US00RE46717E

(19) **United States**

(12) **Reissued Patent**

Piretti

(10) **Patent Number: US RE46,717 E**

(45) **Date of Reissued Patent: Feb. 20, 2018**

(54) CHAIR WITH A PIVOTING BACKREST

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(21) Appl. No.: **14/984,863**

(22) Filed: **Dec. 30, 2015**

Related U.S. Patent Documents

Reissue of:

(64) Patent No.: **8,998,321**
Issued: **Apr. 7, 2015**
Appl. No.: **14/275,695**
Filed: **May 12, 2014**

(30) **Foreign Application Priority Data**

Jul. 31, 2013 (IT) TO2013A0650

(51) **Int. Cl.**
B60N 2/02 (2006.01)
A47C 7/44 (2006.01)

(52) **U.S. Cl.**
CPC ***A47C 7/443*** (2013.01); ***A47C 7/44*** (2013.01)

(58) **Field of Classification Search**
CPC .. A47C 7/40; A47C 7/44; A47C 7/441; A47C 7/443; A47C 7/448; A47C 7/48
See application file for complete search history.

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(57) **ABSTRACT**

A chair having a fixed support structure including two side uprights, a backrest having two side portions, and a pair of elastic joints connecting said side portions of the backrest to said side uprights, wherein each of said elastic joints comprises: a bushing fixed to a respective side upright, a helical spring having a longitudinal axis, the helical spring having an upper end resting against a front wall of the bushing, a compression member resting against a lower end of the spring, an upper attachment fixed to a corresponding side portion of the backrest, and a rigid connecting rod having an upper end and a lower end.

5 Claims, 4 Drawing Sheets

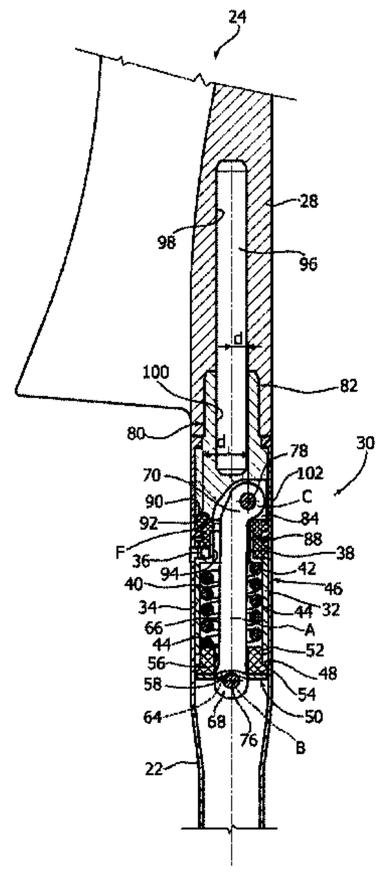


FIG. 1

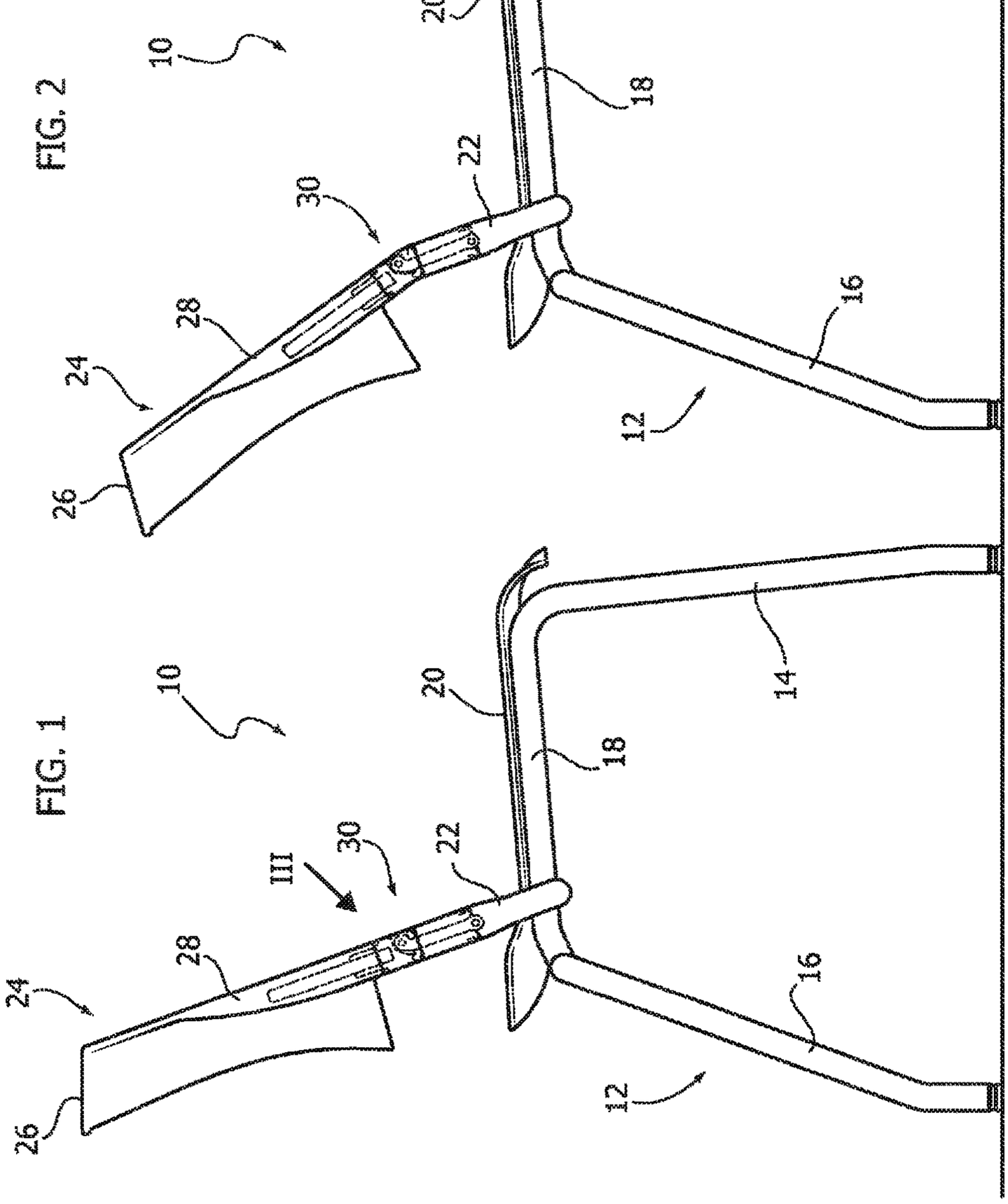
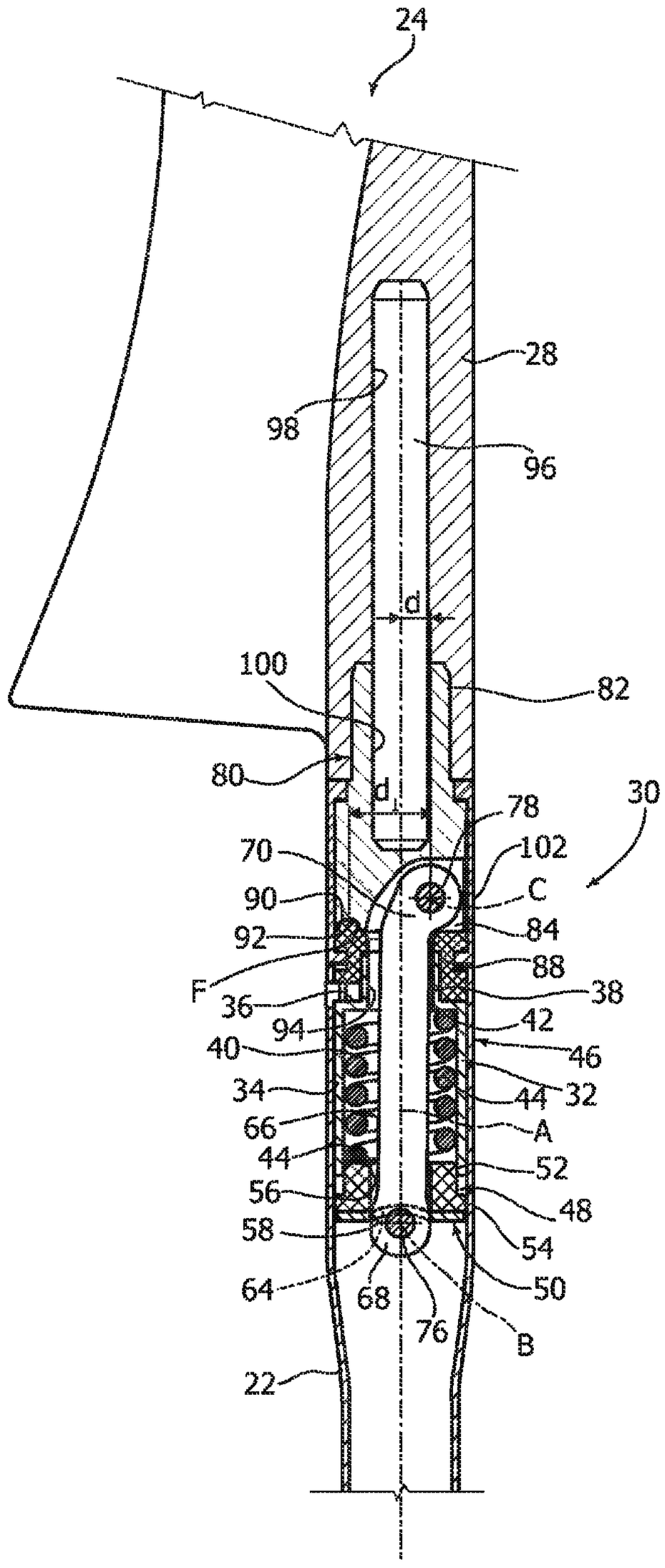


FIG. 2

FIG. 3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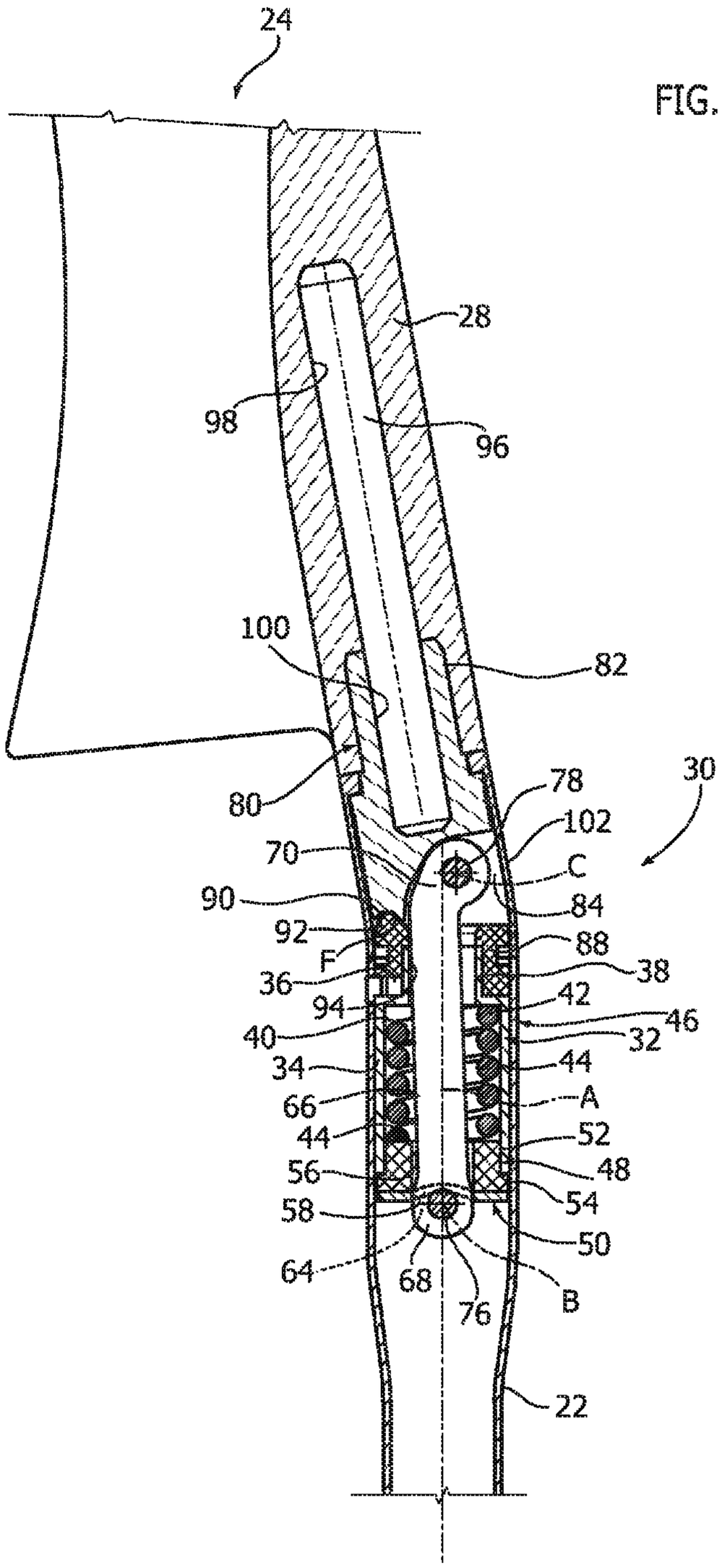
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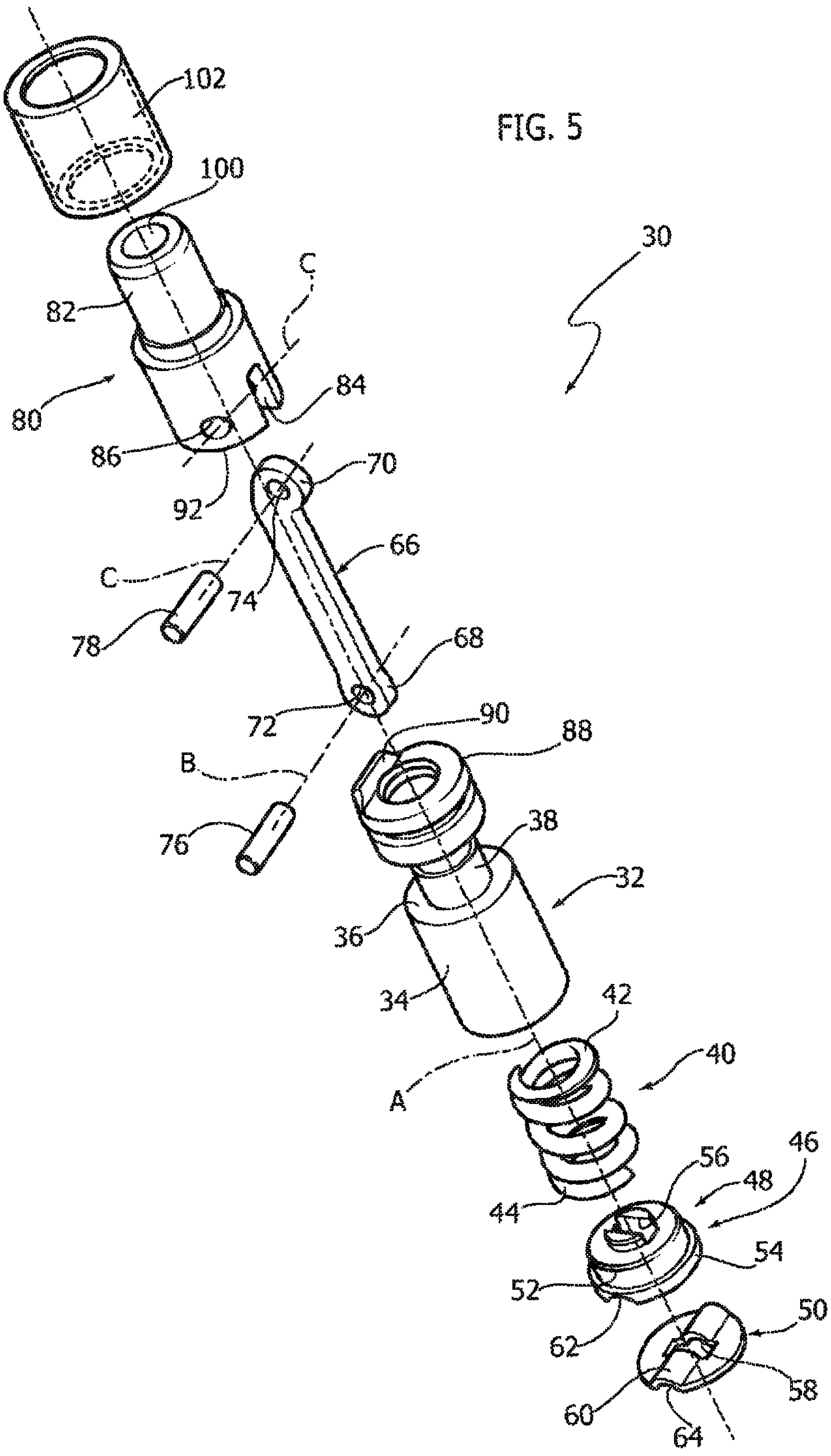
FIG. 4

FIG. 5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CHAIR WITH A PIVOTING BACKREST

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue; a claim printed with strikethrough indicates that the claim was canceled, disclaimed, or held invalid by a prior post-patent action or proceeding.

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims benefit of Italian patent application number TO2013A000650, filed Jul. 31, 2013, which is herein incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a chair with a pivoting backrest capable of tilting backwards under a thrust applied by the user's back.

2. Description of Prior Art

In the state of the art, there are various known solutions of chairs in which the backrest is connected to a fixed support structure by a pair of elastic joints, each of which comprises an upper support inserted into a tubular portion of the backrest, a lower support inserted into a tubular element of the fixed support structure and an elastic element, which allows an inclination between the upper support and the lower support.

For example, the document EP2183997 of the same applicant describes a chair comprising a base structure including two rear tubular elements, a backrest having two tubular portions and two elastic devices, each of which has an upper support inserted into a tubular portion of the backrest, a lower support inserted into the corresponding tubular element of the base structure and an elastic element deformable by bending to allow pivoting between the upper support and the lower support, wherein each of the elastic devices comprises a plurality of stacked sectors, arranged between the upper support and the lower support.

The elastic elements that are deformable by bending have the drawback of a limited elastic force for opposing the backward thrust applied by the user.

In principle, with elastic elements in compression formed, for example, by helical compression springs, it would be possible to increase the force provided by the elastic joints that contrast the backward thrust applied by the user on the backrest of the chair. However, with helical compression springs arranged coaxially to the side uprights of the backrest, the lever arm for the compression of the springs is limited.

SUMMARY OF THE INVENTION

The present invention aims to provide a chair with a pivoting backrest equipped with simple and robust elastic joints, capable of providing a high elastic force that counteracts the backward thrust applied by the user on the backrest of the chair.

According to the present invention, this object is achieved by a chair having the characteristics forming the subject of claim **1**.

The claims form an integral part of the disclosure provided in relation to the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described in detail with reference to the accompanying drawings, given purely by way of non-limiting example, wherein:

FIG. **1** is a side view of a chair according to the present invention in the rest position;

FIG. **2** is a side view corresponding to FIG. **1**, illustrating the backrest in the backwardly-inclined position;

FIG. **3** is an axial section of the part indicated by the arrow III in FIG. **1** in the rest position;

FIG. **4** is an axial section analogous to FIG. **3** in the position of maximum backward-inclination; and

FIG. **5** is an exploded perspective view of certain components of the elastic joint indicated by the arrow III in FIG. **1**.

DETAILED DESCRIPTION

With reference to FIGS. **1** and **2**, numeral **10** indicates a chair according to the present invention. The chair **10** comprises a fixed support structure **12** including a pair of front legs **14** and a pair of rear legs **16**. The front legs **14** and the rear legs **16** are connected together by means of upper connecting elements **18**. A seat **20** is fixed to the upper connecting elements **18** of the fixed support structure **12**.

The fixed support structure **12** comprises two tubular side uprights **22** extending upwards. The two side uprights **22** are fixed with respect to the support structure **12**. For example, the side uprights **22** can be fixed to the upper connecting elements **18**.

The seat **10** comprises a backrest **24** pivotally connected to the fixed support structure **12**. The backrest **24** comprises a backrest panel **26** having an arcuate shape, and two side portions **28** located laterally on opposite sides with respect to the backrest panel **26**. The side portions **28** can be formed in a monolithic manner with the backrest panel **26**. The side portions **28** of the backrest **24** are connected to the respective side uprights **22** of the fixed support structure **12** by means of respective elastic joints **30**.

With reference to FIG. **5**, each elastic joint **30** comprises a bushing **32** having a cylindrical wall **34** having an open lower end and an upper end fitted with a front wall **36**. The bushing **32** can be equipped with a projecting appendage **38** that projects upwards from the front wall **36**.

The elastic joint **30** comprises a helical spring **40** housed within the cylindrical wall **34** of the bushing **32**. The helical spring **40** has a longitudinal axis A coaxial to the axis of the cylindrical wall **34** of the bushing **32**. The helical spring **40** has an upper end **42** and a lower end **44**. The upper end **42** rests against the front wall **36** of the bushing **32**. The lower end **44** of the helical spring **40** rests on a compression member **46**. In the illustrated example, the compression member **46** comprises a body of plastic material **48** and a metal washer **50**. The body of plastic material **48** has a cylindrical portion **52** that couples, in a sliding manner, with the lower end of the bushing **32**. At the bottom of the cylindrical portion **52**, a radially-projecting shoulder **54** is formed. The body **48** of the compression member **46** has a through hole **56** with a rectangular section. The washer **50** rests against a lower surface of the body **48**. The washer **50** has a through hole **58** with a rectangular section aligned with the hole **56** of the body **48**. Preferably, the washer **50** has a convex deformed portion **60** that couples with a correspond-

ing concave seat **62** formed on the lower surface of the body **48**. The washer **50** has a concave seat **64** on the surface opposite to the convex projection **60**.

The elastic joint **30** comprises a rigid connecting rod **66** preferably made of metal. The connecting rod **66** preferably has a rectangular cross section. The connecting rod **66** has a lower end **68** and an upper end **70** equipped with respective holes **72**, **74**, engaged by respective pins **76**, **78**. The axes of the pins **76**, **78**, indicated with B and C, are parallel to each other, and transverse relative to the axis A of the spring **40**.

The elastic joint **30** comprises an upper attachment **80** having a shank **82**, which is fixed into a hole formed at the lower end of the respective side portion **28** of the backrest **24**. The upper attachment **80** has a groove **84** into which the upper end **70** of the connecting rod **66** is inserted. The upper attachment **80** has a transverse hole **86**, through which the upper pin **78** is inserted, which connects the upper end **70** of the connecting rod **66** to the upper attachment **80**, in an articulated manner.

The elastic joint **30** is preferably provided with a ring of plastic material **88** fitted on the appendage **38** of the bushing **32**. The ring **88** has a lower front surface, which rests on the front surface **36** of the bushing **32**, and an upper surface **90** against which a lower surface **92** of the upper attachment **80** rests. As is illustrated in FIGS. **3** and **4**, the upper surface **90** of the ring **88** and the lower surface **92** of the upper attachment **80** may have respective projecting and receding profiles in order to establish a shape coupling.

As is visible in FIGS. **3** and **4**, the bushing **32** of each elastic joint **30** is fixed, for example by hammering, to the upper end of the corresponding tubular upright **22** of the fixed support structure **12**.

The lower portion of the connecting rod **66** extends through the holes **56** and **58** of the body **48** and of the washer **50** of the compression member **46**. The first pin **76** connects the lower end **68** of the connecting rod **66** to the compression member **46** in an articulated manner. The pin **76** is housed in the concave seat **64** of the washer **50**. The central portion of the connecting rod **66** included between the ends **68**, **70** extends through the helical spring **40** and through a through hole **94** formed in the upper part of the bushing **32**.

The upper end **70** of the connecting rod **66** that projects above the ring **88** is bent forwards. In this way, the articulation axis C, between the upper end **70** of the connecting rod **66** and the upper attachment member **80**, is moved forward by a distance d (FIG. **3**) with respect to the longitudinal axis A of the spring **40**. The articulation axis B of the lower end **68** of the connecting rod **66** of the compression member **46** is essentially located on the longitudinal axis A of the spring **40**.

The effect of the forward displacement of the axis C with respect to the longitudinal axis A of the spring **40** is that of increasing, all other conditions being equal, the elastic torque applied by the springs **40** to the backrest **24**. When a backward thrust is applied to the backrest **24** by the user's back, the upper attachment **80** pivots backwards about a fulcrum point, indicated with F in FIGS. **3** and **4**. The fulcrum point F is defined by the point of mutual rotation between the contact surfaces of the upper attachment **80** and the ring **88**. The rotation of the upper attachment **80** about the fulcrum point F compresses the spring **40** by means of the connecting rod **66**. The return elastic force of the spring **40** has a lever arm of dimension d**1**, with respect to the pivot fulcrum F. The lever arm d**1** is increased thanks to the forward displacement of the articulation axis C. Consequently, at a constant axial force exerted by the spring **40**, thanks to the forward displacement of the articulation axis C, a higher torque on the backrest **24** is achieved, which counteracts the backward thrust applied by the user.

In the position of maximum backward inclination of the backrest, illustrated in FIG. **4**, the radial shoulder **54** of the compression member **46** rest against the lower end of the bushing **32** and forms a stroke end, which prevents further backward inclination of the backrest.

To stiffen the fixing area between the side portions **28** of the backrest **24** and the corresponding upper attachments **80**, each elastic joint **30** may be fitted with a stiffening pin **96** (FIGS. **3** and **4**) having an upper portion driven into a hole **98** of the side portion **28** of the backrest **24**, and a lower portion driven into a hole **100** of the respective upper attachment **80**.

Each elastic joint **30** can also be fitted with an protective elastic element **102** arranged coaxially around the contact area between the upper attachment **80** and the ring **88**, in order to avoid pinching of garments or parts of the body between the contact surfaces of the upper attachment **80** and the ring **88**.

Of course, without prejudice to the principle of the invention, the details of construction and the embodiments may vary widely with respect to those described and illustrated without departing from the scope of the invention as defined by the following claims.

The invention claimed is:

1. A chair comprising:

a fixed support structure including two side uprights; a backrest having two side portions; and

a pair of elastic joints connecting said side portions of the backrest to said side uprights,

wherein each of said elastic joints comprises:

a bushing fixed to a respective side upright;

a helical spring having a longitudinal axis, the helical spring having an upper end resting against a front wall of the bushing;

a compression member resting against a lower end of the spring;

an upper attachment fixed to a corresponding side portion of the backrest; and

a rigid connecting rod having an upper end and a lower end articulated, respectively, to the upper attachment and to the compression member about respective axes parallel to each other and transverse with respect to said longitudinal axis,

wherein the articulation axis between the upper end of the connecting rod and the upper attachment of each elastic joint is spaced forward with respect to said longitudinal axis.

2. A chair according to claim **1**, wherein each elastic joint comprises a ring of plastic material placed between said upper attachment and said bushing.

3. A chair according to claim **2**, wherein said ring and said upper attachment have respective surfaces in contact with each other, and shaped in such a way as to establish a shape coupling.

4. A chair according to claim **2**, wherein each of said elastic joints comprises a protective elastic element fitted on an area of contact between said upper attachment and said ring.

5. A chair according to claim **1**, wherein said connecting rod has an upper end portion bent forward and housed in a grove of said upper attachment, the upper end of said connecting rod being articulated to the upper attachment by means of a pin.

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