July 1, 1969 P. J. WILLIAMS 3,453,024

SINGLE ACTION CHAIR CONTROL

Filed Nov. 6, 1967 Sheet 1 of 2

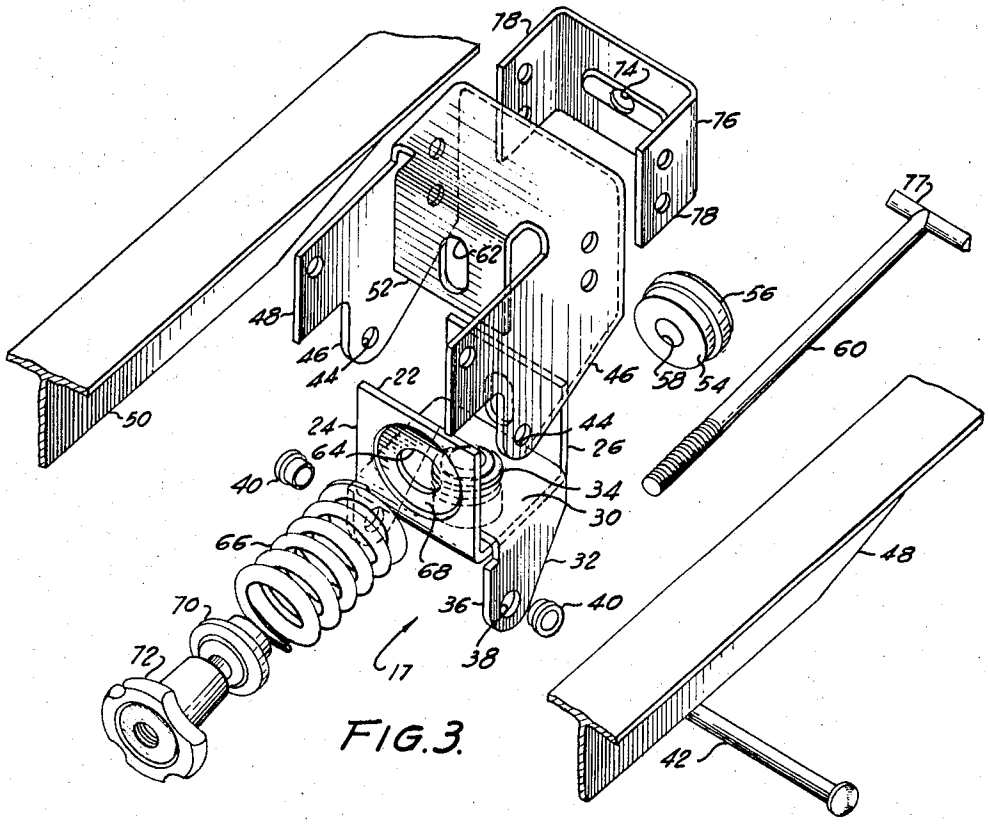


FIG. 3.

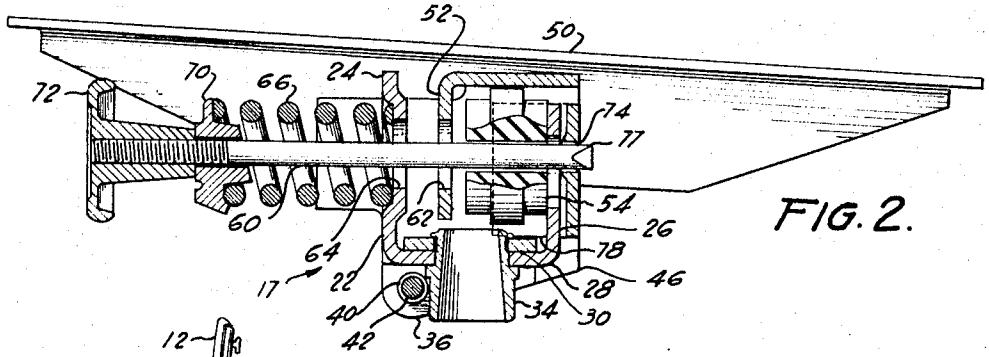


FIG. 2.

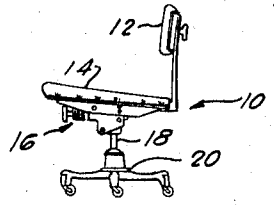


FIG. 1.

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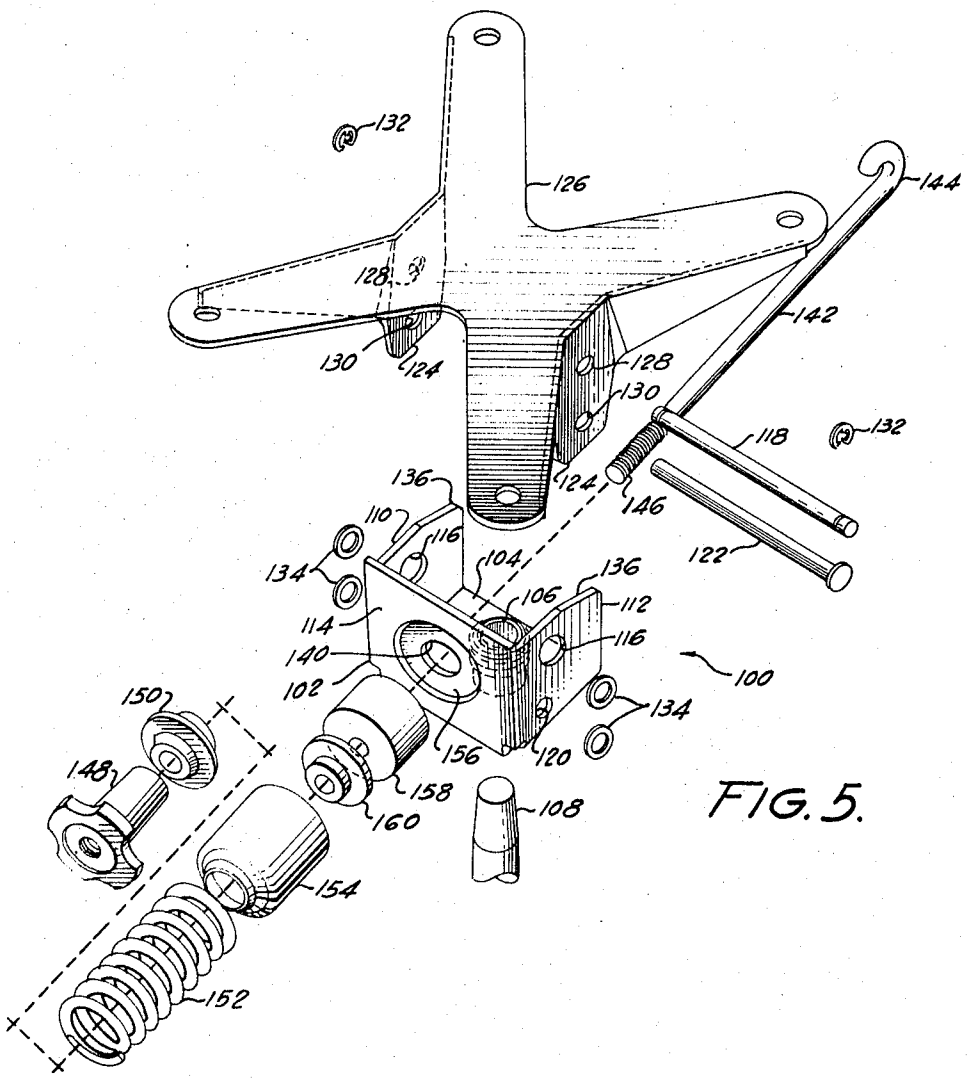


FIG. 5.

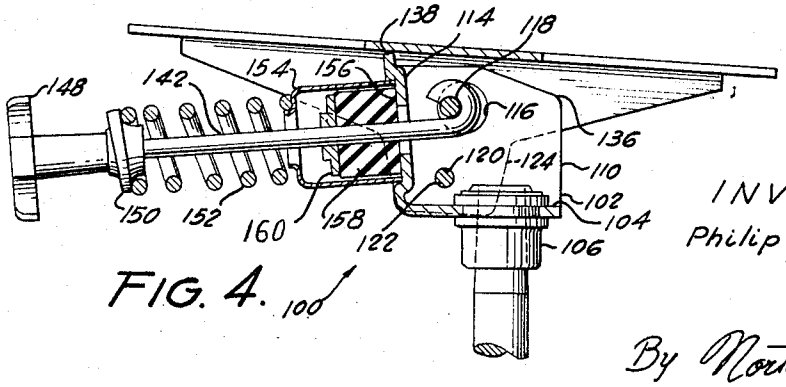


FIG. 4.

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SINGLE ACTION CHAIR CONTROL

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Int. Cl. A47c 3/00
U.S. Cl. 297—304 7 Claims

ABSTRACT OF THE DISCLOSURE

The following specification describes an improved chair control in which the weight of the chain and a chair occupant is initially balanced by a coiled spring, and a rubber spring introduces an additional counterbalancing force only in response to backward tilting of the seat or back.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates in general to spring biased chair controls and more particularly to a chair control utilizing one spring for counteracting the weight of the chair back and an additional spring for counteracting rearward tilting of the back only when the back is tilted rearwardly.

Summary of the invention

Spring biased chair controls require a spring for counteracting the weight of the chair back and the occupant. This spring must additionally resist the backward tilting movement, when the occupant leans against the chair back. For counteracting the load either one stiff spring or two lighter springs are used, but these are effective at all times to counteract the weight of the back, the weight of the occupant and the backward tilting movement. The occupant must therefore shift his weight against considerable resistance during ordinary movement in the chair resulting in a so-called stiff ride.

In addition, the construction of a stiff or heavy coiled spring or the use of two coiled springs with appropriate adjustment apparatus for counteracting both the chair weight and occupant movements is relatively expensive.

It is therefore proposed in the present invention to use a relatively light coil spring for balancing the weight of the chair back so as to provide a desired small amount of resilient resistance to normal movements by the occupant. A rubber spring is coaxially arranged with the coiled spring, but it is not subjected to load until after the occupant leans against the back so that the rubber spring adds its resistance to that of the coil spring only during the backward leaning movement when that resistance is required.

The use of the rubber spring and apparatus common to both springs for operating the springs also provides considerable economies of construction.

Accordingly, it is an object of the present invention to provide an improved chair control in which resistance to ordinary movements of the chair occupant are minimized and an additional restraining force is introduced only in response to backward tilting movements by the chair occupant.

It is another object of the present invention to provide a more economical chair control utilizing both a coil spring and a spring of inherently resilient material such as rubber for accommodating the full range of chair movements.

Other objects and features of the present invention will become apparent on examination of the following specification, claims and drawings.

Description of the drawings

FIG. 1 is a schematic illustration of a chair incorporating one embodiment of a chair control utilizing the principles of the present invention;

FIG. 2 is a sectional side elevation of the chair control employed in the chair of FIG. 1;

FIG. 3 is an isometric view of the sectional chair control shown in FIG. 2 with the parts in displaced or exploded position to better illustrate their form or relationship;

FIG. 4 is a sectional view of another chair control incorporating the invention; and

FIG. 5 is an isometric view of the chair control shown in FIG. 4.

Description of the embodiment shown in FIGS. 1–3

In FIG. 1 a chair is illustrated by the reference character **10**. The chair comprises a chair back **12** and a chair seat **14** carried by a chair control **16**. The chair control **16** is in turn carried by a post **18** supported by a pedestal **20**.

The chair control **16** comprises a spider horn assembly **17** including a U-shaped bracket **22** having upwardly directed vertical legs **24** and **26** and a back leg **28** against which a back leg **30** of a second U-shaped bracket **32** is engaged. The back legs of the two brackets are staked to a post receiving member **34**. The post **18** is received in the post receiving member **34** for supporting the chair control.

The bracket **32** has side legs **36** which extend downwardly and each side leg **36** has an aperture **38** for receiving a respective bearing **40** through which a pivot pin **42** passes. The pivot pin **42** also passes through apertures **44** in respective side legs **46** of a frame member or third U-shaped bracket **48**. The side legs **46** extend forwardly of the axis of post **18** and the apertures **38** and **44** are located forwardly of the post axis so that the pivot axis of the bracket **48** is in front or forward of the post. The side legs **46** are appropriately secured to spider arms **48** and **50**, which in turn carry the back **12** and the seat **14** so that both seat and back pivot with bracket **48** about the axis of pin **42**.

The back leg of bracket **48** is located in a plane above the rear leg **26** of bracket **22**. A tang **52** depends from the front of back leg **48** and the tang extends between the bracket legs **24** and **26** to form a pocket for the receipt of an annular neoprene or rubber spring **54** of 60 to 70 durometer and about 1¼″ diameter.

The spring **54** has an annular or peripheral bead **56** intermediate opposite ends and a centrally located hole **58** through which a rod **60** passes. The rod **60** passes through a slot **62** in tang **52**, an opening **64** in the front leg **24** of bracket **22** and its extending end is encircled by a helically wound coil spring **66**.

The spring **66** is nested at one end in a recess **68** encircling opening **64** and its other end is nested in a thrust bearing **70** which is held engaged with the spring **66** by a hand nut **72** threaded on the rod end. The opposite rod end extends through a passageway **74** in the back leg of a last U-shaped bracket **76** and a stop **77** formed on the opposite rod end engages with bracket **76** to prevent forward movement of the rod and enable spring **66** to be adjustably tensioned by the threading of the nut **72** to bring the back wall of bracket **76** against the leg **26** of bracket **22**. Side legs **78** on bracket **76** overlap leg **26** and are secured to legs **48**. The rubber spring between tang **52** and leg **26** is therefore confined, while bead **56** engages against the back leg of bracket **48** with tang **52** spaced forwardly of the rubber spring **54**. This enables the spring **54** to be placed under compression as the chair back tilts rearwardly to engage tang **52** with the front face of the spring **54**.

Spring 54 requires approximately a 250 pound load to compress 3/16" while spring 66 has a load rating of about 680 pounds. This compares with a single heavy spring construction, formerly used, which has a load rating between 840 to 1100 pounds.

As previously mentioned the spring 66 is tensioned by adjustment of the nut 72 to provide a desired degree of spring tension holding the back 12 and seat 14 in a desired generally vertical and horizontal plane, respectively, since the weight of the back and seat normally tend to pivot the bracket clockwise as seen in the drawings, about the axis of pin 42. This also compensates for the weight of the occupant whose center of gravity will often be located to the rear of the pivot axis at pin 42 and permits the occupant to move with relatively little resistance since the spring 66 is light and is the only spring resisting movement at that time.

When the occupant shifts his weight rearwardly against back 12, pressure is exerted through the bracket or support member 48 secured to bracket 76 against the stop 72, thereby compressing spring 66 farther. Simultaneously the lower surface of the back leg of bracket 52 presses downwardly on the bead 56 of spring 54 so that some additional resistance to rearward tilting is added. When rearward tilting reaches about 5°, the tang 52 engages the end face of spring 54 to compress the spring 54 between tang 52 and leg 26 to introduce needed pressure resisting rearward tilting until the back leg of bracket 48 engages the top surface of leg 26 to stop rearward tilting. On forward tilting the tang 52 moves from the forward surface of spring 54 to thereby relieve the pressure exerted by the spring 54 and thereafter the load is only under resistance of spring 66.

Description of the embodiment shown in FIGS. 4 and 5

In FIGS. 4 and 5 a second or preferred embodiment of a chair control incorporating the principles of the invention is indicated by the reference character 100. The chair control 100 comprises a first support bracket or spider horn 102 having a bottom wall 104 in which a post support member 106 is staked for receiving a chair post 108.

The spider horn 102 has a pair of integrally formed spaced side walls 110 and 112 and a front wall 114 extending between the two side walls. The side wall 110 has an aperture 116 aligned with an aperture 116 in wall 112 located forwardly of the post axis for receiving a pin 118. The apertures 116 are larger than the pin 118 to permit movement of the pin 118 relative thereto. A second aperture 120 in wall 110 and located forwardly of the post axis is aligned with a second aperture 120 in wall 112 for receiving a rivet 122.

Straddling the side walls 110 and 112 are a pair of depending side walls 124. Walls 124 are integrally formed on an X-shaped integrally formed seat support member 126 on which the chair seat and back are mounted. The depending walls 124 each have a pair of apertures 128 and 130 aligned with apertures 116 and 120, respectively, for receiving the pin 118 and rivet 122, respectively. A pair of retaining rings 132 are provided to prevent axial movement of pin 118 and both the pin 118 and rivet 122 are provided with thrust washers 134. Stop surfaces 136 are provided along the upper edge of walls 110 and 112 to engage the seat support for limiting clockwise or rearward pivoting of the seat support and a stop surface 138 along the upper edge of wall 114 limits forward or counterclockwise pivoting as seen in FIGS. 4 and 5 of the seat support about the axis of rivet 122.

The front wall 114 of the spider horn 102 has a large aperture 140. A rod or bolt 142 passes through aperture 140, which is large enough to permit the bolt to rotate about rivet 122. The bolt 142 has a hook 144 at one end for engaging over pin 118. Threads 146 are provided at the opposite end of bolt 142 for receiving a hand nut 148.

Nut 148 bears against a thrust member 150 which in turn bears against one end of a coil spring 152 similar to spring 66. The other end of spring 152 is seated against the back end of a cup-shaped member or shell 154. The open end of shell 154 seats in a recess 156 formed in wall 114 and encircling aperture 140. One end of a cylindrical rubber spring 158 carried by bolt 134 and similar to spring 54 is also nested in the recess 156 and a thrust collar 160 fixed to bolt 134 bears against the opposite end of spring 156.

Threading the nut 148 inwardly or outwardly on bolt 142 compresses spring 152 accordingly against the shell 154 engaging the spider horn 102. Since the spring is relatively light, little force is required to adjust the spring compression for balancing the chair seat and back about the axis of rivet 122 and thereby compensate for the location of the center of gravity of the seat and back. The spring pressure is exerted against the thrust member 150, nut 148 and bolt 142 to the pin 118 together with the seat support 126 to urge the chair seat and back forwardly or counterclockwise as seen in FIGS. 4 and 5 about the axis of rivet 122 with the apertures 116 in walls 110 and 112 being large enough to accommodate the forward movement until either support 126 engages wall 114 or pin 118 engages the forward edge of each aperture 116. By selecting the proper spring compression, the weight of the chair occupant is also balanced.

When the chair occupant leans against the chair back, the seat support 126 and pin 118 pivot backwards about rivet 122 to pull the bolt 142 backwards and compress the spring 152 additionally. Simultaneously with the backwards or pivoting movement about rivet 122 the thrust collar 160 starts to compress the rubber spring 158 against the front wall of the spider horn to thereby add to the force resisting backward pivoting.

The foregoing constitutes a description of an improved chair control whose inventive concepts are believed set forth in the accompanying claims.

What is claimed is:

1. A chair control for use in controlling the position of a support member relative a chair post, the improvement comprising means for supporting said member on said post for pivotal movement about one axis, a first spring coupled to said post, a second spring coupled to said post independently of said first spring, means for storing a force in said first spring only and for applying a force stored in said first spring to said member for biasing said member in one direction about said axis and means movable only in response to the pivoting movement of said member against said biasing force for storing a force in said second spring independently of the force stored in said first spring to develop an additional force opposing said pivoting movement against said bias.

2. A chair control for use in tiltably supporting a chair back on a chair post adapted to be positioned in a vertical plane, the improvement comprising means for pivotally supporting said back on said post along a pivot axis perpendicular to the axis of said post, a rod coupled to said back for movement therewith, a rubber spring carried by said rod, means for preventing movement of one end of said spring in one direction relative said post along the axis of said rod, a coiled spring carried by said rod, means for preventing movement of one end of said coiled spring relative said post along the axis of said rod, means for adjustably coupling the opposite end of said coiled spring to said rod for storing a force in said coiled spring only and applying said force as a bias force from said coiled spring through said rod to said back for balancing the weight of said back about said pivot axis, and means movable with said back for stressing said rubber spring against said rubber spring movement preventing means only in response to the pivoting of said back against said bias force to develop an additional force opposing pivoting of said back about said pivot axis against said bias force.

3. The chair control claimed in claim 2 in which said coil spring has a load rating of less than 700 lbs.

4. A chair control for use in tiltably supporting a chair back on a chair post adapted to be positioned in a vertical plane, the improvement comprising means for pivotally supporting said back on said post along a pivot axis perpendicular to the axis of said post, a rod coupled with said back for movement therewith, an annular rubber spring encircling said rod and having opposite ends, means preventing movement of one end of said rubber spring in a predetermined direction relative said post along the axis of said spring, a coiled spring encircling said rod and having opposite ends, means preventing movement of one end of said coiled spring in said predetermined direction relative said post along the axis of said coiled spring, means for adjustably coupling the opposite end of said coiled spring to said rod to apply a bias force only from said coiled spring to said rod for balancing the weight of said back about said pivot axis, and means movable with said back for stressing said rubber spring against said rubber spring movement preventing means only in response to the pivoting of said back against said bias force for developing an additional force to oppose the pivoting of said back against said bias force about said pivot axis.

5. A chair control including a support member for use in supporting a chair occupant on a chair post, the improvement comprising a U-shaped spider horn having a back wall for receiving said post, integrally formed side walls on said support member overlappingly positioned relative the side walls of said U-shaped spider horn, a pivot member extending through said side walls for pivotally supporting said support member on said post along a pivot axis perpendicular to the axis of said post, a rod coupled to said support member for movement therewith and extending in a direction transverse to said pivot axis, a rubber spring encircling said rod, a stop wall formed on said U-shaped spider horn between the side walls of said horn with said stop wall having a passageway receiving said rod for axial movement of said rod, said stop wall engaging one end of said rubber spring for preventing movement of a portion of said rubber spring in a predetermined axial direction of said rod relative said post, a coiled spring having opposite ends, a cup-shaped member encircling said rubber spring with the open end of said cup-shaped member engaged against said stop wall and the back wall of said cup-shaped member engaged with one end of said coiled spring for preventing movement of said one end of said coiled spring in said predetermined axial direction of said rod relative said post, means for adjustably coupling the opposite end of said coiled spring with said support member to store a force in said coiled spring only for providing a bias force to balance the weight of said back about said pivot axis, and a thrust member fixed to said rod to apply a force to the end of said rubber spring opposite said rubber spring one end only in response to pivoting of said back against said bias force for independently stressing said rubber spring against said stop wall to develop an additional force to oppose the pivoting of said back about said pivot axis against said bias force.

6. The chair control claimed in claim 5 in which said pivot member for pivotally supporting said support includes a pin movable with said back support, and said rod has one end engaged with said pin for movement therewith.

7. A chair control for use in tiltably supporting a chair back on a chair post adapted to be positioned in a vertical plane, the improvement comprising a U-shaped bracket fixed to said post, a support bracket fixed to said back and having a pair of integrally formed depending walls for placement in overlapping position with the side legs of said U-shaped bracket, means extending through all of said side legs for pivotally supporting said back on said post along a pivot axis perpendicular to the axis of said post and forwardly of the axis of said post, a rod coupled to said back for movement therewith and extending in a direction transverse to said pivot axis, a rubber spring carried by said rod, one leg fixed to said post for engaging one end of said rubber spring for preventing movement of one end of said spring in one direction relative said post along the axis of said rod, said one leg having a passageway for movably receiving said rod, a coiled spring carried by said rod, another leg fixed to said post for engaging one end of said coiled spring for preventing movement of one end of said coiled spring relative said post along the axis of said rod, said other leg having a passageway for movably receiving said rod, means for adjustably coupling the opposite end of said coiled spring to said rod for storing a force in said coiled spring only and applying said force as a bias force from said coiled spring through said rod to said back for balancing the weight of said back about said pivot axis, and a tang on said back support bracket extending between the planes defining the side legs of said U-shaped bracket and having a passageway for movably receiving said rod with said tang being movable with said back for compressing said rubber spring against said one leg only in response to the pivoting of said back against said bias force to develop an additional force opposing pivoting of said back about said pivot axis against said bias force.

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