



US 20170055711A1

(19) **United States**

(12) **Patent Application Publication**

**Goldszer**

(10) **Pub. No.: US 2017/0055711 A1**

(43) **Pub. Date: Mar. 2, 2017**

(54) **FOLDING CHAIR WITH BULBOUS CHAIR ADJUSTMENT MECHANISM**

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(21) Appl. No.: **14/834,941**

(22) Filed: **Aug. 25, 2015**

**Publication Classification**

(51) **Int. Cl.**

*A47C 4/28* (2006.01)  
*A47C 1/031* (2006.01)  
*A47C 1/14* (2006.01)

(52) **U.S. Cl.**

CPC . *A47C 4/28* (2013.01); *A47C 1/14* (2013.01);  
*A47C 1/031* (2013.01)

(57) **ABSTRACT**

A folding chair with a bulbous chair adjustment mechanism. A chair back support frame pivotally attached to seat support frame covered with user support fabric or webbing. The X-frame chair has pivotal forward and rearward leg frames. A terminal vertical fore-leg end has a bulbous cap thereon. Armrest frames pivot on back support frame and the adjustment mechanism includes the bulbous cap and a yoke (stem and tines). The stem pivots on the armrest. The tines pivot on the bulbous cap and fore-leg end. The bulbous cap encloses the U-shaped tine space and substantially fills the U-shaped space such that armrest rotation relative to the forward leg frame causes yoke to swing forward and rearward and move back support frame up-and-back. The cap enclosed U-shaped tine space avoids finger pinch.

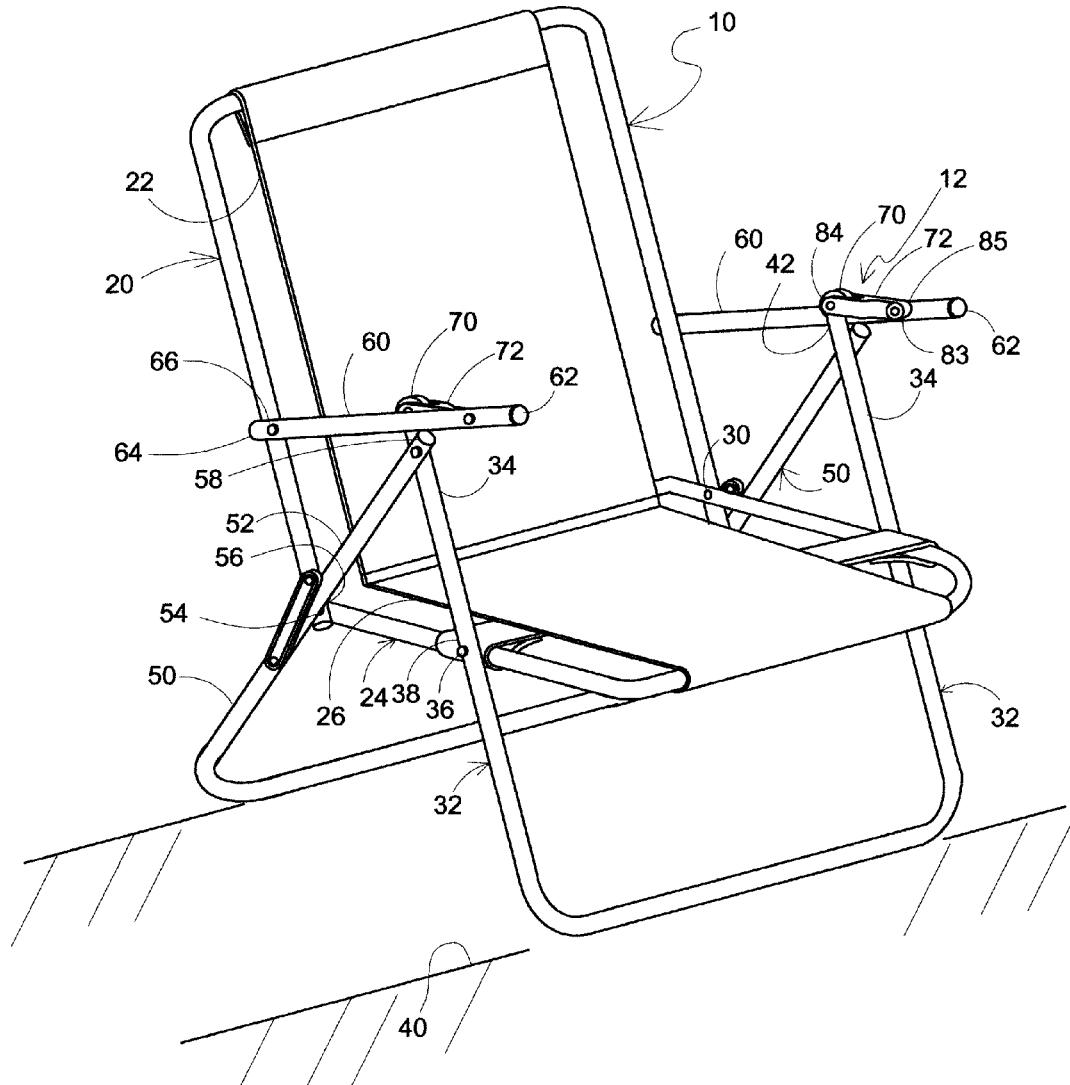


FIG.1  
Upright Position

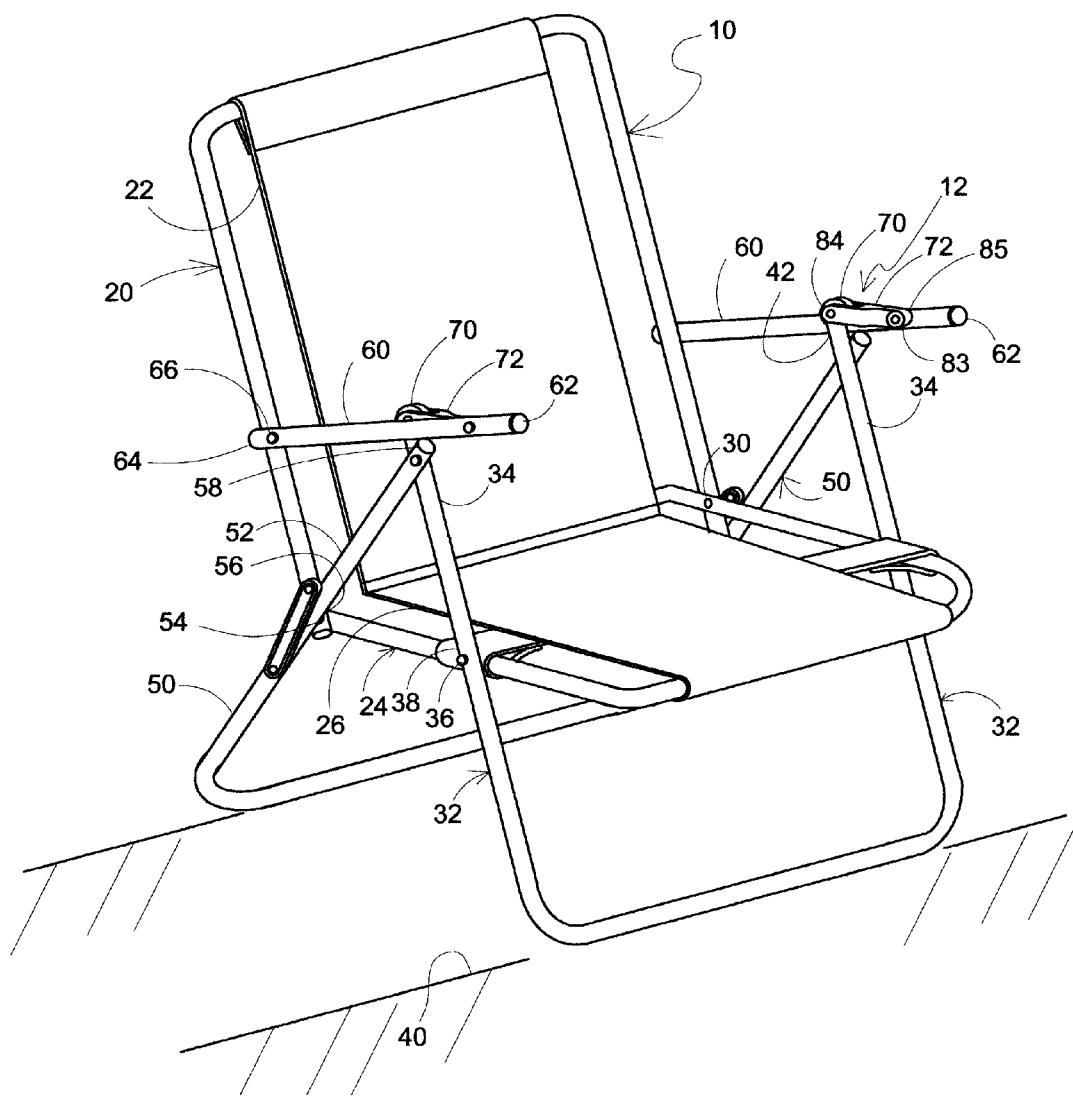


FIG.2  
Laid Back Position

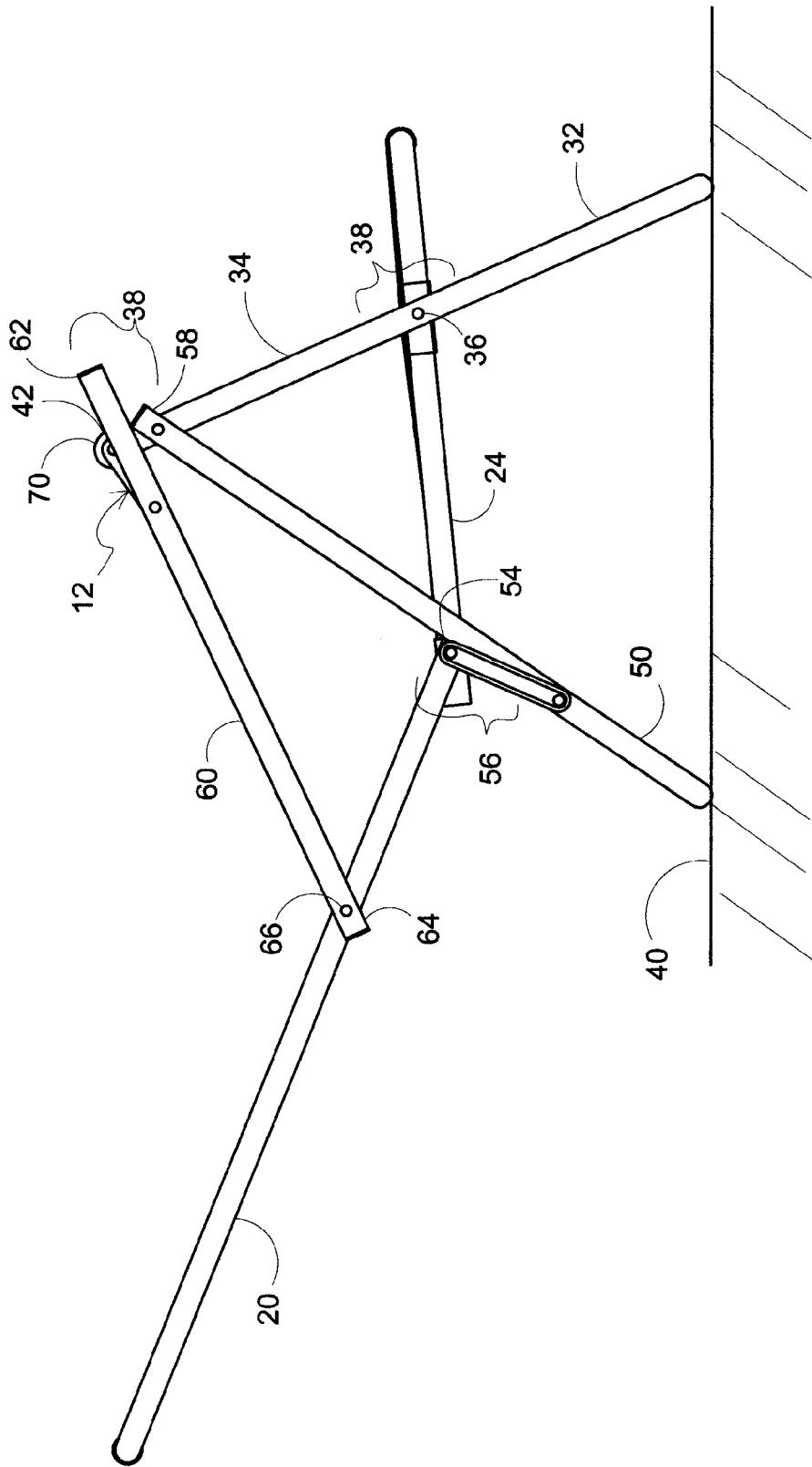


FIG.3  
Upright Position

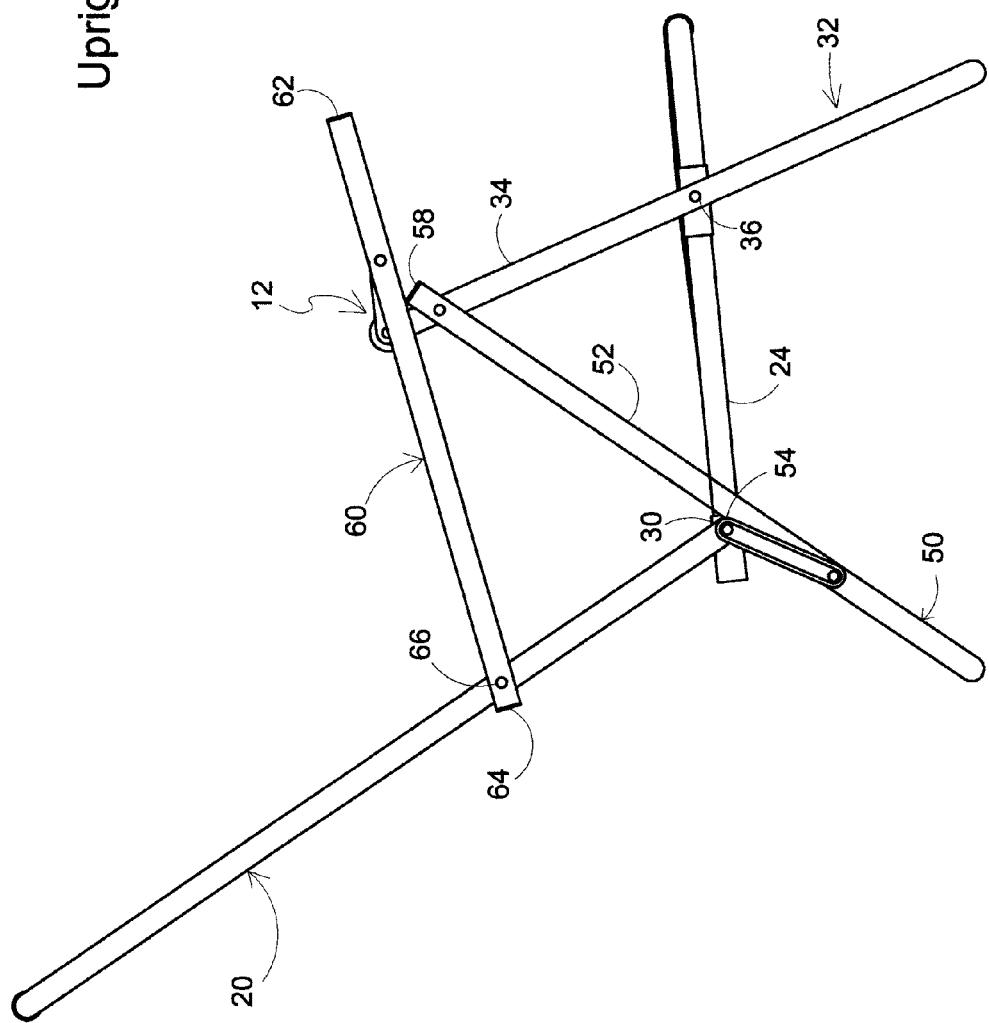


FIG.4

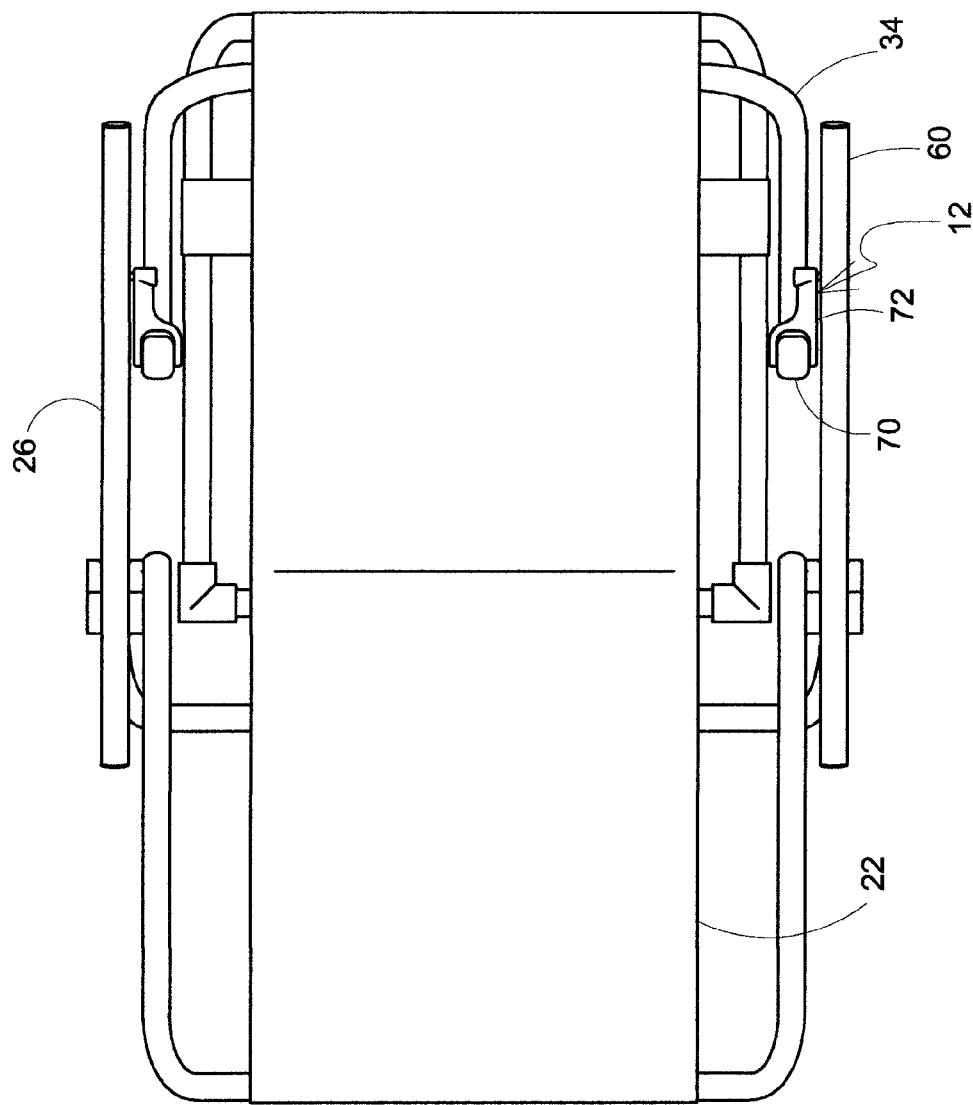


FIG.5  
Upright Position

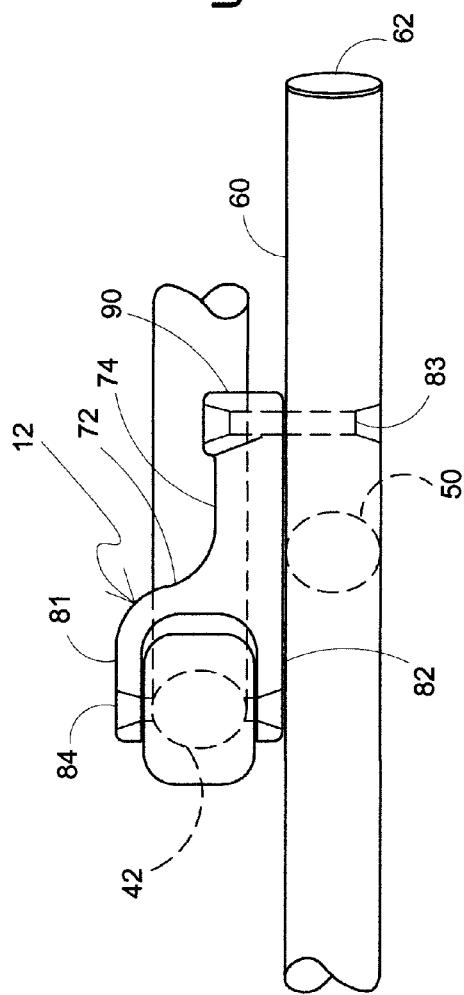


FIG.6  
Upright Position

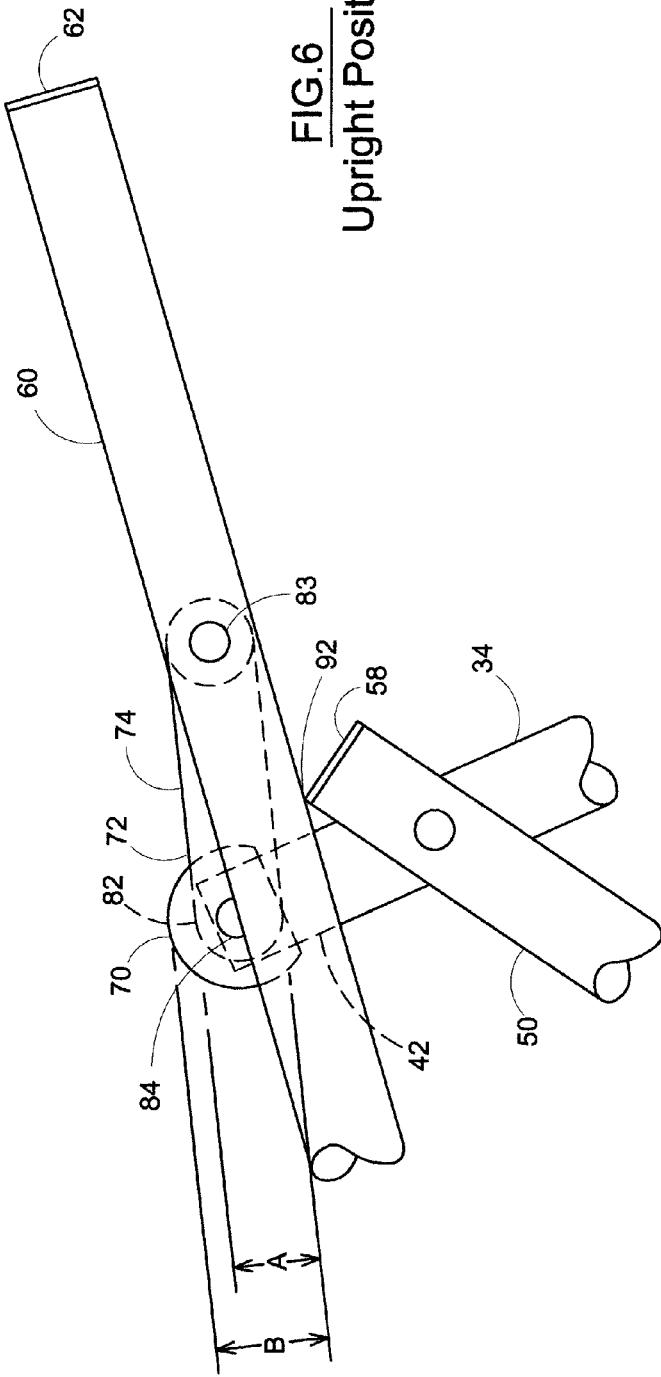
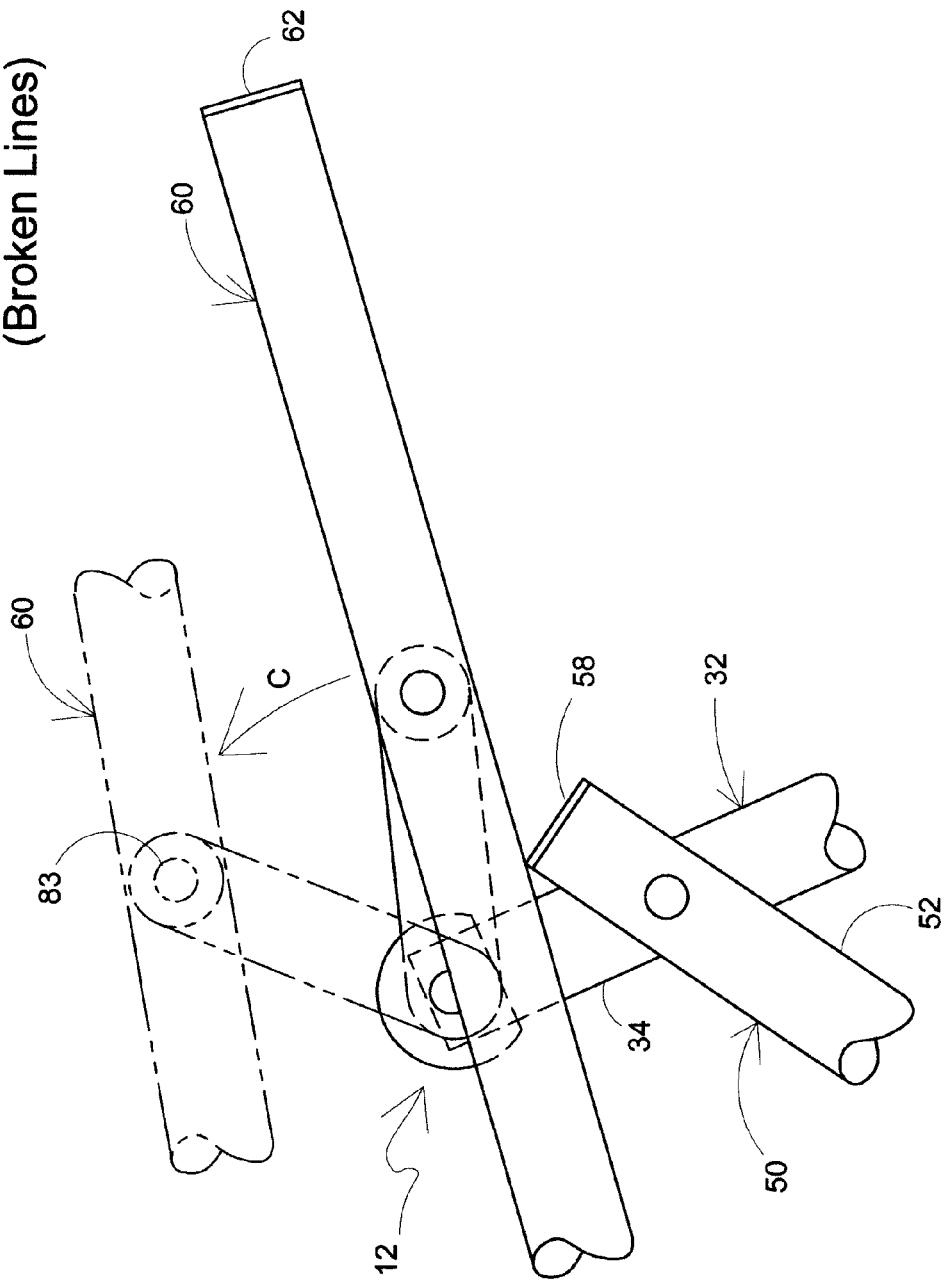


FIG.7  
Intermediate Position  
(Broken Lines)



**FIG.8**  
**Laid Back Position**  
**(Broken Lines)**

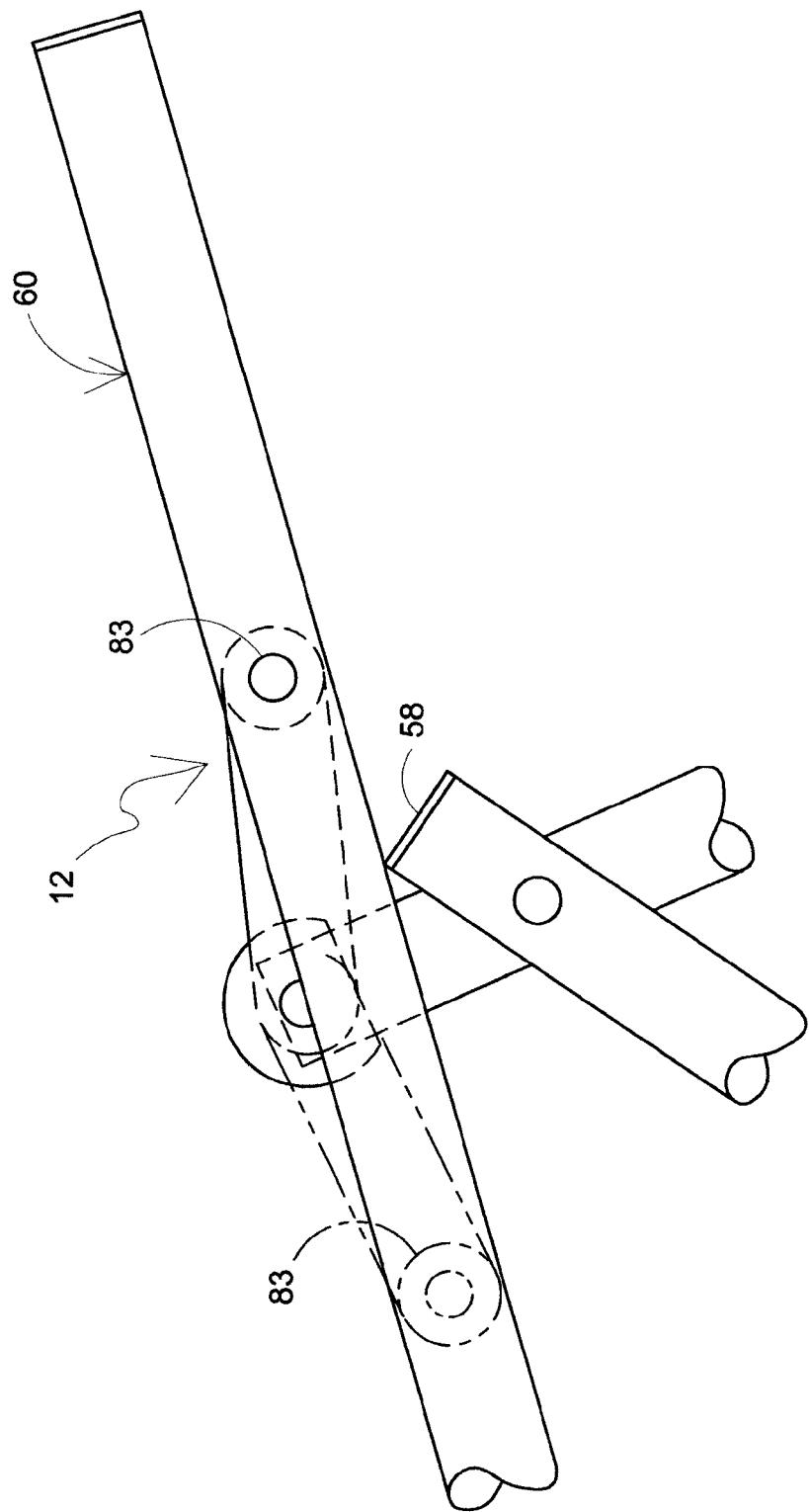


FIG.9

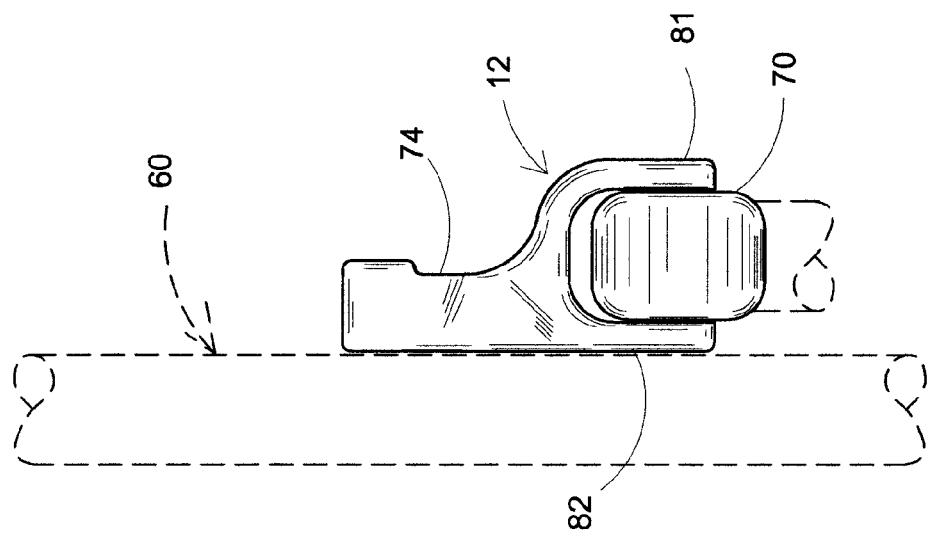


FIG.10

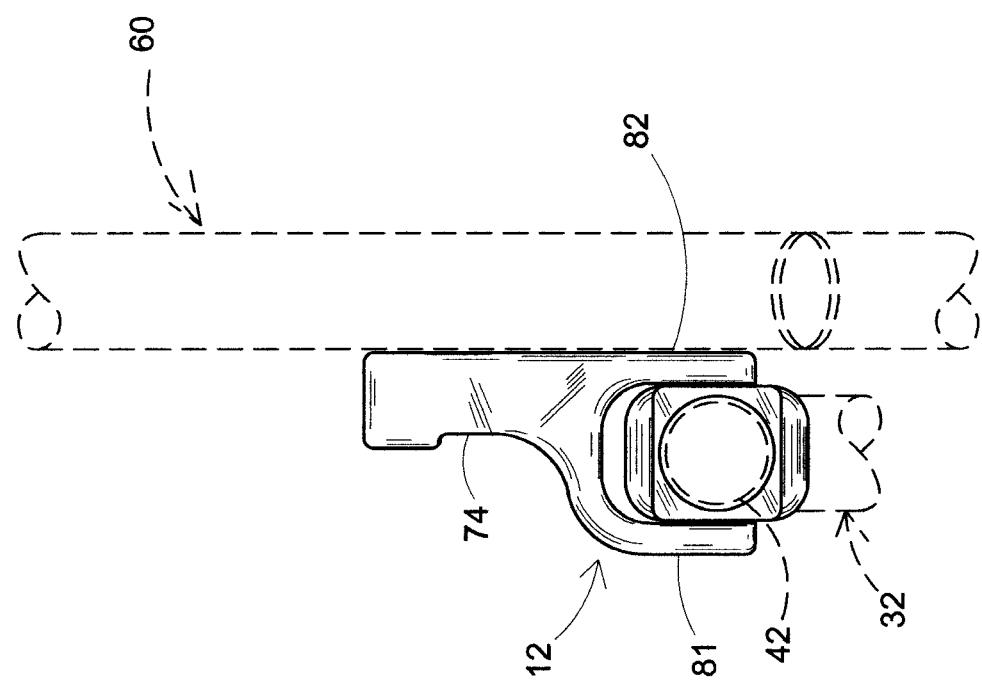
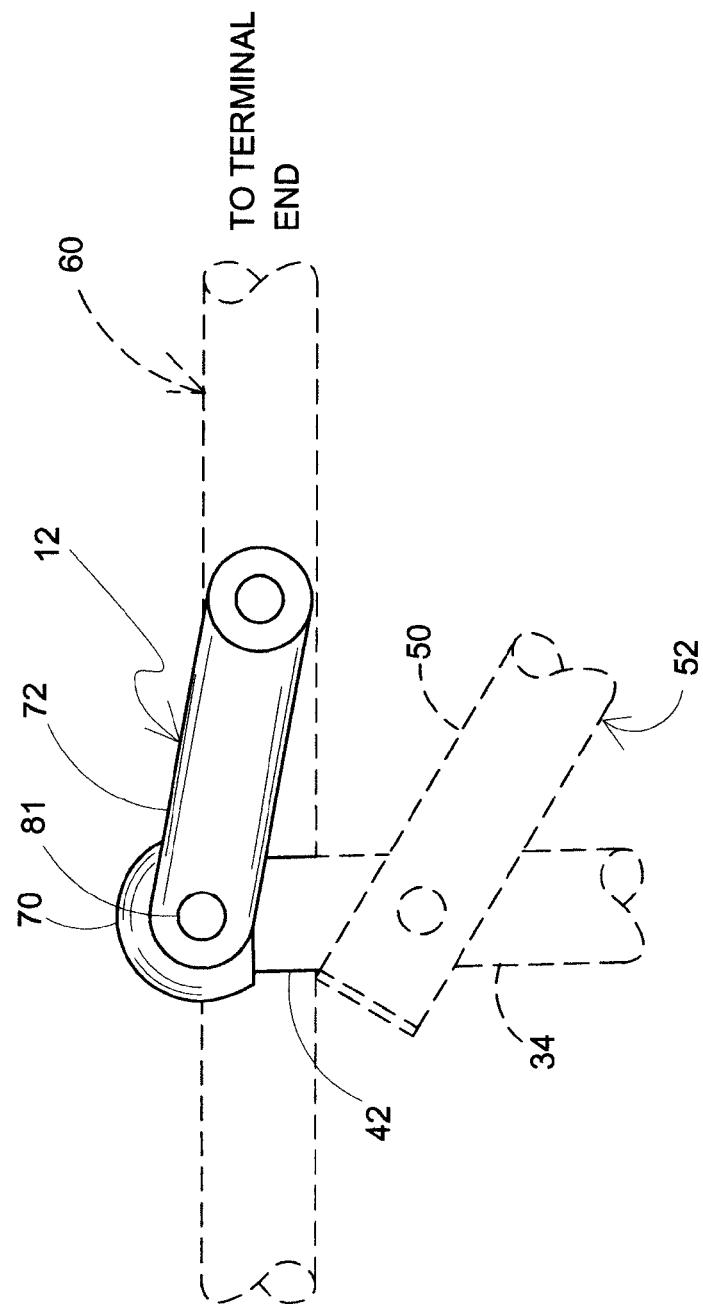


FIG.11



## FOLDING CHAIR WITH BULBOUS CHAIR ADJUSTMENT MECHANISM

**[0001]** The present invention relates to a folding chair and, more particularly, a folding beach chair with a bulbous chair adjustment mechanism which avoids or significantly reduces finger pinch accidents.

### BACKGROUND OF THE INVENTION

**[0002]** Folding chairs typically include forward facing legs ("forward" being relative to the ground plane or relative to the feet of the user) and rearward facing legs (the rearward legs being on the ground behind the forward legs which are near the user's feet). Generally the forward legs and the rearward legs form a folding X-frame structure with an upper region of the forward facing legs forming a back support frame. A seat frame is typically pivotally attached to the rearward facing legs and is pivotally attached at an intermediate position to the forward facing legs in a manner such that if the user lifts up the forward most portions of the seat frame while maintaining the back support frame relatively stable, the chair collapses and the forward leg frames are moved such that they are adjacent the rearward leg frames.

**[0003]** Additionally, users oftentimes want to adjust the reclining position of the back support frame with respect to the seat support frame. Simple mechanisms enable the user to "sit up" and to move the back support rearward to obtain a fully or partly reclined position wherein the user "lays back." However a problem has arisen regarding finger pinch accidents in the chair adjustment mechanism typically disposed between the armrest frame and either the forward facing legs or the rearward facing legs.

### OBJECTS OF THE INVENTION

**[0004]** It is an object of the present invention to provide a folding chair with a bulbous chair adjustment mechanism.

**[0005]** It is another object of the present invention to provide a folding beach chair which eliminates or substantially reduces the occurrence of finger pinch accidents with a bulbous chair adjustment mechanism.

**[0006]** It is an additional object of the present invention to provide a bulbous chair mechanism with a yoke as a single integral unit made of plastic wherein the bulbous portion of the adjustment mechanism is attached atop the terminal end of the forward leg frame (or the terminal end of the rearward leg frame) and the adjustment mechanism has a yoke structure pivotally attached to the bulbous member.

**[0007]** It is a further object of the present invention to provide a chair adjustment mechanism with a yoke having yoke tines spaced apart such that the bulbous cap on the forward leg frame (or rearward leg frame) substantially encloses the spaced apart region between the parallel, opposing yoke tines.

### SUMMARY OF THE INVENTION

**[0008]** The folding chair, preferably a beach chair, has a bulbous chair adjustment mechanism. The adjustment mechanism can either be in combination with an X-frame folding chair or the chair can encompass, as a single unit, the bulbous chair adjustment mechanism. The chair has a back support frame upon which is mounted a flexible back support to support the back of a seated person or user. The

flexible back support (and seat support) may be cloth or nylon or any type of useful webbing. The chair has a seat support frame which upon which is mounted a flexible seat for the seated person. The seat support frame is hinged to the back support frame. The chair has a forward leg frame with at least one substantially vertical first member pivotally attached at an intermediate location between a ground plane and a terminal vertical fore-leg end to the seat support frame. Stated otherwise, the pivot is intermediate the terminal fore-leg end and the ground. Typically, the leg frames are U-shaped and have two vertical fore-leg ends. The chair has a rearward leg frame having at least one substantially vertical second member pivotally attached at an intermediate location between a ground plane and a terminal vertical rear-leg end to one or the other or both the seat support frame and the back support frame. Typically two vertical rear-legs are employed. The pivot mechanism is between the seat support frame and the back support frame and usually has an intermediate swing bar member. The chair has at least one arm rest frame (typically two arm rests) having a free terminal end and an opposing rear end pivotally coupled to the back support frame.

**[0009]** The chair adjustment mechanism has a bulbous cap and a yoke. The bulbous end cap is attached to the terminal fore-leg end. The yoke has a stem and opposing yoke tines. The yoke stem is pivotally coupled to the armrest frame at an intermediate location (between the two armrest ends). The yoke tines are pivotally coupled to the bulbous end cap and the terminal fore-leg end such that the bulbous cap encloses the spaced apart yoke tines. In this manner, the rotation of the armrest frame relative to the forward leg frame causes the yoke to swing forward and rearward. The arm rest moves the back support frame relative to the seat support frame.

**[0010]** Further details of the preferred embodiments include the following features. The yoke tines form a substantially U-shaped space (the tines are spaced apart parallel each other) and the bulbous cap is cross-sectionally sized to substantially fill the U-shaped tine space. The bulbous cap has a rounded pillow shape extending vertically above the yoke tines. The yoke is a single, integral component made of plastic. The stem has a yoke terminal end which is pivotally attached to the arm rest frame. The tines and the stem are disposed in a single plane which rotates about the conjoined yoke and arm rest frame pivot. The terminal vertical rear-leg end abuts the arm rest frame and forms a stop for the yoke at either end of rotation about the yoke and arm rest frame pivot.

**[0011]** The basic chair adjustment mechanism structure, and some of these additional features, avoid or substantially eliminate finger pinch.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0012]** Further objects and advantages of the present invention can be found in the detailed description of the preferred embodiments when taken in conjunction with the accompanying drawings in which:

**[0013]** FIG. 1 diagrammatically illustrates a folding chair and, more particularly, a folding beach chair in accordance with the principles of the present invention.

**[0014]** FIG. 2 diagrammatically illustrates a side view of the chair in a reclined position.

**[0015]** FIG. 3 diagrammatically illustrates the chair in an upright position.

[0016] FIG. 4 diagrammatically illustrates a top view of the folding chair and the bulbous chair adjustment mechanism.

[0017] FIG. 5 diagrammatically illustrates a detail of the bulbous chair adjustment mechanism (top view).

[0018] FIG. 6 diagrammatically illustrates aside view of the chair adjustment mechanism.

[0019] FIGS. 7 and 8 diagrammatically illustrate an intermediate position of the chair mechanism with the arm rest frame 60 being rotated rearward with respect to forward leg frame 32 (FIG. 7) and a laid back position for the bulbous chair mechanism (FIG. 8).

[0020] FIG. 9 diagrammatically illustrates a top view detail of the bulbous chair adjustment mechanism.

[0021] FIG. 10 diagrammatically illustrates a bottom view of the bulbous chair adjustment mechanism.

[0022] FIG. 11 diagrammatically illustrates a detail of the bulbous chair mechanism from a viewpoint inboard the chair, that is, a view laterally outward from a point between opposing arm rest frames 60.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] The present invention relates to a folding chair, and more particularly, a folding beach chair with a bulbous chair adjustment mechanism.

[0024] FIGS. 1-4 are discussed concurrently herein. Similar numerals designate similar items throughout the drawings. The folding chair which, in the illustrated embodiment, is a folding beach chair, is designated as chair 10. A bulbous chair adjustment mechanism 12 enables the chair to be laid-back (as shown in FIG. 2) or to be configured in an upright position (as shown in FIG. 3). Chair 10 has back support frame 20 upon which is mounted a flexible back support 22. Back support 22 as well as back support frame 20 is adapted to support a back of a seated person. As shown in FIG. 1, back support frame 20 is U-shaped and the back support frame 20 has depending legs (not numbered) and an U-shaped bar spanning the U-shaped legs (the top cross bar not numbered). Flexible back support 22 loops around the top of the U-shaped bar of back support frame 20. The unnumbered back support frame is integral with the forward leg members in the illustrated embodiment.

[0025] The chair has a seat support frame 24 with a flexible seat 26 mounted on seat support frame 24. Similar to back support frame 20, seat support frame 24 is U-shaped and the flexible seat 26 is wrapped around the forward facing U-shaped bar of seat support frame 24. To provide additional support, a further flexible strap (unnumbered) extends between the U-shaped legs of the seat support frame 24. The transverse, flexible seat strap (unnumbered) provides additional support for a seated person disposed on flexible seat 26 of chair 10.

[0026] Seat support frame 24 is hinged at pivot 32 to back support frame 20. A backside crossbar (unnumbered) may span the rearward terminal ends of seat support frame 24 such that a transition seat element transitions from flexible seat 26 to flexible back support 22.

[0027] Forward leg frame 32 has at least one substantially vertical first member 34. The term "forward" refers to an element near the foot of the user (as compared to other chair components) such as forward leg frame 32 which is disposed at the fore-end of chair 10 with respect to ground plane 40. Forward leg frame 32 has a vertical first member 34 which

is substantially vertical notwithstanding the fact that it is at an angle with respect to a 90° vertical plane rising above ground plane 40. Vertical first member 34 of leg frame 32 is "substantially vertical" in that it rises above ground plane 40. Forward leg frame 32 is pivotally attached to the seat frame at pivot point 36 at an intermediate leg frame location 38 (intermediate ground plane 40 and terminal fore leg end 42). The pivot at pivot point 36 is at an intermediate location 38 and rotatably joins vertical first member 34 of forward leg frame 32 with seat support frame 24.

[0028] Rearward leg frame 50 has at least one substantially vertical second member 52. Vertical second member 52 is pivotally attached at pivot point 54 to other frame members at an intermediate location 56 between ground plane 40 and terminal rear leg end 58. Pivot point 54 attaches rearward leg frame 50 and either seat support frame 24 or back support frame 20. This rotational coupling between the rearward leg frame, the seat support frame and the back support frame is known in the art and may include a small pivoting bar (unnumbered). In any event, these three elements, the rearward leg frame, the seat support frame and the back support frame are all pivotally coupled together either directly or through an intermediary bar.

[0029] Chair 10 also includes at least one arm rest frame 60 having a free terminal fore end 62 and an opposing rear end 64. Opposing rear end 64 of the arm rest frame 60 is pivotally coupled at pivot point 66 to back support frame 20.

[0030] In the illustrated embodiment, the folding beach chair 10 includes two armrest frames 60 and the forward leg frame is U-shaped. Therefore, the forward leg frame 62 has two vertical first members 34 forms a U-shaped structure with a U-cross bar on ground plane 40. In a similar manner, rearward leg frame 50 is U-shaped and has two vertical second members 52 which are pivotally attached at intermediate locations to the seat frame and the back support frame. The terminal rear leg ends 58 are pivotally attached to the top region of the fore leg ends 42. The rear leg frame is also U-shaped. 100311 Chair adjustment mechanism 12 includes a bulbous end cap 70 and a yoke 72. FIG. 11 shows a detail of bulbous end cap 70. The term "bulbous" as used herein, refers to a substantially hemispherical structure as well as a structure which is square or rectangular with all vertically and horizontally exposed edges being greatly rounded. A yoke, as used herein, is defined as "a clamp or vise that holds a machine part in place or controls its movement or that holds two such parts together. A crosshead of relatively thick cross section, that secures two or more components so that they move together." Definition from Common Mechanical Engineering Terms, Computer-Aided Engineering—University of Wisconsin at [http://homepages.cae.wisc.edu/~me349/resources/engineering\\_terms.pdf](http://homepages.cae.wisc.edu/~me349/resources/engineering_terms.pdf); See also FIG. 16.2, pg. 221 showing a yoke in a knuckle joint in textbook "Mechanical Engineering Design: Principles and Concepts" by Siraj Ahmed, April 2014.

[0031] FIG. 1 shows chair adjustment end cap 70 attached to the terminal fore leg end 42. Two adjustment mechanisms are used, one for each arm rest frame 60, in the preferred embodiment.

[0032] FIGS. 5 and 6 are discussed concurrently herein. Chair adjustment mechanism 12 includes a yoke 72. Yoke 72 has a stem 74 and opposing yoke tines 81, 82. The stem 74 is pivotally coupled at pivot point 83 to the arm rest frame 60 at an intermediate position 85 on arm rest 60. See intermediate position 85 in FIG. 1. Returning to FIG. 5, yoke

tines **81, 82** are also pivotally coupled at pivot point **84** to bulbous end cap **70**. Yoke **72** as yoke tines **81, 82** at one end and a yoke stem **74** at the other end. Tines **81, 82** are pivotally attached to the end cap **70** and also to the terminal fore leg end **42**. The yoke tines **81, 82** are parallel each other and are spaced apart a distance **86**. The tines **81, 82** form a U-shaped space filled by the bulbous cap **70**.

[0033] One of the several important features of the present invention is that bulbous end cap **70** substantially encloses the spaced apart region **86** between yoke tines **81, 82**. This enclosure feature and the rounded bulbous end cap **70** reduces or eliminates finger pinch when the arm **60** rotates above legs **32, 50**.

[0034] FIGS. **6, 7** and **8** diagrammatically show rotation of the arm rest frame **60** relative to the forward leg frame **34** caused by yoke **12** swinging rearward from the upright chair position shown in FIG. **6** to the fully laid-back chair position shown in FIG. **8**. FIG. **7** shows, in dashed lines, an intermediate position between upright position in FIG. **6** in the fully laid-back position in FIG. **8**. The fully laid-back position in FIG. **8** is shown in dashed lines.

[0035] FIG. **5** shows that the yoke tines **81, 82** form a substantially U-shaped region with the parallel spaced apart tine legs. The lateral cross-section of the bulbous end cap **70** is sized to substantially fill this U-shaped space **86**. Pivot point **84** is substantially the axial centerline of bulbous end cap **70** and cap **70** is substantially on the longitudinal centerline of the yoke **72**.

[0036] As shown in FIG. **6**, bulbous end cap **70** has a rounded pillow shape that extends vertically above the yoke tines **81, 82**. In a preferred embodiment, the yoke **12** is a single, integral one piece unit made of plastic. Stated otherwise, yoke **12** and stem **74** and tines **81, 82** are a single piece of plastic. This structure also reduces finger pinch.

[0037] The yoke terminal end **90** in FIG. **5** is pivotally attached at pivot point **83** to the arm rest frame **60**. As shown in FIG. **6**, the tines **81, 82** and yoke stem **74** are disposed in a single plane A. The plane formed by stem **74** and tines **81, 82** is shown as plane A in FIG. **6** and the bulbous end **70** falls substantially within the yoke plane A as shown by plane B. The tines, stem and bulbous end rotate about pivot point **83** at the conjoined yoke **12** and arm rest frame pivot **83**.

[0038] The terminal rear leg end **58** abuts at edge **92** in FIG. **6** the arm rest frame **60** and forms a stop **92** for the yoke at either end of the rotation position as shown in FIGS. **6** and **8**.

[0039] Since the bulbous end is highly rounded and the cross-section of the bulbous end substantially fills the yoke tine U-shaped space **86** (FIG. **5**), the chair adjustment mechanism **12** eliminates or substantially reduces finger pinch accidents.

[0040] FIG. **9** shows the close abutment and complementary mating of bulbous end **70** and yoke tines **81, 82**. FIG. **9** also shows the highly rounded vertical and horizontal edges of the bulbous end **70**.

[0041] FIG. **10** shows a bottom view of the bulbous end and the yoke.

[0042] FIG. **11** is a view from an inboard position of the beach chair **10** showing that bulbous end **70** is attached to the terminal fore leg end **42** of forward leg **32**.

[0043] In an alternate embodiment, bulbous end cap **70** could be attached to the terminal rear leg end and the upper end portion of the forward leg end could act as the stop for

rotation against the arm **60**. This embodiment is within the scope and spirit of the print of the present claims.

[0044] The term "bulbous" as used herein refers to a substantially hemispherical structure and a structure which is square or rectangular with all vertically exposed edges being greatly rounded.

[0045] The claims appended hereto are meant to cover modifications and changes within the scope and spirit of the present invention.

What is claimed is:

1. In combination with a folding beach chair adapted for use by a seated person, a bulbous chair adjustment mechanism, the beach chair having a back support frame upon which is mounted a flexible back support for said seated person, a seat support frame which upon which is mounted a flexible seat for said seated person, said seat support frame hinged to said back support frame, a forward leg frame having at least one substantially vertical first member pivotally attached at an intermediate location between a ground plane and a terminal vertical fore-leg end to said seat support frame, a rearward leg frame having at least one substantially vertical second member pivotally attached at an intermediate location between a ground plane and a terminal vertical rear-leg end to one or the other or both said seat support frame and said back support frame, and at least one arm rest frame having a free terminal end and an opposing rear end pivotally coupled to said back support frame, the bulbous chair adjustment mechanism comprising:

a bulbous cap attached to said terminal fore-leg end; a partly rotatable yoke element having a stem and opposing yoke tines, said stem pivotally coupled to said arm rest frame at an intermediate location, said yoke tines pivotally coupled to said bulbous cap and said terminal fore-leg end such that the bulbous cap encloses the spaced apart yoke tines;

whereby rotation of said arm rest frame relative to said forward leg frame causes said yoke to swing forward and rearward and move said back support frame relative to said seat support frame.

2. The combination of the folding beach chair and the bulbous chair adjustment mechanism as claimed in claim 1 wherein said yoke tines are substantially U-shaped with parallel spaced apart tine legs defining a U-shaped space and said bulbous cap is crosssectionally sized to substantially fill said U-shaped tine space.

3. The combination of the folding beach chair and the bulbous chair adjustment mechanism as claimed in claim 2 wherein said bulbous cap has a rounded pillow shape extending vertically above said yoke tines.

4. The combination of the folding beach chair and the bulbous chair adjustment mechanism as claimed in claim 3 wherein said yoke is a single, integral component made of plastic.

5. The combination of the folding beach chair and the bulbous chair adjustment mechanism as claimed in claim 4 wherein said stem has a yoke terminal end which is pivotally attached to said arm rest frame.

6. The combination of the folding beach chair and the bulbous chair adjustment mechanism as claimed in claim 5 wherein said tines and said stem are disposed in a single plane which rotates about the conjoined yoke and arm rest frame pivot.

7. The combination of the folding beach chair and the bulbous chair adjustment mechanism as claimed in claim 6

wherein said terminal vertical rear-leg end abuts said arm rest frame and forms a stop for said yoke at either end of rotation about said yoke and arm rest frame pivot.

**8.** A folding chair with a bulbous chair adjustment mechanism comprising:

- a back support frame upon which is mounted a flexible back support adapted to support a back of a seated person;
- a seat support frame which upon which is mounted a flexible seat for said seated person, said seat support frame hinged to said back support frame;
- a forward leg frame having at least one substantially vertical first member pivotally attached at an intermediate location between a ground plane and a terminal vertical fore-leg end to said seat support frame;
- a rearward leg frame having at least one substantially vertical second member pivotally attached at an intermediate location between a ground plane and a terminal vertical rear-leg end to one or the other or both said seat support frame and said back support frame;
- at least one arm rest frame having a free terminal end and an opposing rear end pivotally coupled to said back support frame;
- a chair adjustment mechanism with a bulbous cap and a yoke;
- said bulbous cap attached to said terminal fore-leg end;
- said yoke having a stem and opposing yoke tines, said stem pivotally coupled to said arm rest frame at an intermediate location;
- said yoke tines pivotally coupled to said bulbous cap and said terminal fore-leg end such that the bulbous cap encloses the spaced apart yoke tines;
- whereby rotation of said arm rest frame relative to said forward leg frame causes said yoke to swing forward and rearward and move said back support frame relative to said seat support frame.

**9.** The folding chair with a bulbous chair adjustment mechanism as claimed in claim **8** wherein said yoke tines are substantially U-shaped with parallel spaced apart tine legs defining a U-shaped space and said bulbous cap is cross-sectionally sized to substantially fill said U-shaped tine space.

**10.** The folding beach chair with a bulbous chair adjustment mechanism as claimed in claim **9** wherein said bulbous cap has a rounded pillow shape extending vertically above said yoke tines.

**11.** The folding beach chair with a bulbous chair adjustment mechanism as claimed in claim **10** wherein said yoke is a single, integral component made of plastic.

**12.** The folding beach chair with a bulbous chair adjustment mechanism as claimed in claim **11** wherein said stem has a yoke terminal end which is pivotally attached to said arm rest frame.

**13.** The folding beach chair with a bulbous chair adjustment mechanism as claimed in claim **12** wherein said tines and said stem are disposed in a single plane which rotates about the conjoined yoke and arm rest frame pivot.

**14.** The folding beach chair with a bulbous chair adjustment mechanism as claimed in claim **13** wherein said terminal vertical rear-leg end abuts said arm rest frame and forms a stop for said yoke at either end of rotation about said yoke and arm rest frame pivot.

**15.** The folding beach chair with a bulbous chair adjustment mechanism as claimed in claim **9** wherein stem has a yoke terminal end which is pivotally attached to said arm rest frame.

**16.** The folding beach chair with a bulbous chair adjustment mechanism as claimed in claim **15** wherein said tines and said stem are disposed in a single plane which rotates about the conjoined yoke and arm rest frame pivot.

**17.** The folding beach chair with a bulbous chair adjustment mechanism as claimed in claim **16** wherein said terminal vertical rear-leg end abuts said arm rest frame and forms a stop for said yoke at either end of rotation about said yoke and arm rest frame pivot.

**18.** The folding beach chair with a bulbous chair adjustment mechanism as claimed in claim **9** wherein stem has a yoke terminal end which is pivotally attached to said arm rest frame and wherein said terminal vertical rear-leg end abuts said arm rest frame and forms a stop for said yoke at either end of rotation about said yoke and arm rest frame pivot.

**19.** The folding beach chair with a bulbous chair adjustment mechanism as claimed in claim **8** wherein said bulbous cap completely encloses and fills in the space between said rotatably mounted yoke tines to avoid finger pinch accidents.

**20.** A folding beach chair with a bulbous chair adjustment mechanism comprising:

- a back support frame upon which is mounted a flexible back support adapted to support a back of a seated person;

- a seat support frame which upon which is mounted a flexible seat for said seated person, said seat support frame hinged to said back support frame;

- a forward leg frame having at least one substantially vertical first member pivotally attached at an intermediate location between a ground plane and a terminal vertical fore-leg end to said seat support frame;

- a rearward leg frame having at least one substantially vertical second member pivotally attached at an intermediate location between a ground plane and a terminal vertical rear-leg end to one or the other or both said seat support frame and said back support frame;

- at least one arm rest frame having a free terminal end and an opposing rear end pivotally coupled to said back support frame;

- a chair adjustment mechanism with a bulbous cap and a yoke;

- said bulbous cap attached to said terminal rear-leg end;
- said yoke having a stem and opposing yoke tines, said stem pivotally coupled to said arm rest frame at an intermediate location;

- said yoke tines pivotally coupled to said bulbous cap and said terminal fore-leg end such that the bulbous cap encloses the spaced apart yoke tines;

- whereby rotation of said arm rest frame relative to said rearward leg frame causes said yoke to swing forward and rearward and move said back support frame relative to said seat support frame.