A chair frame structure and method for making the same that allows efficient assembly without dependence on welding, provides reliable strength, and allows production costs to be reduced. The chair frame structure includes a gas spring receiving base into which an end of a gas spring is inserted and abutted is joined to a seat support base of a main seat support unit. The gas spring receiving base is joined to the seat support base using blind rivets applied at a plurality of positions by the operation performed from outside. Since the gas spring receiving base is joined using blind rivets without reliance on welding, it is possible to achieve an efficient, low-cost seat structure that provides adequate strength with a simple structure.
Fig 1
Fig 7

(a)

(b)

(c)
Fig 14
CHAIR FRAME STRUCTURE AND METHOD FOR MAKING THE SAME

TECHNICAL FIELD

[0001] The present invention relates to a chair frame structure serving as the support framework of the main elements of a chair, e.g., the seat and backrest, and a method for making the same. More specifically, the present invention relates to a chair frame structure equipped with: a main seat support unit formed by joining a gas spring receiving base to which is fitted a gas spring for adjusting seat height and a seat support base for joining a seat; and a backrest frame joined to the main seat support unit for mounting of a backrest. The present invention also relates to a method for making the same.

BACKGROUND TECHNOLOGY

[0002] FIG. 14 is a perspective drawing of an example of a conventional office chair. As shown in FIG. 14, an office chair 1 is equipped with the following main elements: a plurality of legs 12 equipped with casters at the ends thereof; a support column 2 secured to the base ends of the legs 12 and projected upward; a main seat support unit 4 provided at the top end of the support column 2; a seat 7 attached in a fixed manner to the main seat support unit 4; and a backrest 5 positioned rearward from the seat 7 and elastically supported to allow rearward tilting relative to the main seat support unit 4 (refer to Patent Document 1). Synchronized types of chairs, in which the seat 7 can move forward and back in tandem with the tilting of the backrest 5, have also been proposed.

[0003] The main seat support unit 4 of an office chair 1 equivalent to the office chair shown in FIG. 14 and the surrounding structure thereof are shown in the perspective drawing in FIG. 15 and the cross-section drawing in FIG. 16. As shown in FIG. 15 and FIG. 16, the support column 2 is equipped with: a cover unit 2a that can extend and retract along the height axis; and a gas spring 3 provided inside the cover unit 2a, the gas spring 3 allowing the height of the chair 1, i.e., the height of the seat 7 and the backrest 5, to be adjusted. The gas spring 3 includes: a main unit 3a with a lower end secured to the base sections of the legs 12; and a multi-stage rod 3b that extends upward and is slideably fitted to the main unit 3a. The main seat support unit 4 is joined to the upper end of the rod 3b. The extending/retracting of the rod 3b relative to the main unit 3a raises and lowers the main seat support unit 4 integrally with the seat 7 and the backrest 5 attached thereto.

[0004] A conventional, publicly known gas spring with a locking mechanism is used for the gas spring 3. While a detailed description of the internal structure of the locking mechanism and the like of the gas spring 3 will be omitted, pressing an operation button 3′ provided at the upper end of the rod 3b lets the rod 3b extend and retract freely relative to the main unit 3a, thus allowing the height of the seat 7 and the backrest 5 to be adjusted. Releasing the operation button 3′ restricts (locks) the extending/retracting of the rod 3b relative to the main unit 3a, thus locking the height of the seat 7 and the backrest 5 to the height selected at the time the button was released.

[0005] The main seat support unit 4 is equipped with: a seat support base 17 made of a shaped metal material formed in the shape of an upwardly opened tray; and a gas spring receiving base 18 joined to the seat support base 17. Attachment bolts 15 are adapted to attachment holes 16 formed at the four corners outside the opening of the seat support base 17. A seat shell 6 is provided below the seat 7. At the lower surface of the seat shell 6, there is formed a rectangular flat surface 26 surrounded by a frame-shaped peripheral rib 23 that projects slightly downward. Threaded holes are formed at the four corners of the flat surface 26. The attachment bolts 15 adapted to the main seat support unit 4 are screwed into the threaded holes of the seat shell 6, thereby securing the main seat support unit 4 to the seat shell 6.

[0006] A base plate section 17a is formed as a flat bottom of the seat support base 17, and at the center of the base plate section 17a a through hole 19 through which the upper section of the rod 3b is inserted. A gas spring receiving base 18 is joined to the center of the seat support base 17 to form, together with the seat support base 17, a box-shaped structure. At a central position of the gas spring receiving base 18, there is formed a through hole 20 that is concentric with the through hole 19 when viewed at in the direction of the axis of the rod 3b. The gas spring receiving base 18 is formed with a flat upper surface 18a that faces the seat shell 6. The end of the rod 3b is inserted from the lower through hole 19 to the upper through hole 20, with the operation button 3′ provided at the upper end being exposed above the upper surface 18a of the gas spring receiving base 18. The seat support base 17 is joined to the upper end of the rod 3b by way of the gas spring receiving base 18. The main seat support unit 4 is raised and lowered by the extension/retraction of the rod 3b relative to the main unit 3a. The cover unit 2a that surrounds the gas spring 3 is formed with a vertically telescoping structure and is extended and retracted in tandem with the raising and lowering of the main seat support unit 4. The cover unit 2a does not, however, provide support for the loading acting on the main seat support unit 4. In some chairs, the cover unit 2a may be omitted.

[0007] On the main seat support unit 4, e.g., on the side surface to the left when the chair 1 is viewed from the front, is provided a vertical groove 11 that houses an operation lever 8 in a manner that allows the lever to be moved up and down. The operation lever 8 is a member that is used to push the operation button 3′ of the gas spring 3 for adjusting the height of the chair 1. The operation lever 8 is formed from: a metal, round rod 8a with a handle 21 provided on one end and an operation unit 14 provided on the other end; and a pivot 9 secured perpendicularly to the round rod 8a. On the bottom surface of the seat shell 6, there is formed a groove 10 into which the pivot 9 can fit. A support unit 25 is formed by the pivot 9 interposed between the groove 10 of the seat shell 6 and the upper section of the main seat support unit 4. The round rod 8a is formed with a curved section 22 near the operation unit 14, and the pivot 9 is welded near this curved section 22. In addition, the operation unit 14 is formed by pressing the end of the round rod 8a from above and below to form flat upper and lower surfaces, thereby providing a larger pressing surface for applying pressure to the operation button 3′.

[0008] With regard to this type of office chair, there has been proposed a way to facilitate alignment while maintaining strength when welding the bracket to the lower surface of the seat support base (refer to Patent Document 2). In this proposed configuration, a bushing is fitted to the upper end of a gas cylinder. The bushing is passed through a seat support base and a bracket secured to the bottom surface of the seat support base, with the entire peripheral surface of the bushing forming a tight contact with a bushing through hole formed in
the seat support base. The seat support base and the bracket
are welded at notches formed on the bushing through hole of
the bracket at intervals along the circumference. The bushing
and the seat support base are welded at other positions as well,
and the bracket is also welded to the seat support base at
peripheral portions.

BACKGROUND TECHNOLOGY DOCUMENTS

Patent Documents
Publication Number 2006-99837
Publication Number 2002-78555

SUMMARY OF THE INVENTION

Problems to be Solved by the Invention

[0011] In frame structures of chairs, there exist structural
members which have to have adequate strength in designs of
chairs, such as gas spring receiving bases and seat support
bases as disclosed in Patent Document 1, backrests as disclo-
sed in Patent Document 2, or other frame structures used
for seats and or brackets of chairs. Conventionally, for reasons
of reliability and strength, welding has been used to secure
the structural members of this type of frame structure to each
other or to a seat base. However, since welding involves
melting and then solidifying materials, it almost always gen-
erates welding distortion and projections known as spatter
at the weld portions. This is one of the causes of assembly
defects and functional defects. As a result, welding distortion
and spatter must be removed after welding, but this is time
consuming and leads to increased costs. In addition, since
predetermined positions must be welded from the inside of
the main unit, the outside of the main unit must be finished
with a sander. Since welding is a specialized skill, the welding
operation itself can lead to increased labor costs in the pro-
duction of the chairs. In addition, the operations of inexperi-
enced welders may lead to weld cracks. As described above,
a welding operation involves a large number of steps, e.g.,
welding, finishing, and spatter removal. As a result, the prod-
uct must be moved from place to place within the workplace,
with space needing to be set aside for the product and the
product needing to be moved. Furthermore, the fumes from
smoke generate a large amount of carbon dioxide (CO₂),
resulting in negative environmental impact and the like.
[0012] In some cases, the entire main seat support unit is die
cast in order to reduce the weight of the chair. However,
aluminum die casting requires a furnace to melt aluminum,
and this involves carbon dioxide (CO₂) emissions and the
need to consume large amounts of power to operate the equip-
ment. This type of single-piece die cast product has a high unit
cost which makes reducing the production costs of chairs
difficult. Furthermore, for technical reasons, e.g., the need to
perform anaerobic welding, welding together different types
of metals increases costs and generally cannot be done inex-
pensively. As a result, as a practical matter, welding must be
done on metals of the same type.
[0013] Accordingly, with regard to frame structures for a
chair obtained by joining structural members to each other in
order to provide a chair framework, e.g., a main seat support
unit for a chair or a backrest frame used with such a main seat
support unit, providing a chair frame structure and a method
for making the same that involves simple operations for join-
ing parts, that provides reliable strength, and that does not rely
on welding, which involves various problems, to join struc-
tural members is a problem to be resolved.

[0014] The object of the present invention is to provide a
chair frame structure and method for making the same
wherein: assembly is easy and does not depend on welding;
reliable strength is provided; and production costs can be
reduced.

Means for Solving the Problems

[0015] In order to solve the problems described above and
to achieve the abovementioned object, the present invention
provides a chair frame structure that is equipped with a main
seat support unit to which are joined a seat and an upper end
of a support column having a lower end thereof secured to
chair legs, the main seat support unit being formed of a gas
spring receiving base to which the upper end of the support
column is joined and a seat support base to which the gas
spring receiving base and the seat are joined, wherein the seat
support base and the gas spring receiving base are joined with
a blind rivet.

[0016] According to another aspect, the present invention
provides a chair frame structure equipped with a backrest
frame supporting a backrest and a main seat support unit to
which are joined a seat and an upper end of a support column,
a lower end of the support column being secured to chair legs,
wherein blind rivets are used to join the main seat support unit
and the backrest frame or to join structural members forming
the backrest frame to each other.

[0017] According to yet another aspect, the present inven-
tion provides a chair frame structure equipped with a backrest
frame supporting a backrest and a main seat support unit to
which are joined a seat and an upper end of a support column,
a lower end of the support column being secured to chair legs,
the main seat support unit being formed of a gas spring
receiving base joined to the upper end of the support column
and a seat support base joined to the gas spring receiving base
and the seat, wherein: the seat support base and the gas spring
receiving base are joined with a blind rivet; and blind rivets
are used to join the main seat support unit and the backrest
frame or to join structural members forming the backrest
frame to each other.

[0018] According to another aspect, the present invention
provides a gas spring receiving base in a chair frame structure
equipped with a main seat support unit to which are joined
a seat and an upper end of a support column, a lower end of
the support column being secured to chair legs, the gas spring
receiving base forming the main seat support unit together
with a seat support base joined to the seat, and the gas spring
receiving base being joined to the upper end of the support
column, wherein the gas spring receiving base is formed with
a rivet insertion hole through which a blind rivet is inserted,
the rivet insertion hole being formed at a position facing a
rivet insertion hole provided on the seat support base and
through which the blind rivet is inserted.

[0019] According to another aspect, the present invention
provides a method for making a chair frame structure that is
equipped with a main seat support unit to which are joined
a seat and an upper end of a support column having a lower end
thereof secured to chair legs, the main seat support unit being
formed of a gas spring receiving base joined to the upper end
of the support column and a seat support base joined to the gas
spring receiving base and the seat, wherein, rivet insertion
holes are formed previously in the gas spring receiving base
and the seat support base at positions aligned with each other; when assembling the chair frame structure, the rivet insertion holes of the gas spring receiving base and the seat support base are aligned with each other and a blind rivet is inserted from outside; and the blind rivet is used to join the gas spring receiving base and the seat support base.

[0020] According to yet another aspect, the present invention provides a method for making a chair frame structure equipped with a backrest frame supporting a backrest and a main seat support unit to which are joined a seat and an upper end of a support column, a lower end of the support column being secured to chair legs, wherein: rivet insertion holes are formed previously in the main seat support unit and the backrest frame at positions aligned with each other; when assembling the chair frame structure, the rivet insertion holes in the main seat support unit and the backrest frame are aligned with each other and a blind rivet is inserted from outside; and the blind rivet is used to join the main seat support unit and the backrest frame.

[0021] In the chair frame structure and method for making the same according to the present invention, a main seat support unit is formed of: a gas spring receiving base to which is joined an upper end of a support column; and a seat support base formed by joining the gas spring receiving base and a seat. In this main seat support unit, the seat support base and the gas spring receiving base are joined using blind rivets without the use of welding. As a result, the main seat support unit can be assembled with simple riveting operations and it is possible to provide a main seat support unit with reliable strength.

[0022] In the chair frame structure and method for making the same according to the present invention, the chair frame structure is equipped with: a backrest frame that supports a backrest; and a main seat support unit to which are joined a seat and an upper end of a support column, a lower end of the support column being secured to legs of the chair. Blind rivets are used to join the main seat support unit and the backrest frame or to join the structural members of the backrest frame to each other. As a result, the assembly of the backrest frame and the assembly of the main seat support unit and the backrest frame can be performed with simple riveting operations while providing reliable strength.

[0023] In this chair frame structure, various structures may be adopted to reinforce the joints formed by using blind rivets. In one example, out of the seat support base, the gas spring receiving base, the main seat support unit, and the backrest frame, projected ribs or embossments are formed on one side of pairs of abutting surfaces, and holes or depressions into which the ribs or the embossments fit when joining with blind rivets are formed on surfaces of remaining side of the pairs of abutting surfaces. This reinforces the joints between the abutting surfaces.

[0024] In another example, when the gas spring receiving base is made with a synthetic resin, an upper end of a support column is fitted into a through hole formed as a truncated cone provided in the gas spring receiving base. In the through hole, a metal ring embedded using insert molding provides at least a hole surface abutting the upper end.

[0025] In yet another example, when the gas spring receiving base is made with a synthetic resin, at rivet insertion holes provided in the gas spring receiving base and through which the blind rivets are inserted, metal reinforcement members formed with holes corresponding to the rivet insertion holes and through which the blind rivets can be inserted are embedded using insert molding.

[0026] In another example, when the gas spring receiving base is formed with a U-shaped cross section that opens upward, a plate-shaped reinforcement member covers an open top side of the U-shaped cross section in order to reinforce the gas spring receiving base, and sides of the reinforcement member are joined to side walls of the gas spring receiving base using blind rivets.

[0027] According to another example, depressions capable of accommodating heads of the blind rivets or dish-shaped holes capable of accommodating the heads formed in a dish shape are provided where the blind rivets are inserted. As a result, the heads of the blind rivets are accommodated in the depressions or dish-shaped holes, preventing the heads from projecting outward. This prevents accidental snagging and collisions.

Advantages of the Invention

[0028] Conventionally, it has been unquestioningly assumed that the use of standard rivets may provide insufficient strength. As a result, when assembling the gas spring receiving base to which the upper end of the gas spring is joined, as well as when assembling main seat support units and backrests, joints have been formed exclusively through welding rather than with rivets. In addition, there has been no awareness that joint structures formed with rivets provide the same degree of strength as welding. In the present invention, blind rivets are used to join structural members of the main seat support unit to each other and structural members of the backrest to each other or to join the main seat support unit and the backrest. As a result, welding operations are eliminated and it is possible to provide reliable joint strength for joints between the same types of materials as well as between different types of materials, e.g., metal and synthetic resin. In addition, assembly is made easier and production costs can be reduced.

[0029] In the chair frame structure and method for making the same according to the present invention, blind rivets are used to join structural members of the main seat support unit to each other and structural members of the backrest to each other or to join the main seat support unit and the backrest. As a result, reliable and adequate joint strength can be provided even between different types of materials. Furthermore, since the joints do not rely on welding, which requires experience, it is possible to reduce the production costs of the chair. Furthermore, the number of defective products can be almost completely eliminated relative to welding.

[0030] Gas springs are used in chairs in order to adjust the height of the seat. Reliable and adequate strength and securing is provided by the use of blind rivets to join the seat support base to the gas spring receiving base to which the upper end of the gas spring is joined. Since the gas spring receiving base is not secured to the seat support base using welding, material other than iron can be used, and the gas spring can be secured firmly even if a different type of material is joined to an iron seat support base.

[0031] With the present invention, Zinkote steel plates or other materials that do not require additional coatings can be used for structural members used in the main seat support unit and other integral structural members, e.g., backrests and armrests. As a result, the need to apply coatings to these
members is eliminated, resulting in an overall reduction in energy consumption and carbon dioxide emission.

[0032] In addition, with the present invention, structural members provided in association with the main seat support unit, e.g., backrests and armrests, made with die-cast materials, iron, synthetic resins, or other types of strong materials can be joined and fastened to the main seat support unit using blind rivets. Furthermore, joints that have conventionally relied on welding can be substituted with blind rivet joints. This can improve the main seat support unit while also allowing structural members provided in association with the main seat support unit to be joined with blind rivets.

[0033] Furthermore, with the present invention, welding is not used to fix the gas spring receiving base to the main seat support unit equipped with the seat support base, to fix the structural elements in the backrest to each other, or to join the main seat support unit to the backrest. As a result, various technical problems associated with welding can be avoided. For example, it is possible to reduce the emission of carbon dioxide (CO$_2$) accompanying the combustion of welding gas. In addition, the use of members that do not require coating reduces environmental impact. In addition, it is possible to avoid problems associated with welding such as: the need to remove spatter, residual stress, distortion, and dimension errors resulting from heat or the like; the need for welding equipment/jigs; the increased costs resulting from the hiring of workers with special skills; the need to perform finishing; and the difficulty of maintaining quality levels. Furthermore, rather than requiring skilled welders to work one chair at a time, the tasks can be done by any worker who can perform standard operations. As a result, assembly can be performed using a production line, with the chair components being placed on the line to assemble the chair structure formed from the main seat support unit and the backrest frame structure.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0034] FIG. 1 Perspective drawings showing an example of the main elements of a chair in which a frame structure according to the present invention is implemented.

[0035] FIG. 2 Drawings showing an example of a gas spring receiving base used in the frame structure shown in FIG. 1.

[0036] FIG. 3 Drawings showing another example of a gas spring receiving base used in a frame structure according to the present invention.

[0037] FIG. 4 Drawings illustrating a frame structure according to the present invention.

[0038] FIG. 5 Drawings showing an example of the joining structures provided by the blind rivets used in the present invention.

[0039] FIG. 6 Drawings showing an example of reinforcement provided for the seat support structure used in the present invention.

[0040] FIG. 7 Drawings showing other examples of joining structures provided by the blind rivets used in the present invention.

[0041] FIG. 8 Drawings showing examples of reinforcement provided for the gas spring receiving base used in the present invention.

[0042] FIG. 9 A perspective drawing showing another example of a gas spring receiving base used in the present invention.

[0043] FIG. 10 A perspective drawing showing an example of a main seat support unit in which a gas spring receiving base used in the present invention is assembled.

[0044] FIG. 11 A perspective drawing showing an example of a chair frame structure according to the present invention.

[0045] FIG. 12 An exploded perspective drawing of the frame structure shown in FIG. 11.

[0046] FIG. 13 Drawings showing examples of a blind rivet used in the present invention.

[0047] FIG. 14 A schematic perspective drawing of a conventional office chair upon which the present invention improves.

[0048] FIG. 15 A perspective drawing showing the seat support base and the peripheral structure thereabout of the office chair shown in FIG. 14.

[0049] FIG. 16 A cross-section drawing of the seat support base and the peripheral structure thereabout of the office chair shown in FIG. 14.

**EMBODIMENTS OF THE INVENTION**

[0050] Embodiments of the chair frame structure according to the present invention will be described using the attached drawings.

[0051] FIG. 1 shows an example of the main elements (seat support structure) of a chair implementing the chair frame structure according to the present invention. The perspective drawing in the figure shows an embodiment of the chair frame structure according to the present invention. FIG. 1 (a) is a cross-section drawing of a seat support structure of the frame structure into which a support column that also serves as a gas spring is inserted. FIG. 1 (b) is a cross-section drawing showing a fitting structure of a backrest frame to the main seat support unit. FIG. 1 (c) is a cross-section drawing showing an example of a conventional welded joint.

[0052] As shown in the perspective drawing in FIG. 1 and the cross-section drawing in FIG. 1 (a), a seat support base 17 of a seat unit is formed of upper and lower half sections equipped with bottom walls 27a, 27a and circumferential walls 27b, 27b formed integrally by bending the peripheral portions of the bottom walls 27a, 27a. The circumferential walls 27b, 27b of the half sections are fitted to each other and are joined by a plurality of blind rivets 28 applied at substantially equal intervals in the overlapping region. At the sections where the support column, which also serves as the gas spring, is inserted, the bottom walls 27a, 27a of the half sections are provided with upwardly tapered guide seats 27c, 27c formed by press forming.

[0053] As shown in FIG. 1, in the backrest frame 70, a box-shaped tilt unit 71 is attached to the main seat support unit 4 by way of a horizontal shaft 72 in a manner that allows forward-and-back tilting. Left and right bent pipes 76, 76 are joined to the tilt unit 71 using a plurality (two each, in the example shown in the figure) of blind rivets 78. As shown in the cross-section detail drawing in FIG. 1 (b), grooves 73 having U-shaped cross sections that open upward are formed at the ends of the tilt unit 71, and base sections 77, 77 of the bent pipes 76, 76 are fitted into the grooves 73, 73 from above. With the base sections 77 of the bent pipes 76 fitted into the grooves 73, blind rivets 78, 78 are applied from the lateral outer sides of the grooves 73 into the grooves 73 to join the bent pipes 76, 76 of the backrest frame 70 to the tilt unit 71.

[0054] In contrast to FIG. 1 (b), FIG. 1 (c) shows a cross-section in which the bent pipes 76, 76 of the backrest frame 70 are joined by being directly welded to the tilt unit 71. The two
sides of the tilt unit 71 are formed as side walls 73a rather than grooves. Since the welds 79 must be formed on the curved surfaces of the bent pipes 76, 76 to join the backrest frame 70 to the outer side surfaces of the side walls 73a, it is evident that the welding operation is complicated and difficult. In the present invention, the seat support structure can be assembled using blind rivets for all necessary attachment sites and securing sites.

FIG. 2 shows an example of a gas spring receiving base used in the seat support structure of the chair in FIG. 1. FIG. 2 (a) is a front-view drawing of the gas spring receiving base, FIG. 2 (b) is a top-view drawing of the same, FIG. 2 (c) is a side-view drawing of the same, and FIG. 2 (d) is a bottom-view drawing of the same. A gas spring receiving base 30 is made with a material such as synthetic resin, iron, or aluminum, and is a member that is assembled in the seat support base 17 of the main seat support unit 4. The use of resin provides a low-cost, light-weight material that can be processed using injection molding and the like. The resin can be, for example, glass mixed into nylon (registered trademark). Iron has a high specific gravity but is a low-cost material that is easy to process. Aluminum is expensive but is light and easy to process.

The gas spring receiving base 30 is equipped with a box-shaped section 31 that serves as an attachment side and a cone-shaped section 32 formed as a truncated cone that is integrally formed with the box-shaped section 31 on one side relative to the vertical axis. A vertically extending through hole 33 is formed through the box-shaped section 31 and the cone-shaped section 32. The through hole 33 is formed so that the center thereof is concentric with that of the cone-shaped section 32. The through hole 33 is formed in the shape fitting to the outer surface of a truncated cone, with the smallest diameter at an opening 34 in the box-shaped section 31 and the largest diameter at an opening 35 in the cone-shaped section 32. Rivet insertion holes 36 used for securing purposes are formed so as to extend vertically from top to bottom at the four corners of the box-shaped section 31 (six positions in this example).

A surface 37 is formed on the opposite side, relative to the vertical axis, of the box-shaped section 31 of the gas spring receiving base 30, i.e., the side at which the opening 34 is formed and against which the main seat support unit 4 abuts. The ribs 38, 39, 39 and the embossments 40 are formed as reinforcing projections on the surface 37. The ribs 38, 39 are two pairs of straight ribs between which the opening 34 is interspersed and include the longer projected ribs 38, 38 and the shorter projected ribs 39, 39 extending perpendicular thereto. The ribs 38, 39 are provided inward from a region defined by an imaginary line connecting the openings of the rivet insertion holes 36.

Embossments 40 are formed to provide reinforcement at the four corners of the surface 37 of the box-shaped section 31 at positions outward from the region defined by an imaginary line connecting the openings of the rivet insertion holes 36. The embossments 40 are formed as short, small columns with heights similar (or identical) to the heights of the ribs 38, 39.

Although not shown in the drawings, the abutment surface of the main seat support unit 4 to which the gas spring receiving base 30 is joined is formed with depressions into which the ribs 38, 39 and the four embossments 40 fit. The engagement of the ribs 38, 39 and the embossments 40 with these depressions serves to reinforce and strengthen the attachment to the main seat support unit 4. In this example, the ribs 38, 39 and the embossments 40 are all formed on the gas spring receiving base 30, but it would also be possible to form some of these elements on the gas spring receiving base 30 with the remaining elements formed on the main seat support unit 4 or to form all of these elements on the main seat support unit 4. In these cases, the depressions into which the ribs 38, 39 and the embossments 40 fit would be formed on the opposing surfaces. Since the depressions result in reduced thickness, it would be preferable to form the depressions on whichever is thicker of the main seat support unit 4 and the gas spring receiving base 30.

The gas spring receiving base 30 is joined to the main seat support unit 4 by inserting blind rivets through the rivet insertion holes 36. Securing parts by welding is something that has been done unquestioningly out of preconception, but this has involved various problems. The use of blind rivets can eliminate these problems. While blind rivets are generally strong with regard to tension, they are weak with regard to torsion. If blind rivets alone cannot provide sufficient strength, providing the ribs 38, 39 and/or the embossments 40 can compensate for the weakness with regard to torsion of the blind rivets.

FIG. 3 shows another example of a gas spring receiving base used in the seat support structure shown in FIG. 1. FIG. 3 (a) is a front-view drawing of the gas spring receiving base. FIG. 3 (b) is a top-view drawing of the same. FIG. 3 (c) is a side-view drawing of the same. FIG. 3 (d) is a bottom-view drawing of the same. In FIG. 3, a gas spring receiving base 50 is a member that is assembled in the main seat support unit 4 and is equipped with a box-shaped section 51 that serves as an attachment side and a truncated frustum-shaped section 52 that is integrally formed with the box-shaped section 51 on one side relative to the vertical axis. The width of the truncated frustum-shaped section 52 is the same as the width of the box-shaped section 51 and, as shown in the front-view drawing, the truncated frustum-shaped section 52 is tapered laterally. The outer shape of the truncated frustum-shaped section 52 is defined to match the shape/structure of the main seat support unit 4. Since the structure used to assemble the gas spring receiving base in the main seat support unit 4 using blind rivets is the same as in the previous example, other shapes/structures are assigned the same numerals as those used in the gas spring receiving base 30 shown in FIG. 2 and redundant descriptions of these will be omitted.

FIG. 4 shows the structure by which the gas spring receiving base shown in FIG. 2 is joined to the chair seat support structure shown in FIG. 1 using blind rivets. In FIG. 4, the circled inset X at the center shows the manner how the gas spring receiving base 30 is joined using blind rivets 45 inserted through holes 46 formed on the seat support base 17. The rectangular inset Y toward the right of the figure shows the gas spring receiving base 30, from FIG. 2. The circled inset Z toward the bottom center of FIG. 4 shows the manner how, at the structure wherein the box-shaped bases 77, 77 of the bent pipes 76, 76 of the backrest frame 70 are fitted from above into the grooves 73, 73 formed on either side of the tilt unit 71, an embossments 47 formed on one side is fitted into a hole 48 formed on the other side. The operation of the gas spring using the lever is as described in the background technology.

FIG. 5 illustrates how the two members (the main seat support unit 4 and the gas spring receiving base 30)
formed with embossments and holes into which they fit are assembled. In FIG. 5 (a), an embossments 62 formed on a first member 60 is fitted in a hole 63 formed on a second member 61 and the members 60, 61 are joined using blind rivets 68, 69 inserted applied in holes formed on the members 60, 61 to the left and the right of the embossments 62 and hole 63. By using the member 61 as the member facing the outside of the device (the unobstructed side) and the member 60 as the member facing inside the device, it is possible to apply the blind rivets 68, 69 from the outside.

[0064] In FIG. 5 (b), the embossments 62 formed on the first member 60 is fitted in a depressions 64 formed on the second member 61, and the members 60, 61 are joined by the blind rivet 68 applied nearby. In FIG. 5 (c), the embossing 62 formed on the first member 60 is fitted in the hole 63 formed on the second member 61, and the members 60, 61 are joined by the blind rivet 68 applied nearby. In FIG. 5 (d), small depressions 66 formed on the second member 61 is fitted in a large depressions 65 formed on the first member 60, and a blind rivet 68 is applied in these depressions to join the members. This prevents the head of the blind rivet 68 from being projected out from the second member 61. In FIG. 5 (e), the members are joined using a blind rivet 69 formed with a dish-shaped head that is inserted through and applied in a hole formed in the first member 60 and a dish-shaped hole 66 formed in the second member 61 to align with the hole. This also prevents the head of the blind rivet 69 from being projected out from the second member 61. Details regarding the insertion/application of the blind rivet 68 in FIG. 5 (b) to (e) are the same as in FIG. 5 (a).

[0065] FIG. 6 shows an example of a seat support structure in a chair according to the present invention. FIG. 6 (a) is a cross-section drawing showing a seat support structure with a reinforced main seat support unit 4. FIG. 6 (b) is a perspective drawing of an example of a reinforcement member of the same. As shown in FIG. 1 and FIG. 4, the main seat support unit 4 of the seat support structure is formed as a thin plate having a U-shaped cross section opening upward. A reinforcement member 80 is formed with a width that allows it to fit snugly into the main seat support unit 4 and is equipped with a top plate section 81 with a window 83 formed at the center thereof to reduce weight and side plate sections 82 formed integrally with the top plate section 81 by bending on the edges. The top plate section 81 and the upright structure 82 formed in the top plate section 81 are formed in the side plate section 82 as well, and holes 85 for applying blind rivets are formed in alignment with the small windows 84. Blind rivets 86 are inserted from the outside of the main seat support unit 4 into the holes formed on the main seat support unit 4 and the holes 85 of the reinforcement member 81 and the holes 86 of the reinforcement member 81 are inserted into the main seat support unit 4. This provides a reinforced seat support structure in which the reinforcement member 81 is assembled to the main seat support unit 4. With the reinforcement member 81, the main seat support unit 4 is formed as a structure with a closed cross section, thus allowing the rigidity of the main seat support unit 4 to be improved without the use of welding.

[0066] FIG. 7 shows cross-section drawings of alternative examples of the reinforcement structure for the seat support structure of the chair according to the present invention. In addition to pipes with round cross sections, pipes with polygonal cross sections may be assembled to the main seat support unit 4 of the seat support structure, e.g., when assembling a rod to support the backrest. FIG. 7 (a) shows an example in which a polygonal pipe 87 is assembled to a flat section 4e of the main seat support unit 4 inside the main seat support unit 4. A hole formed in the main seat support unit 4 is aligned with (faces) a hole formed on the side of the polygonal pipe 87, the blind rivet 86 is inserted through the aligned holes from the outside of the main seat support unit 4, and riveting is performed from the outside of the main seat support unit 4. As a result, the polygonal pipe 87 can be assembled with a simple operation to the main seat support unit 4 without the need for welding.

[0067] FIG. 7 (b) and FIG. 7 (c) show examples of assembling a pipe 89 with a round cross section to the inside of the main seat support unit 4. In FIG. 7 (b), the main seat support unit 4 is formed with a shape that includes a curved section 4b that supports more than half cylindrical surface with the cross-section of the round pipe 89. A single hole formed in the curved section 4b and a single hole formed in the round pipe 89 are aligned, the blind rivet 86 is inserted through the aligned holes from the outside of the main seat support unit 4, and riveting is performed from the outside of the main seat support unit 4. In FIG. 7 (c), the main seat support unit 4 is formed with a shape that includes a curved section 4c that supports more than half cylindrical surface with the cross-section of the round pipe 89. Three holes formed at equal intervals along the circumferential direction of the curved section 4c are aligned with three holes formed in the round pipe 89. The blind rivets 86 are inserted through the three aligned holes from the outside of the main seat support unit 4, and riveting is performed from the outside of the main seat support unit 4. As a result, in FIG. 7 (b) and FIG. 7 (c), the round pipe 89 can be assembled with a simple operation without the need for welding.

[0068] FIG. 8 shows another example of a gas spring receiving base used in the seat support structure of the chair shown in FIG. 1. FIG. 8 (a) is a top-view drawing of the gas spring receiving base. FIG. 8 (b) is a front-view drawing of the same. FIG. 8 (c) is a drawing of an inserted ring. FIG. 8 [A] to [D] show examples of inserted reinforcement members. The use of resin for a gas spring receiving base 90 assembled in the main seat support unit 4 provides a low-cost, light-weight material that can be processed using injection molding and the like. If there are positions that need to be strong, the inclusion of a metal member, e.g., iron, in the resin at these positions using insert molding can provide greater strength.

[0069] The gas spring receiving base 90 shown in FIG. 8 (a) and FIG. 8 (b) is, essentially, joined to the seat support base 17 and has a structure similar to those of the gas spring receiving bases 30, 50 shown in FIG. 2 and FIG. 3. More specifically, the gas spring receiving base 90 is equipped with a box-shaped section 91 and a truncated cone-shaped section 92 as well as a through hole 93 formed as a truncated cone into which the support column is fitted. Rivet insertion holes 96 are formed at the four corners of the gas spring receiving base 90 for the blind rivets to be inserted so as to join to the seat base 17. An iron ring 97 is provided at the upper section of the through hole 93, against which the support column abuts when it is inserted, by insert molding performed when forming the gas spring receiving base 90. The inner surface of the ring 97 is exposed and is continuous with the inner peripheral surface of the truncated cone shape of the through hole 93. If further strength is needed, the ring 97 can, for example, be provided with ribs 98 formed on the outer peripheral surface
thereof to provide reinforcement. The ribs 98 increase the strength of the ring 97 itself, while also improving the bond between the resin and the ring embedded in the resin through insert molding.

[0070] FIG. 8 [A] to FIG. 8 [D] show other examples of inserted reinforcement members. Reinforcement members 100 shown in FIG. 8 [B] are inserted into the gas spring receiving base 90 shown in FIG. 8 (a) and FIG. 8 (b). The reinforcement member 100 shown in FIG. 8 [B] has a U-shaped cross-section. When the reinforcement members 100 are inserted, upper/lower plates 101, 101 are exposed on the surface of the box-shaped section 91 and side plates 102 are embedded in resin. Vertical holes 103, 103 are formed in the upper/lower plates 101, 101, and a horizontal hole 104 is formed in the side plate 102. The vertical holes 103, 103 are aligned with the rivet insertion holes 96. Blind rivets can be inserted through the rivet insertion holes 96 and the vertical holes 103, 103 and riveted.

[0071] FIG. 8 [A] shows a reinforcement member 110 formed with a cross section shaped as a four-sided ring. When the reinforcement member 110 is inserted, upper/lower plates 111, 111 are exposed at the surfaces of the box-shaped section 91 and side plates 112, 112 are embedded in resin. Vertical holes 113, 113 formed in the upper/lower plates 111, 111 are aligned with the rivet insertion holes 96. The insert positions and the relationship with the blind rivets are the same as in the reinforcement member 100 shown in FIG. 8 [B] so a detailed description will be omitted. In FIG. 8 [C], a reinforcement plate 120 includes upper/lower plates 121, 121 and a cylindrical section 122 connecting these plates 121, 121. When inserted, the upper/lower plates 121, 121 are exposed at the surfaces of the box-shaped section 91 and the cylindrical section 122 is embedded in the resin. The upper/lower plates 121, 121 are formed with vertical holes 123, 123 that are in alignment with each other. An inner space 124 of the cylindrical section 122 serves as the rivet insertion hole 96. In FIG. 8 [D], a reinforcement member 130 is formed only from a cylindrical section 132, with no upper or lower plate. The upper and lower ends of the cylindrical section 132 are exposed at the surfaces of the box-shaped section 91 while the peripheral surface is embedded in resin. The inner space 134 of the cylindrical section 132 can be used as the rivet insertion hole 96. If the reinforcement members 100 to 130 need further reinforcement, ribs can be formed, preferably at appropriate positions of the reinforcement members that come into contact with the resin, as in the ring 97.

[0072] FIGS. 9 to 12 are perspective drawings showing another embodiment of a main seat support unit and a gas spring receiving base to be assembled therein according to the present invention. FIG. 9 shows a gas spring receiving base 140 that is equipped with a box-shaped section 141 and a truncated cone-shaped section 142. Furthermore, taking the connection with the seat support base into account, auxiliary plates 143, 143 are provided integrally on the box-shaped section 141. Rivet insertion holes 146 are aligned with the rivet insertion holes on the main seat support unit are formed on the auxiliary plates 143, 143. Blind rivets can also be used on the auxiliary plates 143, 143 to assemble the gas spring receiving base to the main seat support unit.

[0073] FIG. 10 is a perspective drawing of an example of a main seat support unit formed of a gas spring receiving base 150 and a seat support base 160 to which a gas spring receiving base 150 is joined. The gas spring receiving base 150 is joined to a bottom plate 161 of the seat support base 160 from the bottom. A box-shaped section 151 of the gas spring receiving base 150 is abutted against the bottom plate 161, and a truncated cone-shaped section 152 is inserted through the bottom plate 161 and projects into the seat support base 160. Auxiliary plates 153, 153 are provided integrally on either side of the gas spring receiving base 150 and are formed parallel to the bottom plate 161. Each auxiliary plate 153 is formed with a plurality of rivet insertion holes for securing the gas spring receiving base 150 to the bottom plate 161. The gas spring receiving base 150 is joined to the seat support base 160 using blind rivets 156 inserted from the outside of the seat support base 160 through the rivet insertion holes in the auxiliary plates 153, 153.

[0074] FIG. 11 and FIG. 12 show perspective drawings of an example of a main seat support unit formed of a gas spring receiving base 170 and a seat support base 180 to which a gas spring receiving base 170 is joined. FIG. 11 shows the gas spring receiving base 170 joined to the seat support base 180, while FIG. 12 shows the non-assembled state before joining. The seat support base 180 is formed as a long, thin box, with the gas spring receiving base 170 provided toward one end. Since the upper end of the gas spring is fitted into the gas spring receiving base 170, a lever 181 of the seat support base 180 that operates the gas spring is provided in association with the gas spring receiving base 170. The structure of the gas spring receiving base 170 is essentially similar to the structure of the gas spring receiving base 140 shown in FIG. 9. In order to accommodate the greater height of the seat support base 180, a box-shaped section 171 of the gas spring receiving base 170 is provided with legs 173, 173 opposite from a truncated cone-shaped section 172. One of the legs 173 is provided with an auxiliary plate 174 extending parallel to the box-shaped section 171. The auxiliary plate 174 is formed with rivet insertion holes 176 so that it can be secured to the seat support base 180 using blind rivets.

[0075] FIG. 13 shows an example of a blind rivet used in the present invention and usage examples of the same. FIG. 13 (a) is a longitudinal cross-section drawing showing an example of a blind rivet used in the present invention. FIG. 13 (b) to (e) illustrate sequentially how a blind rivet is used to join two plates. As shown in FIG. 13 (a), the blind rivet 68 (28, 45, 68, 69, 78, 86, 156) is a rivet with a structure that allows it to be crimped from the side from which the rivet is inserted. When a shaft 205 inserted through a hollow rivet 200 is pulled back, the rivet 200 is deformed and crimped. Then, the shaft 205 breaks midway, leaving behind the crimped rivet 200. The rivet 200 is equipped with a shaft section 201 and a flange section 202 toward the front. The shaft 205 is provided at the end thereof with a head section 206, the diameter thereof being larger than the diameter of the opening of the shaft section 201 of the rivet 200 and smaller than the outer diameter of the shaft section 201.

[0076] As shown in FIG. 13 (b), the two plates 210, 211 to be joined are formed with a hole 212 through which the rivet 200 before crimping can be inserted. The blind rivet 68, in which the rivet 200 is attached to the shaft 205, is inserted from the front side (the side of the plate 211) of the plates through the hole 212, with the rivet 200 extending behind the plate 210 (FIG. 13 (c)). Using a riveter 215, the shaft 205 is pulled toward the front while the flange section 202 of the rivet 200 is pushed toward the plates 210, 211. As a result, the head section 206 of the shaft 205 crimps the end of the shaft section 201 of the rivet 200, causing it to expand sideways. The plates 210, 211 are joined to each other by being clamped.
between the flange section 202 of the rivet 201 and the end section 203 of the rivet 200 that has been crimped so as to expand laterally (FIG. 13 (d) to (e)). The breaking of the shift 205 at a fragile section 207 (refer to FIG. 13 (a)) positioned inside the rivet 200 allows the front side section of the shift 205 to be removed and retrieved from the rivet 200. As a result, crimping does not need to be performed from both sides as in standard solid rivets, thus significantly improving ease of assembly, and it has been observed that adequate strength is provided.

The description above presents embodiments of the chair frame structure and method for making the same according to the present invention, but it is evident that various modifications and additions may be made without departing from the technical idea of the present invention. With regard to the reinforcement of the gas spring receiving base, for example, modifications and additions can be made as appropriate to the locations to reinforce, the shape and structure of the reinforcement member, and the like.

LIST OF DESIGNATORS

[0078] 1: office chair
[0079] 2: support column
[0080] 2a: cover unit
[0081] 3: gas spring
[0082] 3a: main unit
[0083] 3b: rod
[0084] 3c: operation button
[0085] 4: main seat support unit
[0086] 5: backrest
[0087] 6: seat shell
[0088] 7: seat
[0089] 8: operation lever
[0090] 8a: round rod
[0091] 9: pivot
[0092] 10: groove
[0093] 11: vertical groove
[0094] 12: leg
[0095] 14: operation unit
[0096] 15: attachment bolt
[0097] 16: attachment hole
[0098] 17: seat support base
[0099] 17a: base plate section
[0100] 18: gas spring receiving base
[0101] 18a: upper surface
[0102] 19, 20: through hole
[0103] 21: handle
[0104] 22: curved section
[0105] 23: frame-shaped rib
[0106] 25: pivot support unit
[0107] 26: flat surface
[0108] 27a: bottom wall
[0109] 27b: circumferential wall
[0110] 27c: guide seat
[0111] 28: blind rivet
[0112] 30: gas spring receiving base
[0113] 31: box-shaped section
[0114] 32: truncated cone-shaped section
[0115] 33: through hole
[0116] 34: opening
[0117] 35: opening
[0118] 36: rivet insertion hole
[0119] 37: surface
[0120] 38, 39, 39: rib
[0121] 40: embossment
[0122] 45: blind rivet
[0123] 46: hole
[0124] 47: embossment
[0125] 48: hole
[0126] 50: gas spring receiving base
[0127] 51: box-shaped section
[0128] 52: truncated cone-shaped section
[0129] 60: first member
[0130] 61: second member
[0131] 62: embossment
[0132] 63: hole
[0133] 64: depression
[0134] 65: large depression
[0135] 66: small depression
[0136] 67: dish-shaped hole
[0137] 68, 69: blind rivet
[0138] 70: backrest frame
[0139] 71: tilt unit
[0140] 72: horizontal shaft
[0141] 73: U-shaped groove
[0142] 73a: side wall
[0143] 76: bent pipe
[0144] 77: base section
[0145] 78: blind rivet
[0146] 79: weld
[0147] 80: reinforcement member
[0148] 81: top plate section
[0149] 82: side plate section
[0150] 83: window
[0151] 84: small window
[0152] 85: hole
[0153] 86: blind rivet
[0154] 87: polygonal pipe
[0155] 89: round pipe
[0156] 90: gas spring receiving base
[0157] 91: box-shaped section
[0158] 92: truncated cone-shaped section
[0159] 93: through hole
[0160] 96: rivet insertion hole
[0161] 97: ring
[0162] 98: rib
[0163] 100: reinforcement member
[0164] 101: upper/lower plate
[0165] 102: side plate
[0166] 103: vertical hole
[0167] 104: horizontal hole
[0168] 110: reinforcement member
[0169] 111: upper/lower plate
[0170] 112: side plate
[0171] 113: vertical hole
[0172] 114: horizontal hole
[0173] 120: reinforcement plate
[0174] 121: upper/lower plate
[0175] 122: cylindrical section
[0176] 123: vertical hole
[0177] 124: inner space
[0178] 130: reinforcement member
[0179] 132: cylindrical section
[0180] 134: inner space
[0181] 140: gas spring receiving base
[0182] 141: box-shaped section
[0183] 142: truncated cone-shaped section
[0184] 143: auxiliary plate
A chair frame structure that is equipped with a main seat support unit to which are joined a seat and an upper end of a support column having a lower end thereof secured to chair legs, said main seat support unit being formed of a gas spring receiving base to which said upper end of said support column is joined and a seat support base to which said gas spring receiving base and said seat are joined, wherein said seat support base and said gas spring receiving base are joined with a blind rivet.

A chair frame structure equipped with a backrest frame supporting a backrest and a main seat support unit to which are joined a seat and an upper end of a support column, a lower end of said support column being secured to chair legs, said main seat support unit being formed of a gas spring receiving base joined to said upper end of said support column and a seat support base joined to said gas spring receiving base and said seat, wherein:
said seat support base and said gas spring receiving base are joined with a blind rivet; and
blind rivets are used to join said main seat support unit and said backrest frame or to join structural members forming said backrest frame to each other.

A chair frame structure equipped with a backrest frame supporting a backrest and a main seat support unit to which are joined a seat and an upper end of a support column, a lower end of said support column being secured to chair legs, said main seat support unit being formed of a gas spring receiving base joined to said upper end of said support column and a seat support base joined to said gas spring receiving base and said seat, wherein:
said seat support base and said gas spring receiving base are joined with a blind rivet; and
blind rivets are used to join said main seat support unit and said backrest frame or to join structural members forming said backrest frame to each other.

A chair frame structure according to claim 1 wherein, in order to reinforce joints formed with said blind rivets: out of said seat support base, said gas spring receiving base, said main seat support unit, and said backrest frame, projected ribs or embossments are formed on one side of pairs of abutting surfaces; and holes or depressions into which said ribs or said embossments fit when joining with blind rivets are formed on surfaces of remaining sides of said pairs of abutting surfaces.

A chair frame structure according to claim 4 wherein, in order to prevent heads of said blind rivets from being projected, depressions capable of accommodating said heads or dish-shaped holes capable of accommodating said heads formed in a dish shape are provided where said blind rivets are inserted.

A chair frame structure according to claim 1 wherein:
said gas spring receiving base is made with a synthetic resin; and,
in a through hole formed as a truncated cone provided in said gas spring receiving base into which said upper end of said support column is fitted, a metal ring embedded using insert molding forms at least a hole surface abutting said upper end.

A chair frame structure according to claim 1 wherein:
said gas spring receiving base is made with a synthetic resin; and
at rivet insertion holes provided in said gas spring receiving base and through which said blind rivets are inserted, metal reinforcement members formed with holes corresponding to said rivet insertion holes and through which said blind rivets can be inserted are embedded using insert molding.

A chair frame structure according to claim 1 wherein:
said gas spring receiving base is formed with a U-shaped cross section that opens upward;
a plate-shaped reinforcement member covers an open top side of said U-shaped cross section in order to reinforce said gas spring receiving base; and
sides of said reinforcement member are joined to side walls of said gas spring receiving base using blind rivets.

A gas spring receiving base in a chair frame structure equipped with a main seat support unit to which are joined a seat and an upper end of a support column, a lower end of said support column being secured to chair legs, said gas spring receiving base forming said main seat support unit together with a seat support base joined to said seat, and said gas spring receiving base being joined to said upper end of said support column, wherein:
said gas spring receiving base is formed with a rivet insertion hole through which a blind rivet is inserted, said rivet insertion hole being formed at a position facing a rivet insertion hole provided on said seat support base and through which said blind rivet is inserted.

A gas spring receiving base in a chair frame structure according to claim 9 wherein:
said gas spring receiving base is made with a synthetic resin; and
said gas spring receiving base into which said upper end of said support column is fitted is provided with a through hole formed as a truncated cone, a metal ring being embedded using insert molding in said through hole to form at least a hole surface abutting said upper end.

A gas spring receiving base in a chair frame structure according to claim 9 wherein:
said gas spring receiving base is made with a synthetic resin; and
at rivet insertion holes provided in said gas spring receiving base and through which said blind rivets are inserted,
metal reinforcement members formed with holes corresponding to said rivet insertion holes and through which said blind rivets can be inserted are embedded using insert molding.

12. A method for making a chair frame structure that is equipped with a main seat support unit to which are joined a seat and an upper end of a support column having a lower end thereof secured to chair legs, said main seat support unit being formed of a gas spring receiving base joined to said upper end of said support column and a seat support base joined to said gas spring receiving base and said seat, wherein:

rivet insertion holes are formed previously in said gas spring receiving base and said seat support base at positions aligned with each other;

when assembling said chair frame structure, said rivet insertion holes of said gas spring receiving base and said seat support base are aligned with each other and a blind rivet is inserted from outside; and

said blind rivet is used to join said gas spring receiving base and said seat support base.

13. A method for making a chair frame structure equipped with a backrest frame supporting a backrest and a main seat support unit to which are joined a seat and an upper end of a support column, a lower end of said support column being secured to chair legs, wherein:

rivet insertion holes are formed previously in said main seat support unit and said backrest frame at positions aligned with each other;

when assembling said chair frame structure, said rivet insertion holes in said main seat support unit and said backrest frame are aligned with each other and a blind rivet is inserted from outside; and

said blind rivet is used to join said main seat support unit and said backrest frame.

* * * * *