US 20130313884A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2013/0313884 A1

(43) Pub. Date: Nov. 28, 2013

Matsumoto et al.

(54) **CHAIR BACKREST DEVICE**

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(21) Appl. No.: **13/982,097**

(22) PCT Filed: **Jan. 27, 2011**

(86) PCT No.: **PCT/JP2011/051607**

§ 371 (c)(1),
(2), (4) Date: **Aug. 19, 2013**

Publication Classification

(51) **Int. Cl.**
A47C 7/40 (2006.01)

(52) **U.S. Cl.**
CPC *A47C 7/40* (2013.01)
USPC **297/452.18**

(57) **ABSTRACT**

The invention is capable of maintaining the planar view curve profile of the elastic membranous member of the back-contacting surface while enabling the maintenance of a stable and comfortable seated posture. The side frame members (**13**C) of a backrest frame (**13**) are formed substantially as obtuse angles with the bend towards the front when viewed from the side. The upper frame member (**13**A) is formed, in planar view, as an arc that protrudes towards the back. An elastic membranous member (**14**) is stretched so that when viewed from the side, the intermediate position curves gently towards the front, substantially forming an obtuse angle. Paired left and right shape-maintaining members (**17**), each slanting outward and upward, connect the lower frame member (**13**B) near the left and right sides to the bends (**13***a*) in the left and right side frame members. The lower parts of both the left and right sides of the elastic membranous member are supported by the shape-maintaining members.

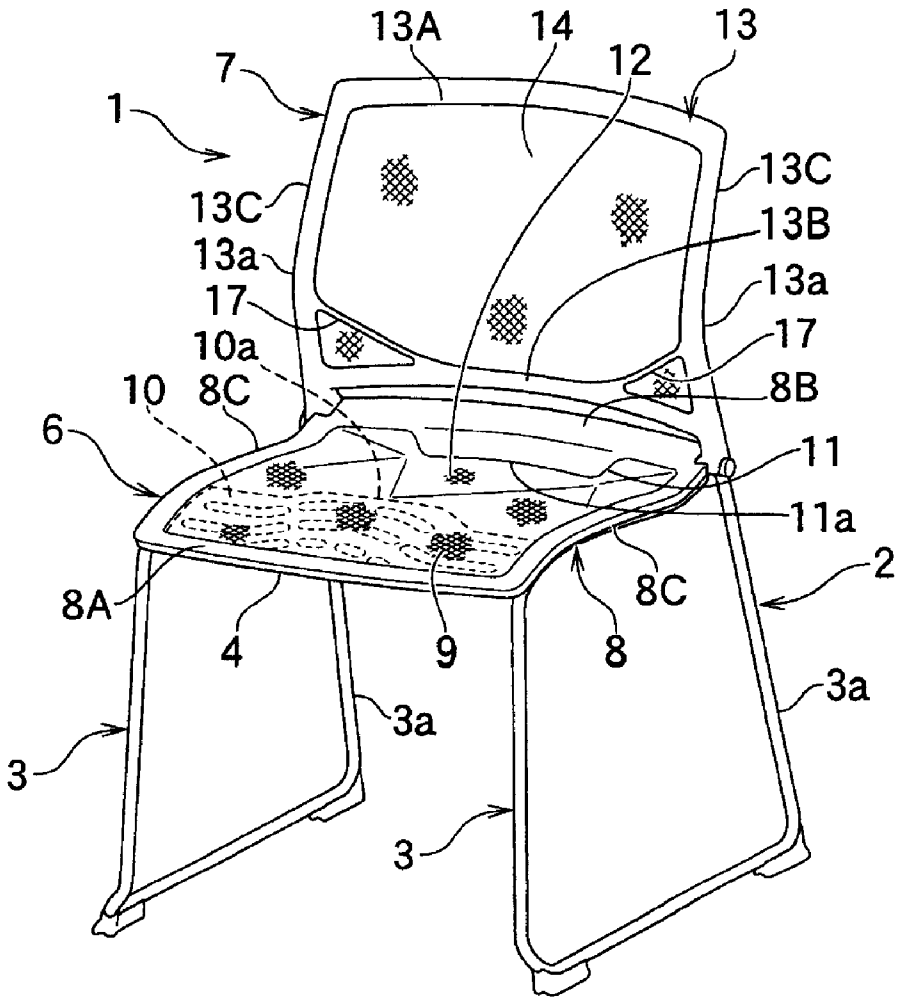
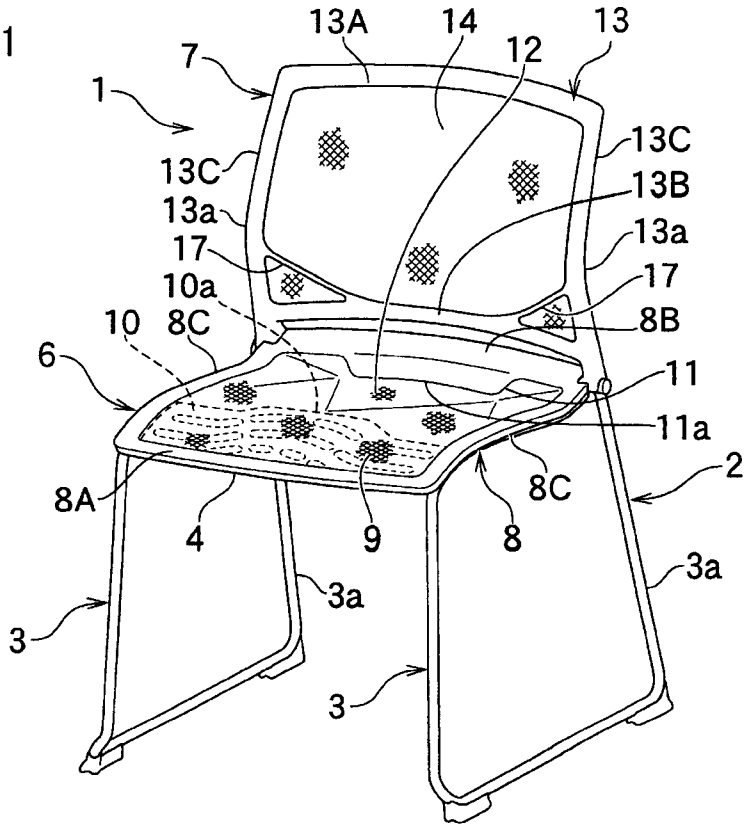


FIG.1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14
12
13
7
1
13C
13C
13B
13a
13a
17
17
10a
10
8C
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11a
2
8A
8C
4
9
8
3a
3a
3
3

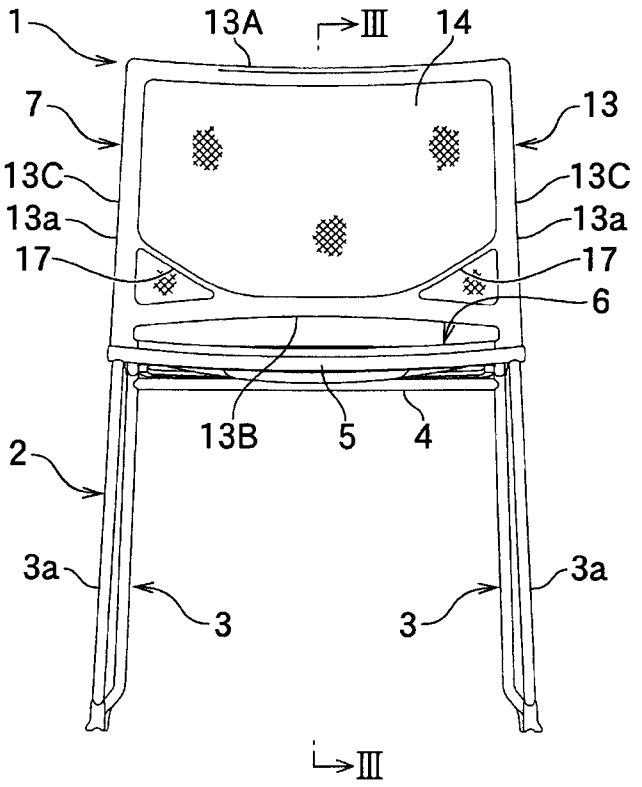


FIG.2

FIG.3

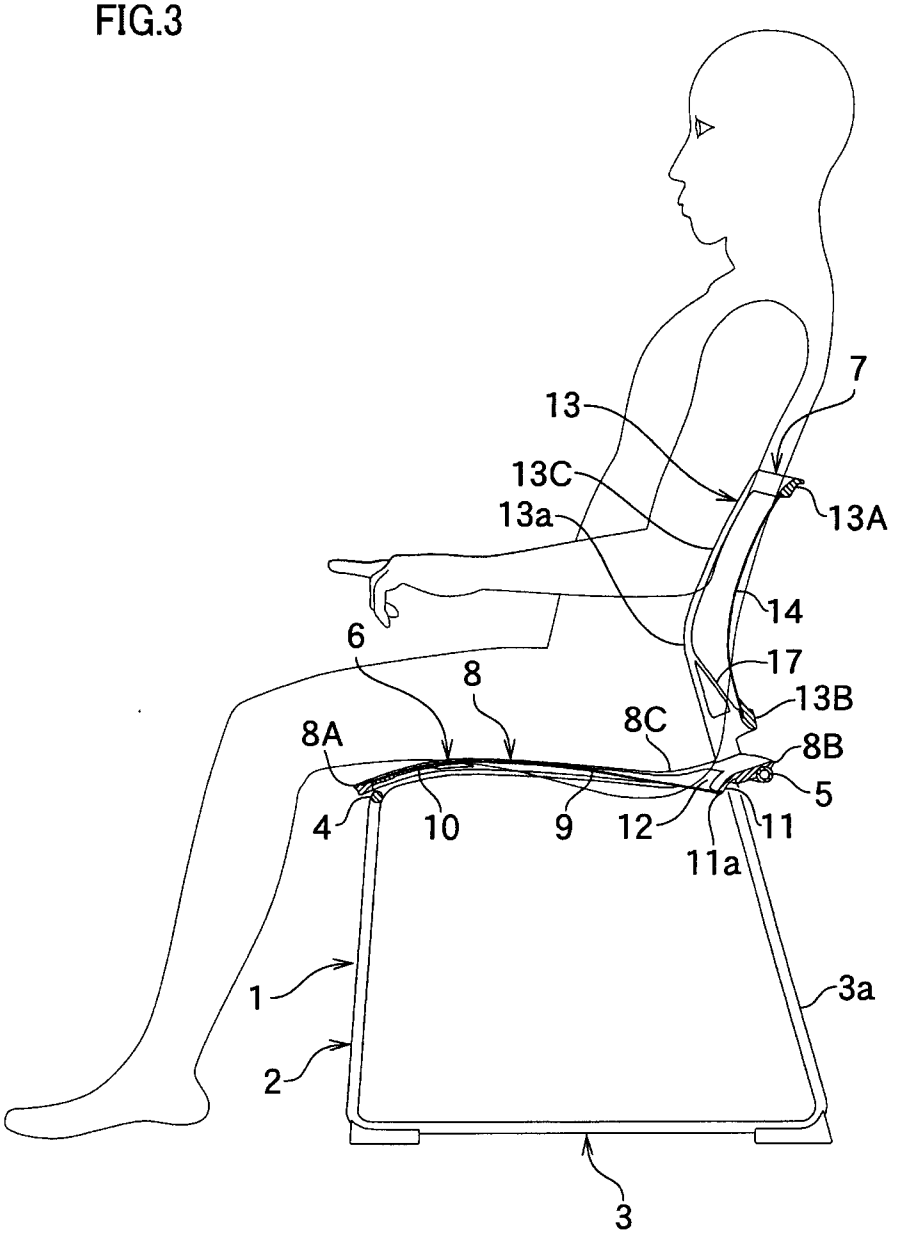


FIG.4

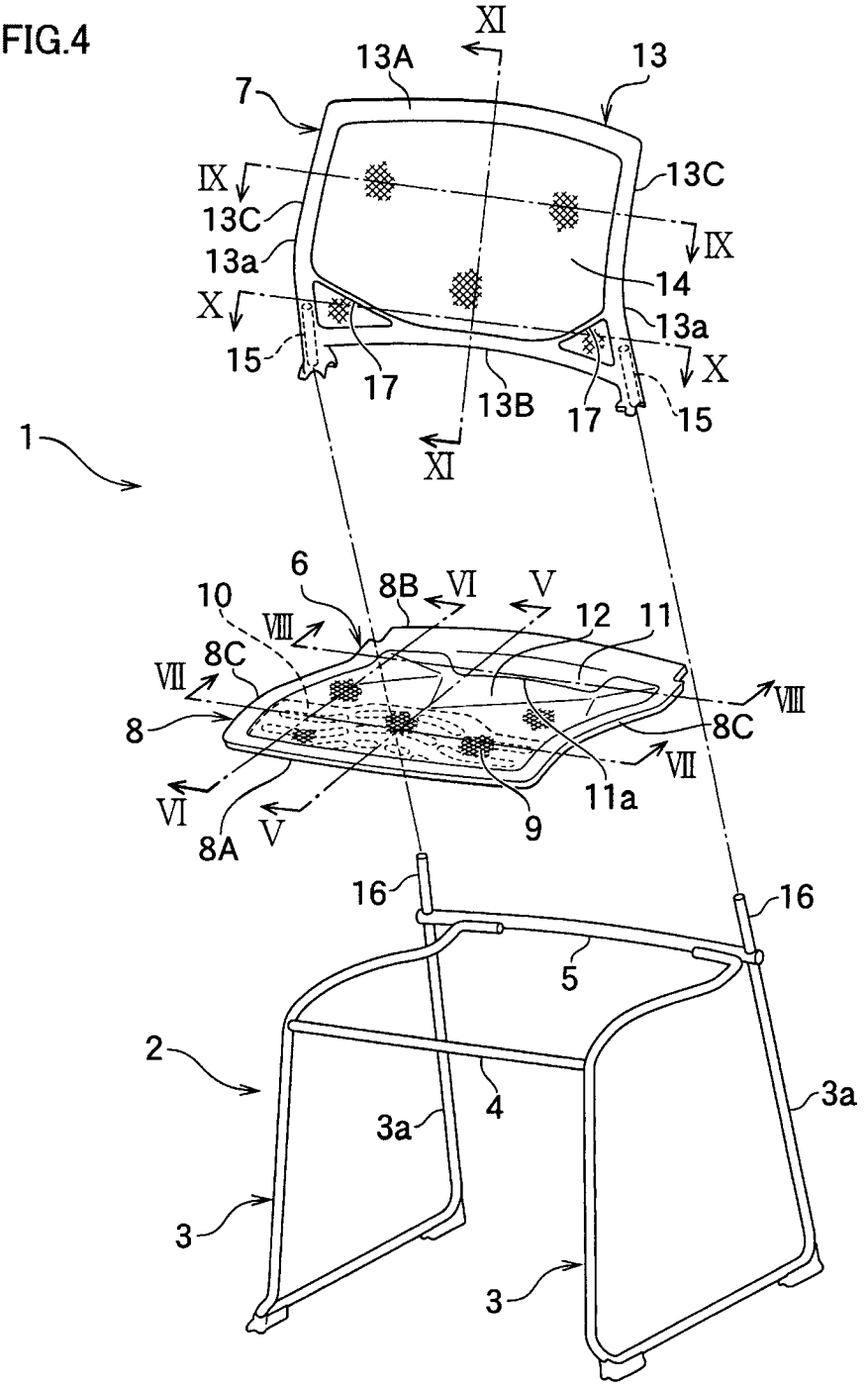

XI
13A
13
7
IX
13C
13C
13a
X
15
17
13B
17
15
XI
IX
13C
IX
14
13a
X
1
6
8B
VI
V
10
VIII
12
11
8C
VII
8
VIII
8C
VII
11a
VI
8A
V
9
16
16
5
2
4
3a
3a
3
3

FIG.5

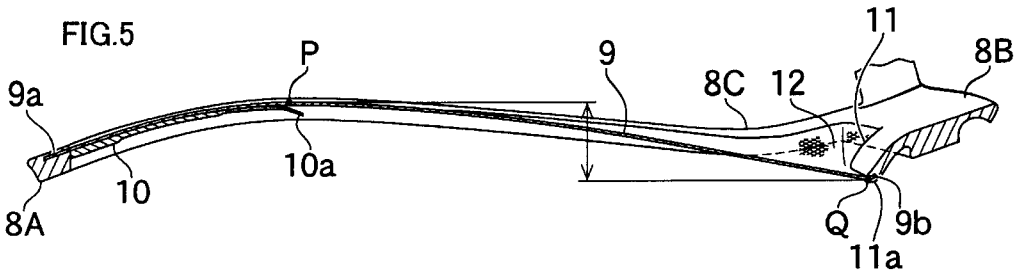


FIG.6

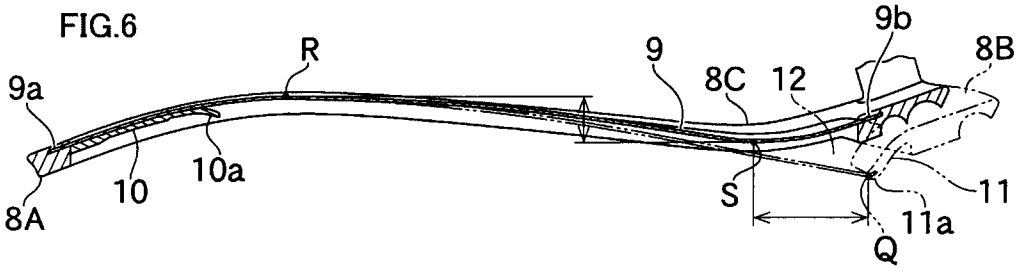


FIG.7

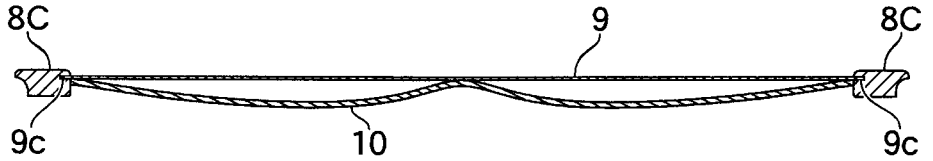


FIG.8

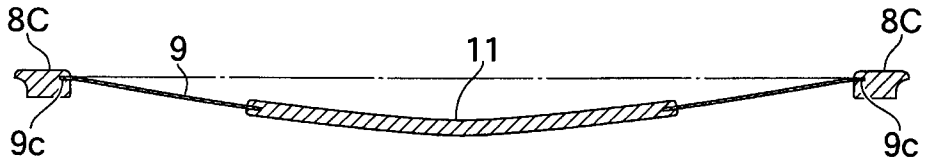


FIG.9

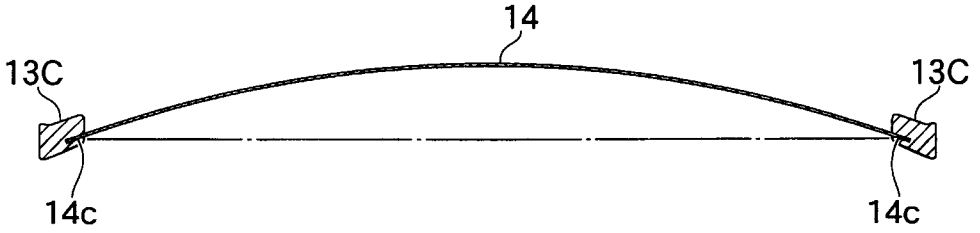


FIG.10

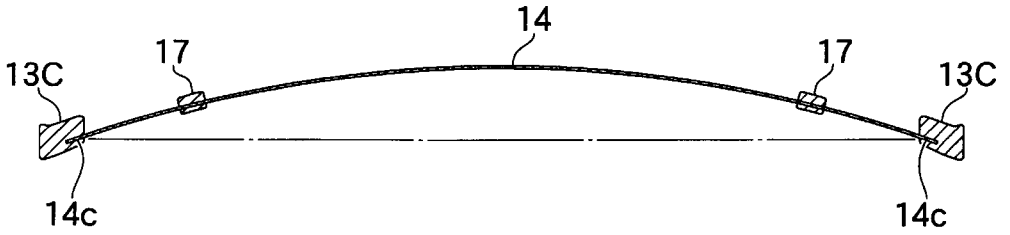
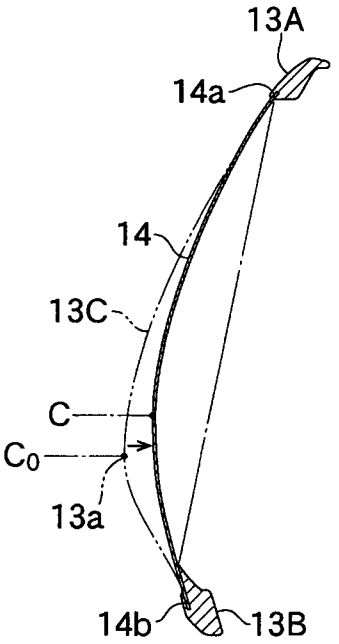


FIG.11



CHAIR BACKREST DEVICE

TECHNICAL FIELD

[0001] The present invention relates to the backrest of a chair in which an elastic membrane is stretched over a substantially rectangular backrest frame to form a back-contacting surface.

BACKGROUND OF THE INVENTION

[0002] The backrest of a chair comprises a substantially rectangular backrest frame and an elastic membrane knitted or woven as high-tension elastic mesh that is stretched over the backrest frame. The backrest in which suitable elasticity is applied to the back-contacting surface is known in Patent Literatures 1 and 2.

[0003] An elastic membrane is molded by suitable tension together with a backrest frame with a die, which is known in Patent Literature 3.

[0004] However, in the chair in each of the Patent Literatures, elasticity of the back-contact surface of the backrest is applied by elasticity of the elastic membrane itself and by tension for stretching the elastic membrane over the backrest frame. So the back-contacting surface is flat and a back position of the user is not stable when he/she sits.

[0005] As described in Patent Literature 2, in order to stabilize the back of the user when he/she sits, the middle of the back-contacting surface projects backward when viewed from the above, and right and left side frames are bent to project forward in the middle so that the back of the user may be fitted.

[0006] However, when viewed from the above, upper and lower frame members of the backrest frame are rounded backward, and right and left side frame members are bent to project forward in the middle when viewed from the side. Upper and lower edges of the elastic membrane are stretched over the backrest frame, and right and left side edges are stretched to the right and left side frame members for the backrest frame. By tension that applies to the elastic membrane over the whole circumference, restoration force acts so that the back-contact surface becomes planar in the vicinity of the bent portion of the side frame members.

[0007] In order to maintain the back-contact surface in the shape when viewed from the above and side, it is necessary to provide separate complicated holding means. It is disadvantageous that the shape of the elastic membrane cannot be kept for a long time.

PRIOR ART

Patent Literature

[0008] Patent Literature 1: Japanese Patent No. 3993375

[0009] Patent Literature 2: Japanese Design No. 1199426

[0010] Patent Literature 3: Japanese Patent No. 3200409

SUMMARY OF THE INVENTION

Problems to be Solved by the Invention

[0011] In view of the disadvantages, it is an object of the present invention to provide a backrest of a chair in which an arc of an elastic membrane is kept for long time, whereby a stable sitting posture of a user can be maintained.

Means for Solving the Problems

[0012] The foregoing problems are solved by the following invention as claimed.

[0013] (1) In the backrest of a chair, the backrest comprising a substantially rectangular backrest frame comprising upper, lower, right-side and left-side frame members and an elastic membrane stretched in the backrest frame, the right-side and left-side frame members of the backrest frame are bent at a bent point so that a middle of each of the frame members gently projects forward when viewed from a side, the elastic membrane being stretched so that a middle is curved at a curved point forward when viewed from the side, the backrest further comprising a pair of shape-maintaining members each of which is provided obliquely outward and upward between the bent portion of each of the right and left side members and part of the lower frame member close to each of the right and left side frame members, the elastic membrane being supported at lower ends of right and left side portions by the shape-maintaining member.

[0014] (2) In the item (1), the curved point of the elastic membrane is higher than the bent point of the side frame.

[0015] (3) In the item (1) or (2), the backrest frame is molded together with the shape-maintaining members and the elastic membrane.

[0016] (4) In any one of the items (1) to (3), the upper frame member is formed like an arc gently projecting backward when viewed from an above.

[0017] (5) In any one of the items (1) to (4), the upper frame member is formed straight when viewed from the above.

[0018] (6) In any one of the items (1) to (5), the lower frame member is formed like an arc gently projecting backward when viewed from the above.

Advantages of the Invention

[0019] According to claim **1**, the side frame member of the backrest frame is bent at the bent point to project in the middle forward when viewed from the side and the elastic membrane is stretched over the backrest frame to curve forward at the curved point in the middle. The shape-maintaining member is provided between is provided between the bent point of each of the right and left side frame members and part of the lower frame member near the side frame member. The lower part of the elastic membrane is supported by shape-maintaining member. The shape-maintaining member creates restraining force for restraining a returning force for elastically returning the elastic membrane to a flat face. Thus, the curve of the elastic membrane of the back-contacting surface can be maintained for a long time.

[0020] The shape-maintaining member is provided obliquely outward and upward between the bent point of the side frame member and part of the lower frame member near the side frame member. When a user sits on the chair, he/she can take stable and comfortable sitting posture without giving discomfort that the shape-maintaining member comes in contact with the back bone of the user,

[0021] According to claim **2**, the curved point of the elastic membrane is higher than the bent point of the side frame member close to the back bone of the user. When the user sits, the curved point of the elastic membrane presses the lumbar of the user, he/she can keep stable sitting posture with a straight back.

[0022] According to claim **3**, the backrest frame is molded together with the shape-maintaining member and elastic

membrane, thereby increasing support strength of the elastic membrane by the backrest frame and shape-maintaining member and restraining elastic-returning force of the elastic membrane.

[0023] According to claim **4**, the upper frame member is formed like an arc projecting backward when viewed from the above. Thus, the back surface of the elastic membrane is supported by the shape-maintaining member to press forward. A restraining force is applied against the direction of elastic returning force. Thus, the elastic membrane which acts as back-contacting surface can stably be maintained like an arc which curves backward when viewed from the above.

[0024] According to claim **5**, the upper frame member is straight when viewed from the above. A restraining force for pushing the elastic membrane forward is applied by the shape-maintaining member against a returning force which pushes backward to have the back-contacting surface of the elastic membrane come closer to a flat surface.

[0025] According to claim **6**, the lower frame member is formed like an arc which projects backward. The lower edge of the elastic membrane can be maintained like an arc. In addition to the effect by claim **4**, the shape of the elastic membrane forming a back-contacting surface can be maintained for a long time.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] FIG. **1** is a perspective view of one embodiment of a chair comprising the backrest according to the present invention;

[0027] FIG. **2** is a back elevational view of the chair;

[0028] FIG. **3** is a central vertical sectional view taken along the line III-III in FIG. **2** to illustrate that a user sits on the chair;

[0029] FIG. **4** is an exploded perspective view of the chair.

[0030] FIG. **5** is an enlarged vertical sectional view of the seat taken along the line V-V in FIG. **4**;

[0031] FIG. **6** is an enlarged vertical sectional view of the seat taken along the line VI-VI in FIG. **4**;

[0032] FIG. **7** is an enlarged vertical sectional view of the seat taken along the line VII-VII in FIG. **4**;

[0033] FIG. **8** is an enlarged vertical sectional view of the seat taken along the line VIII-VIII in FIG. **4**.

[0034] FIG. **9** is an enlarged horizontal sectional view of the backrest taken along the line IX-IX in FIG. **4**;

[0035] FIG. **10** is an enlarged horizontal sectional view taken along the line X-X in FIG. **4**; and

[0036] FIG. **11** is an enlarged vertical sectional view taken along the line XI-XI in FIG. **4**.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0037] One embodiment of the present invention will be described with respect to the appended drawings.

[0038] FIG. **1** is a perspective view of one embodiment of a chair comprising the backrest according to the present invention; FIG. **2** is a back elevational view of the chair; FIG. **3** is a central vertical sectional view taken along the line III-III in FIG. **2** to illustrate that a user sits on the chair; and FIG. **4** is an exploded perspective view of the chair.

[0039] In FIGS. **1** to **4**, in the chair according to the present invention, a leg unit **2** comprises a pair of side legs **3**,**3** to which metal pipe is bent like a rectangle, and a pair of cross rails **4**,**5** for connecting the upper ends of the side legs **3**,**3** to each other. A seat **6** is attached over the leg unit **2** and a backrest **7** is attached to the back end of the seat **6**.

[0040] In the seat **6**, a synthetic-resin seat frame **8** such as polypropylene comprises front and back frame members **8**A,**8**B and right and left frame members **8**C,**8**C like a rectangle. The circumferential edge of an elastic membrane **9** into which polyamide or polypropylene fiber is knitted or woven like a mesh is stretched by one-piece molding.

[0041] FIG. **5** is an enlarged vertical sectional view of the seat taken along the line V-V in FIG. **4**; FIG. **6** is an enlarged vertical sectional view of the seat taken along the line VI-VI in FIG. **4**; FIG. **7** is an enlarged vertical sectional view of the seat taken along the line VII-VII in FIG. **4**; and FIG. **8** is an enlarged vertical sectional view of the seat taken along the line VIII-VIII in FIG. **4**.

[0042] In FIGS. **5**-**8**, in the elastic membrane **9**, a front edge **9***a* is supported by the inner circumferential surface of the front frame member **8**A of the seat frame **8**; a back edge **9***b* is supported by the inner circumferential surface of the back frame member **8**B of the seat frame **8**; and right and left side edges **9***c*,**9***c* are supported by the inner circumferential surfaces of the side frame members **8**C,**8**C of the seat frame **8**.

[0043] In FIGS. **6** and **7**, an arcuate front tongue **10** is formed to extend backward and upward, and the front part of the elastic membrane **9** is held on the upper surface of the front tongue **10**.

[0044] In FIG. **7**, the front tongue **10** has two arcs projecting downward between the center of the width and the side frame members **8***c*,**8***c*. The rear end **10***a* of the front tongue **10** is curved downward not to come in contact with the lower surface of the elastic membrane **9**.

[0045] Hence, in FIG. **3**, the buttock of the user goes down in a recess **12** and the right and left thighs bends down with the elastic membrane **9** to come in contact with the right and left recesses of the front tongue **10**, so that the front tongue **10** plays a role in cushioning against the weight of the user.

[0046] The back frame member **8**B is an arc which slightly projects backward when viewed from the above and an arc which slightly projects downward when viewed from the back. The back frame member **9**B has a rear tongue **11** in a trapezoid in which a front side is shorter than a back side when viewed from the above.

[0047] The rear tongue **11** has a front end **11***a* which is an arc which slightly projects backward when viewed from the above and curves forward and downward to be lower than the upper surface of the back frame member **8**B.

[0048] The middle of the back edge **9***b* of the elastic membrane **9** is supported by the front end of the rear tongue **11** so that the middle of the elastic membrane **9** gently projects downward in FIG. **8**.

[0049] Thus, in FIG. **5**, the elastic membrane **9** is stretched so as to form a gentle curve from the highest point P in the middle of the front tongue **10** formed as an arc backward and upward from the front frame member **8**A, to the lowest point Q at which the elastic membrane **9** is supported by the front end **11***a* of the rear tongue **11** curved downward, thereby forming the recess **12** which gradually lowers from the back end **10***a* of the front tongue **10** in the middle of the seating surface of the seat **6** to the front end **11***a* of the rear tongue **11** of the back frame member **8**B. The recess **12** ensures that the user's buttock and thighs are held with the front sectional shape of the front tongue **10** to not deviate laterally.

[0050] In FIG. **6**, the side frame member **8**C is formed from the highest point R of the front part which curves backward

and upward, to the middle part which curves backward and downward and the lowest point of the back part, and curves backward and upward. The lowest point Q at the back end of the elastic membrane **9** supported by the front end **11***a* of the rear tongue **11** is rearward of and lower than the lowest point S of the back part of the side frame member **8**C supporting the side edges of the elastic membrane **9**.

[0051] Hence, the highest point R of the side frame member **8**C is higher than the middle of the front tongue **10**, and the front part of the seat **6** becomes lower toward the middle. The lowest point Q at the back end of the elastic membrane **9** supported by the front end **11***a* of the rear tongue **11** is positioned at the back of the lowest point S of the back part of the side frame member **8**C. The seat **6** lowers without spreading backward from the highest point R to the lowest point S of the side frame member **8**, and the seat **6** gradually shrinks and lowers toward the front end **11***a* of the rear tongue **11** at the lowest point Q at the back end of the elastic membrane **9** from the lowest point S of the side frame member **8***c*, so that the buttocks of the user can be held more suitably and he/she can take more stable sitting posture.

[0052] In the side frame member **8**C, the front part is tilted backward and upward, and the middle part is tilted backward and downward from the highest point R. The side frame member **8**C is gently tilted backward and upward from the lowest point A of the rear part, thereby improving the appearance of the seat.

[0053] Furthermore, the lowest point Q is lower than the lowest point S of the side frame member **8**C by which the elastic membrane **9** is supported. Thus, even if the transversely middle part of the elastic membrane **9** is returned to horizontal flat surface by tension, more shaping force than longitudinally shaping force of the side frame member **8**C can be applied, thereby making the shape of the recess **12** more stable.

[0054] The side edges of the elastic membrane is positioned at the back of the lowest point S of the side frame member **8**C. Hence, the recess **12** curves gradually backward from the back part of the side frame member **8**C when viewed from the above to enable it to fit the top and side shapes of the back frame member **8**C.

[0055] As shown in the seat **6**, in the backrest **7**, a synthetic resin backrest frame **13** such as polypropylene comprises an upper frame member **13**A and a lower frame member **13**B, and right and left frame members **13**C,**13**C like a rectangle. The circumferential edges of an elastic membrane **14** to which polyamide fibers or polypropylene fibers are knitted or woven as mesh are supported and stretched on the inner circumferential surface of the frame members **13**A-**13**C.

[0056] In FIG. **4**, support rods **16**,**16** which project from the upper ends of the rear legs **3***a*,**3***b* of the right and left side legs **3** of the leg unit **2** are inserted into holes **15** in the lower end of the right and left frame members **13**C,**13**C of the backrest frame **13**, so that the backrest **7** is mounted to stand on the back part of the seat **6**.

[0057] In FIGS. **1** and **2**, the upper frame member **13**A and lower frame member **13**B of the backrest frame **13** curve backward when viewed from the above. In FIG. **3**, the right and left side frame members **13**C each bends to project forward in the middle when viewed from the side.

[0058] In FIGS. **1**, **2** and **4**, a pair of shape-maintaining members **17**,**17** is symmetrically disposed between the lower frame member **13**B close to the side and a bent portion **13***a* of the right and left side frame members **13**C,**13**C, and the lower sides of the elastic membrane **14** are supported by the shape-maintaining member **17**.

[0059] The shape-maintaining member **17** is molded together with the backrest frame **13** and elastic membrane **14** when the backrest **7** is molded.

[0060] FIG. **9** is an enlarged horizontal sectional view of the backrest taken along the line IX-IX in FIG. **4**; FIG. **10** is an enlarged horizontal sectional view taken along the line X-X in FIG. **4**; and FIG. **11** is an enlarged vertical sectional view taken along the line XI-XI in FIG. **4**.

[0061] In FIGS. **9**-**11**, in the elastic membrane **14** stretched over the backrest frame **13**, an upper edge **14***a* is held on the inner circumferential surface of the upper frame member **13**A; and a lower edge **14***b* is held on the inner circumferential surface of the lower frame member **13**C of the side frame member **13**C. When viewed from the side, the elastic membrane **14** is curved to project forward in the middle in FIG. **11** and like an arc which projects backward in FIG. **9** when viewed from the above

[0062] In the backrest **7**, the elastic membrane **14** is stretched and supported on the lower part to the shape-maintaining member **17** provided between the part of the lower frame member **13**B close to the bent portion **13***a* of the right and left side frame members **13**C,**13**C in FIG. **10**, causing a forward elastic returning force obtained at the elastic membrane **14** close to the bent portion **13***a* of the right and left side frame members **13**C, or a restraining force as shown by an arrow in FIG. **11** restraining tension for getting near a flat surface forward by forming an arc projecting backward when viewed from the above.

[0063] Specifically, the shape-maintaining member **17** supports the back surface of the elastic membrane **14** to press forward thereby applying restraining force against a direction of elastic returning force of the elastic membrane **14**.

[0064] Thus, when viewed from the side, the curve of the elastic membrane **14** close to the bent portion **13***a* of the right and left side frame member **13**C can be maintained for a long time.

[0065] The lower side parts of the elastic membrane **14** are supported by the shape-maintaining member **17**. As shown by broken lines in FIG. **11**, a curving point C is higher than a bending point C**0** of the side frame member **13**C. When the user sits in FIG. **3**, the curving point C is higher than the bending point C**0** of the side frame member **13**C in a position close to the lower part of a back bone of the user to press lumbar of the user, so that the user can be held in more stable straight sitting posture.

[0066] In the foregoing embodiment, the upper frame member **13**A is formed like an arc that projects backward. By stretching the elastic membrane **14**, forward elastic returning force is produced close to the bent portion **13***a*. When the upper frame member **13**A is straight when viewed from the above, forward elastic returning force is not produced, but the back surface of the elastic membrane comes closer to the flat surface to cause restoration force for pushing back. Against this force, restraining force for pushing the elastic membrane forward is applied by the right and left shape-maintaining member **17** enabling the vertical curve of the elastic membrane **14** to be kept for a long time.

What is claimed is:

1. The backrest of a chair, the backrest comprising a substantially rectangular backrest frame comprising upper,

lower, right-side and left-side frame members and an elastic membrane stretched in the backrest frame,

wherein the right-side and left-side frame members of the backrest frame are bent at a bent point so that a middle of each of the frame members gently projects forward when viewed from a side, the elastic membrane being stretched so that a middle is curved at a curved point forward when viewed from the side, the backrest further comprising a pair of shape-maintaining members each of which is provided obliquely outward and upward between the bent portion of each of the right and left side members and part of the lower frame member close to each of the right and left side frame members, the elastic membrane being supported at lower ends of right and left side portions by the shape-maintaining member.

2. The backrest of claim **1** wherein the curved point of the elastic membrane is higher than the bent point of the side frame.

3. The backrest of claim **1** wherein the backrest frame is molded together with the shape-maintaining members and the elastic membrane.

4. The backrest of claim **1** wherein the upper frame member is formed like an arc gently projecting backward when viewed from an above.

5. The backrest of claim **1** wherein the upper frame member is formed straight when viewed from the above.

6. The backrest of claim **1** wherein the lower frame member is formed like an arc gently projecting backward when viewed from the above.

* * * * *