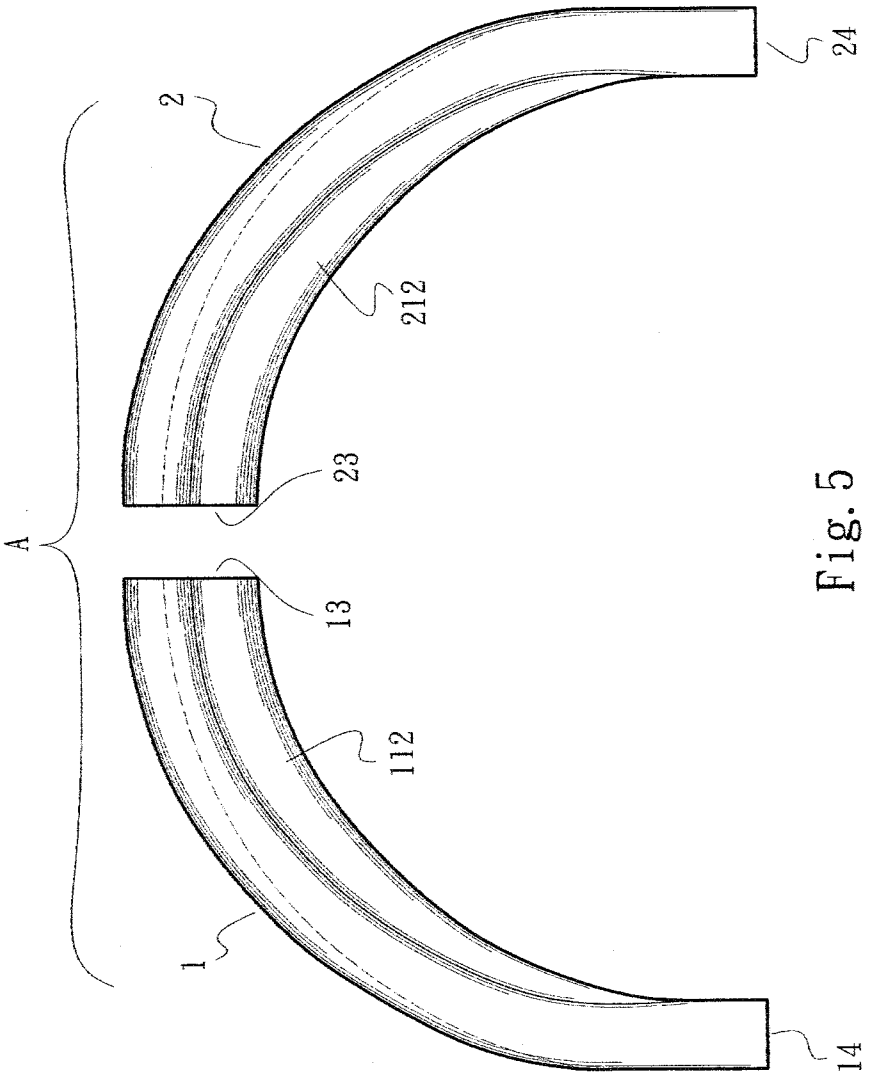



Fig. 5

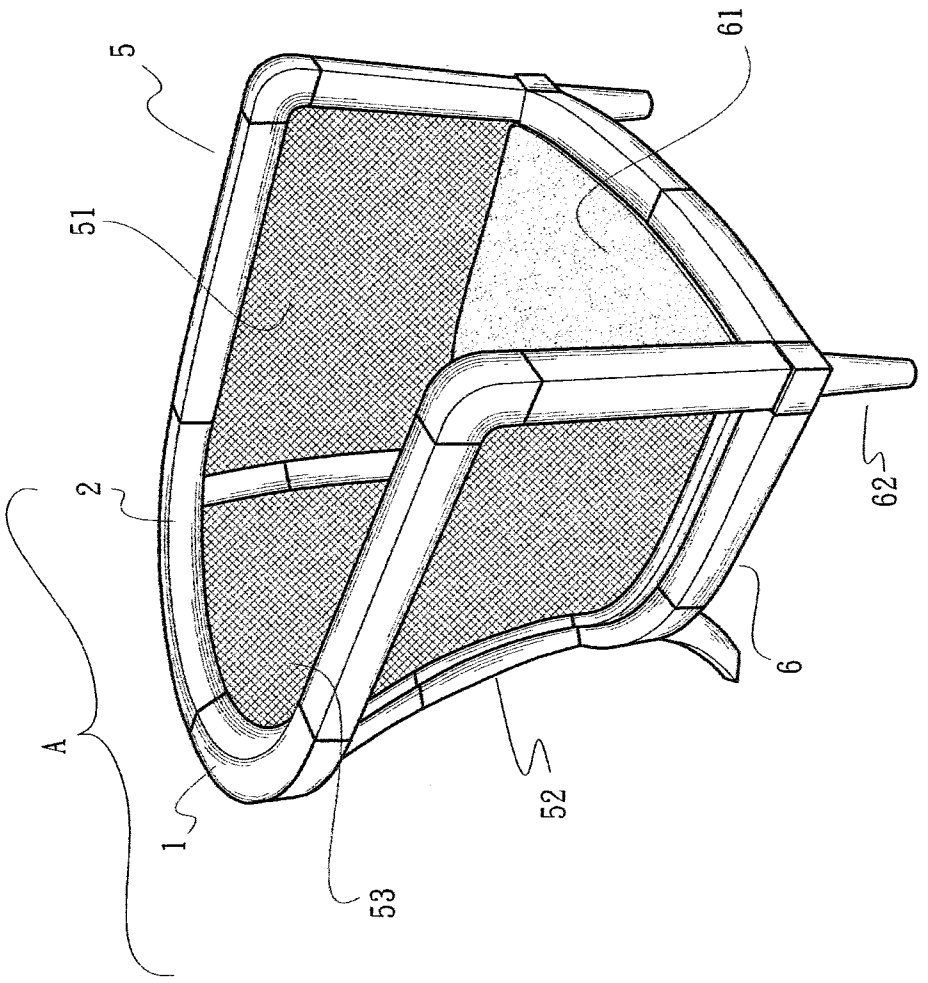



Fig. 6

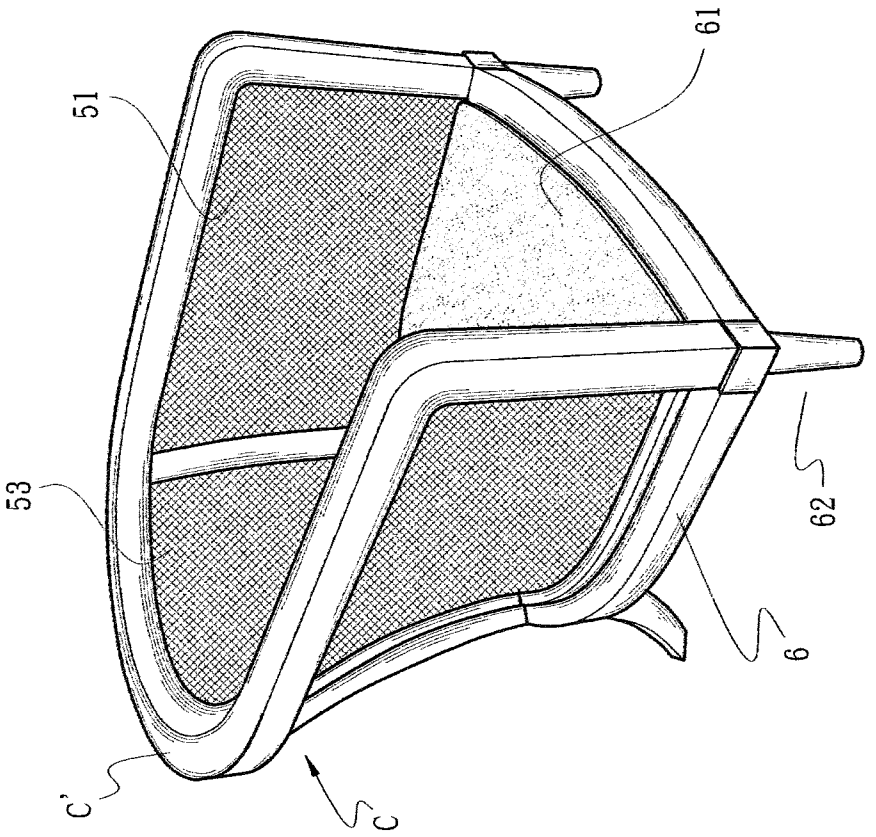



Fig. 7

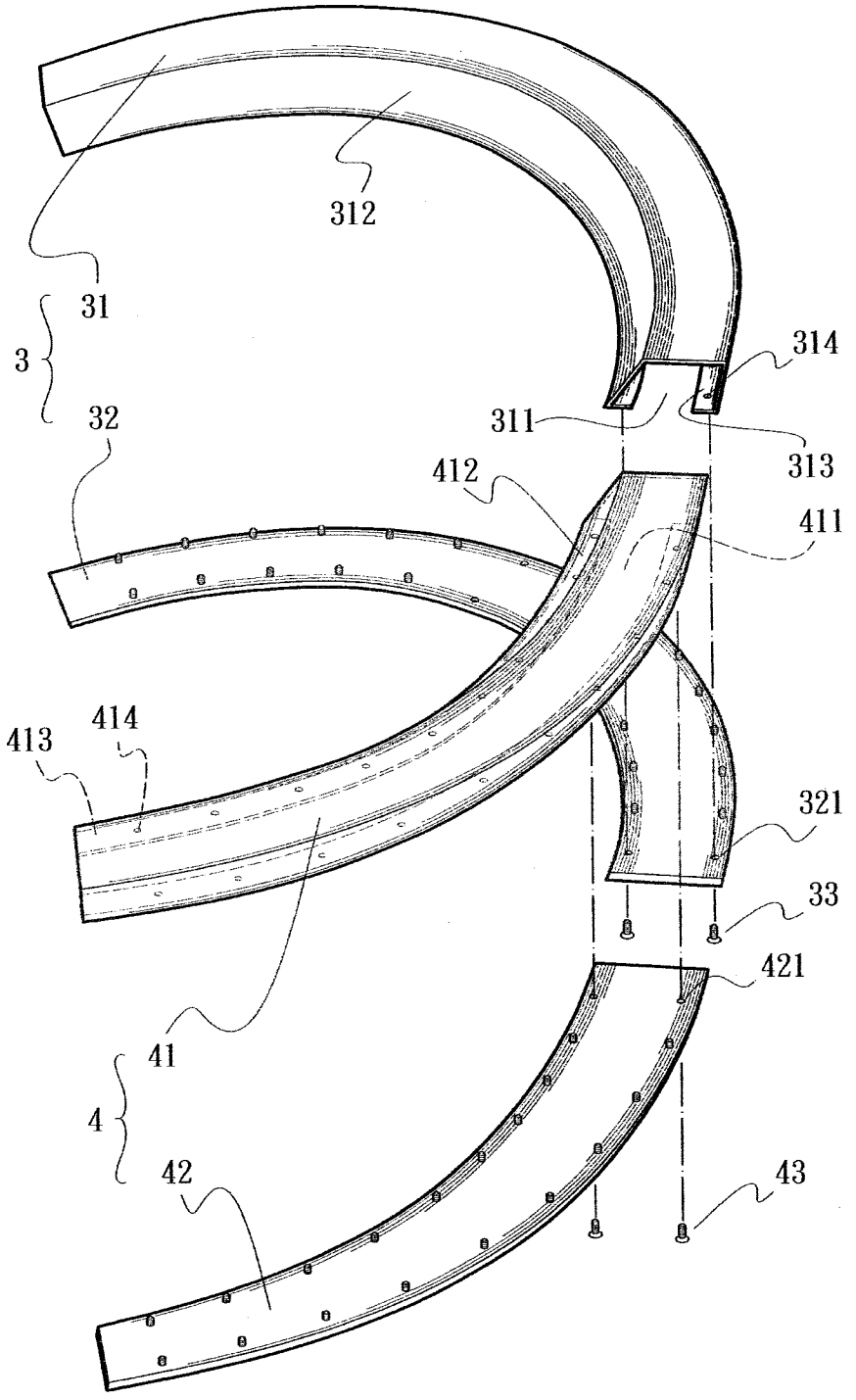



Fig. 8

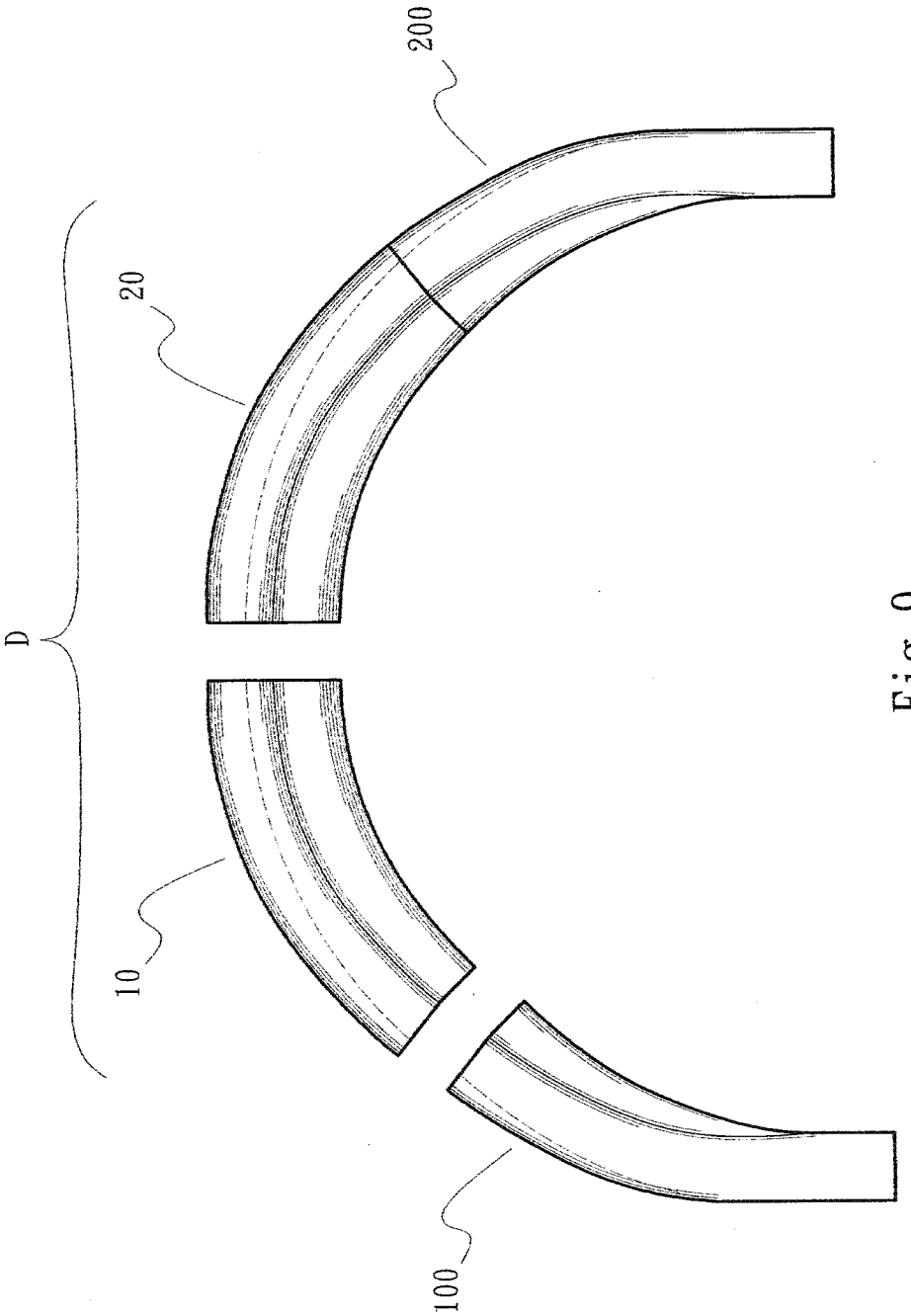



Fig. 9

# FURNITURE BOW BEAM STRUCTURE

## REFERENCE TO RELATED APPLICATION

**[0001]** This application is a being filed as a Continuation-in-Part application of Ser. No. 12/588,105, filed 5 Oct. 2009, currently pending.

## BACKGROUND OF THE INVENTION

**[0002]** 1. Field of the Invention

**[0003]** The present invention relates generally to a furniture bow beam structure, and more particularly to a tubular structure with different curvatures and varied cross-sectional shapes respectively applicable to different sections of one single beam.

**[0004]** 2. Description of the Related Art

**[0005]** Wooden materials are easy to process and have special material characteristics (such as surface stripes and incense). Therefore, wooden materials have been widely applied to common or high-class furniture long since. However, the processing of the wooden materials necessitates higher-level technique so that it is hard to mass-produce wooden furniture. As a result, the manufacturing cost for wooden furniture is high. This fails to meet economic benefit principle. Moreover, it is known that the resources of woods have been rapidly consumed and there is a worldwide trend of environmental protection. Under such circumstance, it's getting harder and harder to acquire some kinds of wooden materials. Therefore, it is a trend to replace wooden materials with other materials (such as plastics and metals) as the main materials of furniture. However, different materials (plastics and metals) have different material performances (such as hardness, elasticity and structural strength). Therefore, the difficulty in processing these materials varies. It is important to find how to overcome the difficulty in processing these different materials instead of wooden materials and achieve not less quality feeling and durability of the furniture.

**[0006]** FIG. **1** shows a traditional wooden chair including a chair seat **601** and a lower support **60** annularly arranged along a periphery of the chair seat **601**. One side (rear side) of the chair seat **601** is formed with an arc edge. Multiple downward extending support legs **602** are disposed under the lower support **60**. Two L-shaped side supports **50** extend from the straight side of the chair seat **601** to the arc side thereof. A back beam **7** is interconnected between the two side supports **50**. The back beam **7** is substantially a bow beam structure. The bottom side of the back beam **7** has multiple connection faces **71** downward connected to the lower support **60**. In addition, multiple backboards **73** and side spacer boards **501** with adaptive patterns are respectively disposed between the connection faces **71** and between the side supports **50** and the connection faces **71** to form a complete wooden chair structure. In the above structure, the side supports **50** are connected with the back beam **7** to form a configuration similar to that of the lower support **60** (and the chair seat **601**). Accordingly, the backboards **73** and the side spacer boards **501** are obliquely arranged in a gradually upward diverging pattern. Also, in order to meet the requirement of a user for comfortableness when sitting or lying on the chair, the backboards **73** are upward connected to the bottom edge of the back beam **7** in adjacency to the chair seat **601**. Therefore, the back beam **7** should have such a structure as shown in FIG. **2** that two end sections of the back beam **7** are formed with connection ends **71**. The connection ends **71** have a cross-sectional shape identical to that of the two side supports **50**, whereby the back beam **7** can be smoothly connected with the side supports **50**. An inner side of a middle section **72** of the back beam **7** is formed with an upward obliquely arranged arc face **721** for snugly connecting with the backboards **73**. Accordingly, the middle section **72** has a substantially trapezoidal cross-section with a longer lower side and a shorter upper side. (The nonparallel sides of the trapezoid can have a certain inclination angle as necessary). Also, between the middle section **72** and the two lateral connection ends **71** are at least partially formed gradually varied curvatures and cross-sectional shapes. In processing of such shape of wooden structure, the straight wooden blanks are generally first preliminarily shaped in cross section and then baked and heated many times and curved into a suitable curvature with a mold or manually. Then the wooden materials are plug-in connected and assembled with each other and finely planed, milled and sanded into the desired configuration. Such processing procedure is quite complicated so that the production rate and production efficiency are very low. As a result, it is hard to mass-produce the wooden chairs. Moreover, the wooden materials have become more and more expensive. Therefore, the manufacturing cost for the wooden chair is very high. This fails to meet economic benefit principle and lowers competitive ability.

**[0007]** In the case that the chair structure is mainly made of other materials (such as metals or hard plastics), in consideration of the cost for the materials, the chair structure is preferably composed of hollow tubular components. However, some components in certain positions (such as the back beam **7**) have different curvatures (or even three-dimensionally variably extend with the central line or bottom face not positioned on the same plane) on the same segment of component. Moreover, in some cases, the respective different parts of the back beam **7** need to have different structural variations with different cross-sectional shapes. Accordingly, the conventional tubular material bending processing method, (that is, directly bending the tubular member made by means of metal extrusion) is inapplicable. Therefore, it is important to find how to overcome the bottleneck in the conventional integral molding processing and widely use other materials instead of the wooden materials so as to lower manufacturing cost and speed the production.

## SUMMARY OF THE INVENTION

**[0008]** It is therefore a primary object of the present invention to provide a furniture bow beam structure, which is made of metal-made tubular structure instead of wooden beam structure so as to lower material cost and enhance competitive ability of the product.

**[0009]** To achieve the above and other objects, the furniture bow beam structure of the present invention is composed of multiple segments of supports, which are connected with each other. The supports themselves at least partially extend by gradually varied curvatures or shapes. Each two adjacent ends of the supports are formed as open ends respectively having the same curvature and cross-sectional shape, whereby the adjacent open ends are connected with each other to form an integrated and smoothly extending beam structure.

**[0010]** The present invention can be best understood through the following description and accompanying drawings wherein:

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0011]** FIG. **1** is a perspective view of a conventional wooden chair;

**[0012]** FIG. **2** is a plane view of the back beam structure of the chair of FIG. **1**;

**[0013]** FIG. **3** is a flow chart of the manufacturing method of the present invention;

**[0014]** FIG. **4** is a perspective exploded view of a first embodiment of the present invention;

**[0015]** FIG. **5** is a top view of the first embodiment of the present invention;

**[0016]** FIG. **6** is a perspective assembled view of the first embodiment of the present invention, showing the application thereof;

**[0017]** FIG. **7** is a perspective view according to FIG. **6**, showing the appearance of the chair after processed;

**[0018]** FIG. **8** is a perspective exploded view of a second embodiment of the present invention; and

**[0019]** FIG. **9** is a top view of a third embodiment of the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0020]** Please refer to FIG. **3**. The manufacturing method of the present invention includes step **S101** of cutting board material into assembling member blank, step **S102** of press molding, step **S103** of trimming, step **S104** of primarily rectifying, step **S105** of forming reverse angles, step **S106** of cleaning, step **S201** of cutting board material of connecting member, step **S202** of trimming, step **S203** of forming reverse angles, step **S204** of cleaning, step **S301** of assembling and step **S302** of secondarily rectifying. In step **S101** of cutting board material into assembling member blank, metal board material is cut by means of plasma cutting (laser) or any other suitable method to form at least one assembling member blank with necessary basic configuration. In step **S102** of press molding, the board material of the assembling member blank is processed by means of an apparatus such as a punch or a press to form a semi-product of the assembling member with U-shaped cross-section and necessary curvature and configuration. In step **S103** of trimming, the excessive edge materials of the semi-product of the assembling member are removed by means of a mill or (CNC processing machine). Then, in step **S104** of primarily rectifying, the local rebound of the semi-product of the assembling member due to material elasticity is rectified so as to have precise shape and size. Then, in step **S105** of forming reverse angles, the sections to be connected are processed, (for example, sanded), to form reverse angles. Finally, in step **S106** of cleaning, the surface is cleaned to complete an assembling member with U-shaped cross-section and necessary curvature and configuration. In step **S201** of cutting board material of connecting member, the metal board material is cut (in the same manner) to form a plate-like semi-product of the connecting member with desired curvature and configuration. Then, in step **S202** of trimming, step **S203** of forming reverse angles and step **S204** of cleaning, the semi-product of the connecting member is further processed into the connecting member adapted to the assembling member. In step **S301** of assembling, by means of welding, screw-connection, adhesion or any other suitable processing measure, the assembling member and the connecting member are assembled into a support structure with curvatures and cross-sectional shapes in conformity with a predetermined part of the back beam. Then, different supports are welded with each other to form a complete back beam. Finally, in step **S302** of secondarily rectifying, the deformation resulting from internal stress of thermal expansion/contraction in welding process or external force in screw-connection. Also, the gaps between the connection sections are repaired to have precise size and shape and better appearance and quality feeling.

**[0021]** Please refer to FIGS. **4** to **7**. The back beam structure A of the present invention is a curved/arc beam member arranged in a specific position on a piece of furniture. (The piece of furniture can be a chair as mentioned in the prior art). The back beam A may three-dimensionally variably extend, (that is, the central line or bottom face is not positioned on the same plane). The respective parts of the back beam A have different structural characteristics with different cross-sectional shapes. In a first embodiment, the back beam A is composed of a first support **1** and a second support **2**, which are symmetrically connected with each other. (The first and second supports **1**, **2** are manufactured by means of the above method according to different curvatures of two sides of the back beam A. In practice, the number of the segments of the supports can be increased or decreased as necessary or in accordance with different structures. In general, the convenience in processing those parts with greater curvatures is taken into major consideration). The first and second supports **1**, **2** respectively have symmetric curvatures and varied cross-sectional shapes in conformity with two sides of the back beam A (that laterally extend from the center of the back beam A). The first and second supports **1**, **2** are composed of a first assembling member **11**, a first connecting member **12**, a second assembling member **21** and a second connecting member **22**, which are mated and connected with each other. The first and second assembling members **11**, **21**, (which can be made of metal or any other suitable material), have openings **111**, **211** that obliquely diverge and open to a lateral (bottom) side. The first and second connecting members **12**, **22** can be respectively fixedly connected to the openings **111**, **211** by means of welding (or adhesion). Accordingly, the first and second supports **1**, **2** are respectively formed as two hollow tubular bodies each having inclined and curved face **112**, **212** on inner bent sides. Two end sections of the first support **1** are respectively formed with two connection open ends **13**, **14**. Two end sections of the second support **2** are respectively formed with two connection open ends **23**, **24** having curvature and shape identical to those of the connection open ends **13**, **14** of the first support **10**. The adjacent connection open ends **13**, **23** of the first and second supports **1**, **2** are connected with each other (by means of welding or adhesion) to form a complete and smoothly connected back beam structure A.

**[0022]** In practice, the connection open ends **14**, **24** of the back beam structure A can be connected to two L-shaped side supports **5** respectively. The side supports **5** downward extend to connect with a lower support **6**. The lower support **6** is annularly arranged along a periphery of a chair seat **61**. Multiple downward extending support legs **62** are disposed under the bottom of the lower support **6**. In addition, at least two rear supports **52** are disposed under a middle section of the back beam A. The rear supports **52** downward extend to connect with the lower support **6** so as to form a frame body C of the chair. Side spacer members **51** are distributed between the side supports **5** and the lower support **6**. In addition, back spacer members **53** are disposed between the two rear supports **52** to form a non-wooden chair structure (as shown in

FIG. **6**). When processing the frame body structure C composed of the side supports **5**, the lower support **6**, the rear supports **52** and the back beam A, a suitable filler can be filled into the gaps between the supports and the connection sections of the back beam A. Then, a suitable paint C' is sprayed onto the surface (as shown in FIG. **7**) to enhance the appearance and quality feeling of the product.

**[0023]** FIG. **8** shows a second embodiment of the back beam structure B of the present invention. In this embodiment, the back beam structure B is composed of a first support **3** and a second support **4**, which are symmetric with each other. The first and second supports **3**, **4** basically have the same symmetric curvatures and varied cross-sectional shapes as the first and second supports **1**, **2**. The only difference therebetween is that the first and second supports **3**, **4** are composed of a first assembling member **31**, a first connecting member **32**, a second assembling member **41** and a second connecting member **42**, which are mated and connected with each other. The inner bent sides of the first and second assembling members **31**, **41** have openings **311**, **411** that obliquely diverge and open to a lateral (bottom) side. Two inner flanges **312**, **412** are respectively disposed on two lateral edges of each opening **311**, **411**. Multiple fixing holes **313**, **413** are respectively formed on the flanges **312**, **412**. Multiple through holes **321**, **421** are respectively formed on two lateral edges of the first and second connecting members **32**, **42** in alignment with the fixing holes **313**, **413**. Multiple fixing members **33**, **43** are passed through the through hole **321**, **421** and locked in the fixing holes **313**, **413** to connect the first and second assembling members **31**, **41** with the first and second connecting members **32**, **42** to form the first and second supports **3**, **4**. (The fixing members **33**, **43** can be rivets or bolts. In the case that the fixing members **33**, **43** are bolts, the fixing holes **313**, **413** are threaded holes). The first and second supports **3**, **4** are then connected with each other to form the back beam B. In this embodiment, the first and second assembling members **31**, **41** are connected with the first and second connecting members **32**, **42** by means of riveting or screw connection to form an aspect different from the first embodiment.

**[0024]** FIG. **9** shows a third embodiment of the back beam D of the present invention. In practical manufacturing process, in the case that the back beam D has smaller curvature radius or radian than the back beams A and B, the back beam D will have greater variation per unit length. In this case, the back beam D can be composed of two pairs of shorter assembling supports **10**, **100** and **20**, **200**, which are symmetric with and connected to each other. The assembling supports **10**, **100** are connected to form the same structure as the first support **1**. The assembling supports **20**, **200** are connected to form the same structure as the second support **2** (or **4**). Accordingly, the difficulty in manufacturing those components with more complicated configuration or greater variation can be overcome to enhance the quality of the product.

**[0025]** The back beam structure of the present invention can be made of metal or any other suitable material instead of wooden material so as to reduce material cost and meet the requirements of environmental protection. Moreover, the back beam can be composed of a certain number of segments of supports, (for example, four, three or two supports), in accordance with different curvatures or radians. Therefore, the structure is simplified and modularized and the processing procedure is facilitated so as to increase production efficiency and enhance competitive ability of the product.

**[0026]** The above embodiments are only used to illustrate the present invent ion, not intended to limit the scope thereof. Many modifications of the above embodiments can be made without departing from the spirit of the present invention.

What is claimed is:

**1**. A furniture bow beam structure composed of multiple segments of supports, which are connected with each other, at least one single support of the beam structure at least partially extending at different curvatures, each two adjacent ends of the supports being formed as open ends with the same curvature and cross-sectional shape, whereby the adjacent open ends are connected with each other to form an integrated and smoothly extending beam structure.

**2**. The furniture bow beam structure as claimed in claim **1**, wherein each support is composed of an assembling member and a connecting member, the assembling member having a half-closed elongated cover member with an opening that obliquely diverge to one side in width, the connecting member being connected to the opening and mated with the assembling member to laterally block the open side so as to form a hollow tubular body.

**3**. The furniture bow beam structure as claimed in claim **2**, wherein the assembling member and the connecting member are fixedly connected with each other by means of welding.

**4**. The furniture bow beam structure as claimed in claim **2**, wherein flanges are respectively disposed on two lateral edges of the opening of the assembling member, multiple fixing holes being respectively formed on the flanges, multiple through holes being respectively formed on two lateral edges of the connecting member, multiple fixing members being passed through the through hole and locked in the fixing holes to connect the assembling member with the connecting member.

**5**. The furniture bow beam structure as claimed in claim **4**, wherein the fixing holes are threaded holes and the fixing members are bolts.

**6**. The furniture bow beam structure as claimed in claim **4**, wherein the fixing members are rivets.

**7**. The furniture bow beam structure as claimed in claim **1**, wherein bottom face of the beam structure extends with varied curvatures.

**8**. The furniture bow beam structure as claimed in claim **2**, wherein bottom face of the beam structure extends with varied curvatures.

**9**. The furniture bow beam structure as claimed in claim **3**, wherein bottom face of the beam structure extends with varied curvatures.

**10**. The furniture bow beam structure as claimed in claim **4**, wherein bottom face of the beam structure extends with varied curvatures.

**11**. The furniture bow beam structure as claimed in claim **1**, wherein the supports are respectively formed with different cross-sectional shapes.

**12**. The furniture bow beam structure as claimed in claim **2**, wherein the supports are respectively formed with different cross-sectional shapes.

**13**. The furniture bow beam structure as claimed in claim **3**, wherein the supports are respectively formed with different cross-sectional shapes.

**14**. The furniture bow beam structure as claimed in claim **4**, wherein the supports are respectively formed with different cross-sectional shapes.

* * * * *