June 1, 1954

J. B. BENNETT

CHAIR

2,679,893

Original Filed Dec. 7, 1950

3 Sheets-Sheet 1

Fig. 1

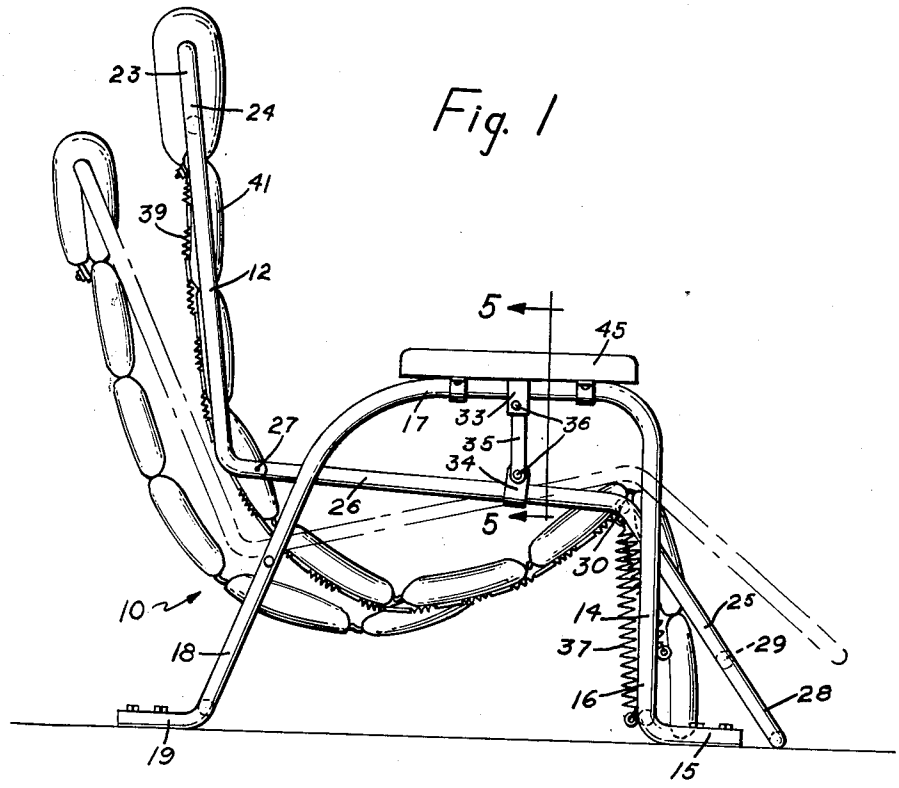
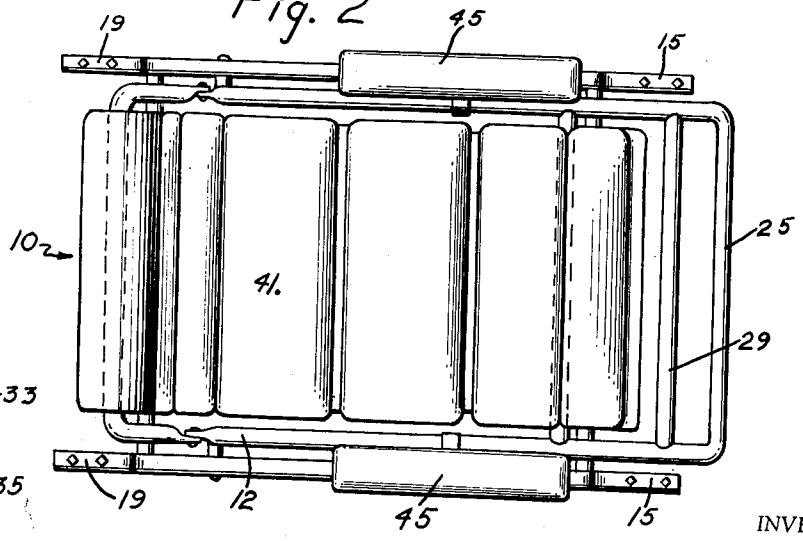


Fig. 2



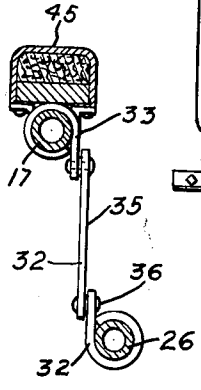


Fig 5

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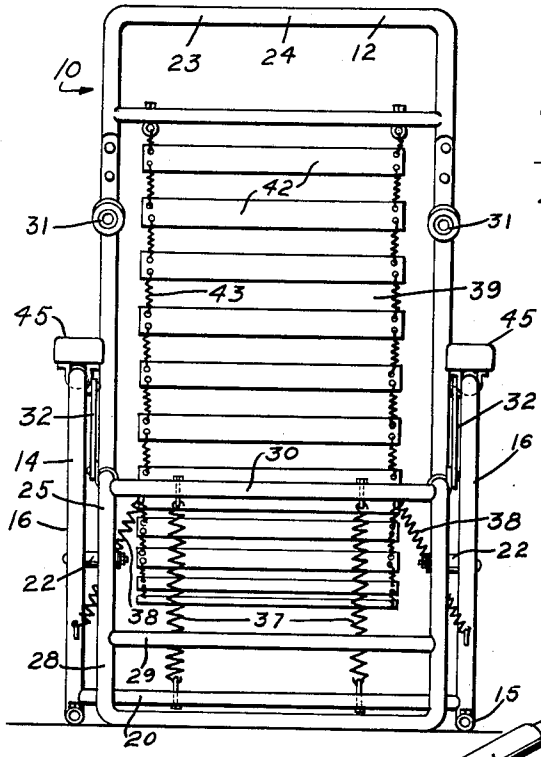


Fig. 3

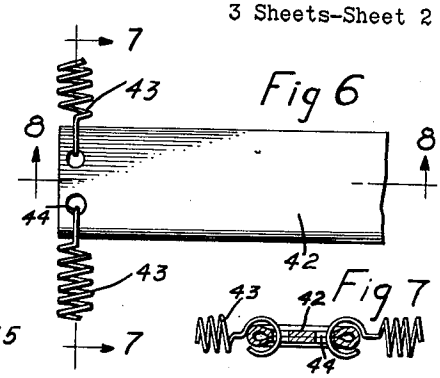


Fig 6

Fig 7

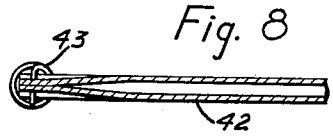


Fig. 8

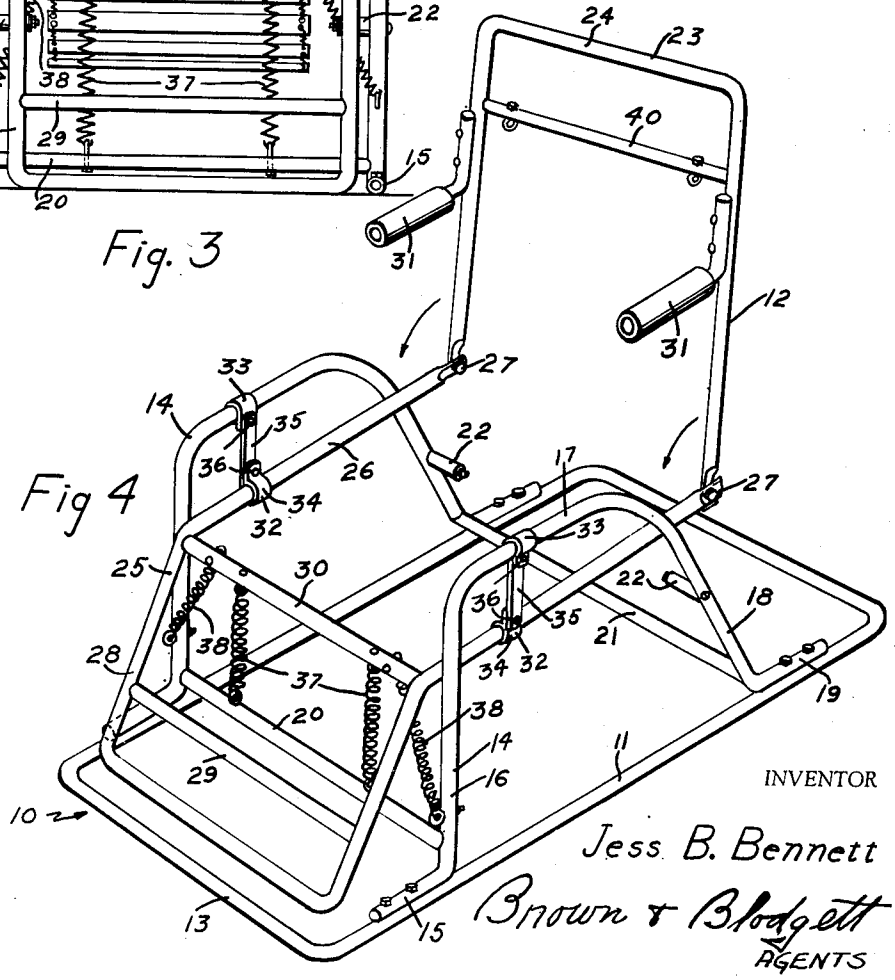


Fig 4

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Fig. 12

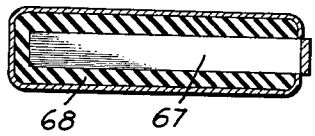


Fig. 9

Fig. 10

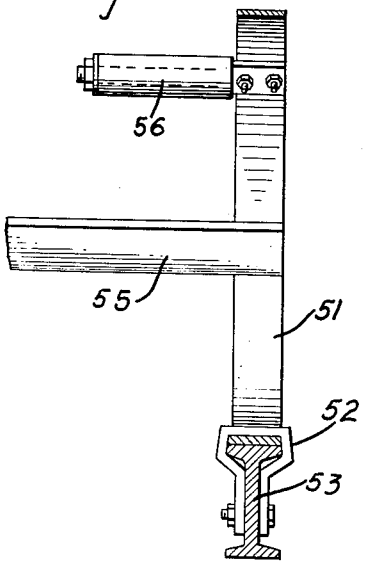
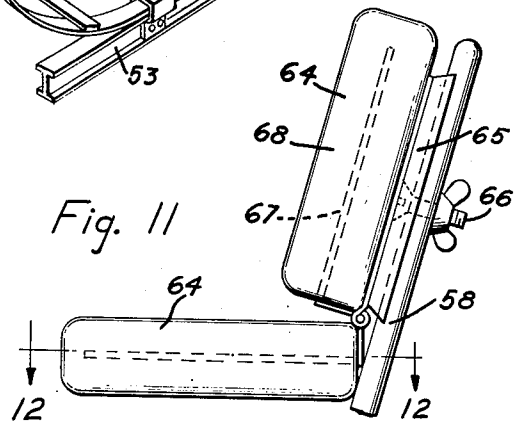


Fig. 11



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Patented June 1, 1954

2,679,893

UNITED STATES PATENT OFFICE

2,679,893

CHAIR

Jess B. Bennett, Washington, D. C.

Continuation of application Serial No. 199,609, December 7, 1950. This application January 16, 1951, Serial No. 206,263

7 Claims. (Cl. 155—56)

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This invention relates to chairs and more particularly to a suspension-type chair for use in aircraft and the like.

This application is a continuation of my copending application Serial No. 199,609 filed December 7, 1950, now abandoned, for improvements in Hammock Chairs.

It is an object of this invention to provide a suspension-type chair which will enable the sitter's body to recline in any desired position merely by the shifting of his body.

It is also an object of the instant invention to provide a seat for an airplane or like vehicle that can also be used for sleeping.

It is a further object of this invention to provide a seat for airplanes which will absorb some of the shock of turbulence in rough flying weather, which will absorb some of the vibration of the airplane engines, and which will minimize the harm suffered by the passenger in the event of a crash.

It is still another object of the present invention to provide an unusually comfortable chair of general application which can be used in either upright or reclining position.

Another object of this invention is to provide a comfortable chair for invalids in which most of the body support is provided by the chair and in which the patient can recline with little exertion or can sleep upright, as is necessary in cases such as acute sinus trouble and certain forms of heart disease.

A further object of this invention is the provision of an airplane seat which in the event of a crash makes use of inertia forces to present the passenger lying down feet first in the direction of forward motion of the airplane.

A further object of this invention is to provide a chair that gives all the features of comfort and safety found in prior art chairs and yet is relatively simple in concept and is light enough for aircraft.

Another object of the present invention lies in the provision of a light chair for aircraft which can be fabricated from standard tubing and other materials and requires no special castings or machined parts.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, the mode of its operation and the manner of its organization may be better understood by referring to the following description taken in conjunction with the following drawings in which:

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Figure 1 is a side elevational view of one embodiment of the chair of the invention.

Figure 2 is a plan view of the embodiment of Figure 1.

Figure 3 is a front elevation of the embodiment of Figure 1.

Figure 4 is a perspective view of the embodiment of Figure 1, with portions of the chair removed.

Figure 5 is a sectional view of the chair taken along the line 5—5 of Figure 1 and looking in the direction of the arrows.

Figure 6 is an enlarged view of a portion of the chair.

Figure 7 is a sectional view taken along the line 7—7 of Figure 6 and looking in the direction of the arrows.

Figure 8 is a sectional view taken along the line 8—8 of Figure 6 and looking in the direction of the arrows.

Figure 9 is a perspective view of another embodiment of the chair of the invention.

Figure 10 is an enlarged sectional view of a portion of the chair taken along the line 10—10 of Figure 9 and looking in the direction of the arrows.

Figure 11 is an enlarged view of a detail of the embodiment of Figure 9.

Figure 12 is a sectional view taken on the line 12—12 of Figure 11 and looking in the direction of the arrows.

Like reference characters denote like parts in the several figures of the drawings.

There are many situations where it is desirable to have available and to use a chair which is adjustable angularly. Chairs of this type are well-known and are used principally in vehicles such as airplanes, buses, and trains where the passenger may wish to ride in normal sitting position or may wish to recline. Generally speaking, the reclining chairs of the prior art suffer from the disability that their structure is complicated and expensive and their angular position can only be changed by the actuation of a detent means which tends to stick and give trouble. Also, most chairs of the type described do not allow for the isolation of the chair from the floor of the vehicle and, therefore, all jolts and vibrations are felt by the occupant of the chair. In the event of the sudden stopping of the vehicle. as in an accident or crash, the occupant of the seats of the prior art is propelled forward by his own inertia and his head strikes the seat in front of him; even when a safety belt is used, the occupant suffers injury to his abdomen because of the cutting action of the belt.

The chair of the invention obviates the above-recited difficulties in a manner which will be evident from the description which follows:

The chair of the invention, which can be best understood by reference to Figure 4, is generally indicated by the reference character 10. The chair comprises generally a base member 11 and a seat member 12. The base member 11 is furnished with a rectangular frame 13 which is adapted to be bolted or otherwise attached to the floor of the airplane or to any other supporting medium. Of course, the chair of the invention may rest on the supporting surface without being fastened thereto, if it is so desired. Attached to each of the long sides of the rectangular frame 13 are side members 14; each side member is an integral length of tube bent to form a front horizontal foot 15, a vertical portion 16, a horizontal portion 17, an inclined portion 18, and a rear horizontal foot 19. The side members 14 are fastened to the frame 13 by means of bolts or the like passing through the horizontal feet 15 and 19. The vertical portions 16 of the side members are joined in their lower portions by a cross-brace 20 and the inclined portions 18 are joined in their lower portions by a cross-brace 21. Intermediate of the inclined portion 18 of each side member 14 is a stop pin 22 which extends inwardly of the chair for a purpose to be explained further on. Each pin 22 comprises a short length of tubing held in position by a bolt passing transversely and horizontally through the tubing of the side member and axially through the tubing of the pin 22.

The seat member 12 is provided with a U-shaped back 23, the bight 24 of which occupies an upper, horizontal position. The seat member 12 is also provided with a support 25 which has two arms 26 adapted to run generally parallel to the plane of the side members 14 in a normally horizontal position and are attached to the free ends of the legs of the back 23 by means of hinges 27. The hinges 27 are so constructed that the back 23 may be folded down adjacent to the support 25 and, yet, cannot be moved in the other direction to much more than a right angle to the arms 26. Generally the plane of the back will form a right angle with the arms 26. At the other ends of the arms 26 from the hinges 27 the support 25 consists of a U-shaped foot rest 28 integral with the arms 26 and inclined at a substantial angle thereto, which angle is the most comfortable angle between the human upper and lower leg in seated position. A bar 29 joins the sides of the foot rest at a point between the bight and the points of jointure with the arms 26. A bar 30 joins the aforementioned points of jointure. The upper portion of the back 23 is provided on each side with a head rest 31 which comprises an L-shaped section of tubing, one leg of which is fastened to the back 23 and the other leg of which extends perpendicularly to the plane of the back and is upholstered for comfort. Also, a bar 40 extends across the back member 23 near the upper portion thereof.

The seat member 25 is suspended between the side members 14 by suspension members 32 which join the horizontal portions 17 of the side members to the arms 26 of the seat members. Each of the suspension members 32 comprises a clip 33 which nonslideably embraces the horizontal portion 17 of a side member and has a depending ear. Each of the suspension members 32 further comprises a clip 34 which embraces an arm 26 of the seat member 25 and has an upstanding ear.

Each pair of clips 33 and 34 is joined by a linkage bar 35 and the ends of this linkage bar are joined to the ears of the respective clips by horizontal pivot pins 36. The bar 30 is connected to the cross-brace 20 of the base member by coil springs 37 and the bar 30 is also connected to the vertical portions 16 of the side members by coil springs 38; these springs are normally in tension.

Referring next to Figure 1, it can be seen that a hammock 39 extends from the bar 40 to the bar 30. A cushion 41 extends over the top of the back member 23 and lies along the surface of the hammock and ordinarily extends downwardly between the bar 30 and the bar 29; if the occupant wishes to recline, he may place the cushion over the bar 30 and the bight of the foot rest. The cushion 41 is of a segmented type with the fold lines running transversely of the chair; in the preferred embodiment, the cloth from which the cushion is made is waterproof and the filler material is sufficiently buoyant to act as a life-preserver in the event of an emergency landing on water.

The hammock 39 is shown in Figure 3 and consists of transverse horizontal slats 42 joined by coil springs 43. As shown in Figure 6, each end of each slat is provided with apertures 44 to receive the ends of the springs. As shown in Figure 7, the edges of each slat are beaded adjacent to the apertures 44 to prevent accidental removal of the spring from the aperture. Figure 8 shows the manner in which the slat 42 is formed from tubular material to bring about the condition described above.

Figures 1 and 3 show the manner in which an arm rest pad 45 is mounted on the horizontal portion 17 on the side members.

It can be seen, then, that the use of the chair is a fairly simple matter. The seat member 12 is suspended from the base member 11 and tilts about a horizontal pivot, presumably the lower set of pivot pins 36. The seat member also swings about the upper pivot pins 36. According to the principles of mechanics, the sum of the couples about the tilting pivot must equal zero. When a person is seated in the chair, his center of gravity is behind the pivot point and produces a couple in one direction, while the tension in the springs 37 and 38 produces a balancing couple in the other direction. If the occupant of the chair wishes to recline, he must stretch the springs to a greater length; this means that he must increase the couple produced by his body-weight and this he does by shifting backwardly in the hammock. He controls his inclination by pushing with his feet on the foot rest and shifting his body-weight relative to the pivot point. The springs 37 and 38 are arranged so that the slack is taken up in springs 37 first and tension does not exist in spring 38 until it is needed to balance an extremely large couple due to a very heavy person sitting in the chair, or the like.

In the event of a crash landing, the occupant of the chair reclines in the chair far enough back to cause the seat member to rest on the stops 22. He is then in the optimum position, with his feet facing forward and his center of gravity below the pivot points, particularly below the upper set of pivot pins 36. This means that when the forward motion of the airplane stops in a crash, the occupant's inertia will act to incline the seat member even further back and also to swing it forward. If the crash is great enough, the stop pins 22 will shear and the seat member will con-

tinue rotating against the spring tension. Thus, the occupant, instead of being propelled forward, will actually rotate backwardly and the inertia of his body will be absorbed by the springs.

The occupant uses a head rest 31 by placing a small pillow over it and then resting his head against the pillow. Also, he may pull the cushion 41 out of its usual position, that is, hanging directly in front of the four springs, and may place it on top of the foot rest so that he may stretch out completely in resting position. It should be noted that, when there are empty seats in the airplane and there is need for space for the storage of baggage and the like, the hammock 39, which is completely free hanging, can be lifted upward from the rear side and baggage stored underneath.

Referring next to Figure 9, which shows an alternative embodiment of the device of the invention, the chair is indicated generally by the reference character 50. The structure is quite similar to the embodiment described above. The principal difference lies in the form of the side members. It can be observed that the side members 51 are fabricated from flat spring stock and are in a tear drop or airfoil shape, with the pointed end to the rear of the seat. Clamps 52 are provided to attach the side members to the floor beams 53 of the vehicle. Flat braces 54 and 55 extend from side member to side member in the lower portions thereof. The side members 51 are also provided with stop pins 56; the method of attachment and the construction of these stop pins is best observed in Figure 10 which also shows the detail of the manner in which the clamps 52 attach the side members 51 to the beams 53. The seat member 57 is similar to that in the above-described embodiment having, as it does, a U-shaped back portion 58, a foot rest 59 and arms 60 joining the two. No hinge is provided in this embodiment. A hammock 61 extends from a bar 62 to a cross-bar 63 and the hammock is of the slat and spring construction described above.

The upper part of the back portion 58 is provided with head rests 64, as before, but the construction is different. Upon reference to Figure 11, it can be observed that the head rests 64 can be folded back against the back portion 58 so as to be out of the way when not being used. In Figure 11 one of the head rests is in operative position, while the other is in retracted position. A base block 65 which is shaped to conform to the surface of the tube in the upper portion of the back is attached by means of a bolt 66. An L-shaped plate 67 is hingedly connected to the base block 65 in such a manner that the junction of the legs of the plate contacts the back 58 when the head rest is in horizontal, operative position. The leg of the plate which extends outwardly is covered with upholstery 68 in a manner clearly shown in Figures 11 and 12.

The seat member 12 is suspended from the side members 51 by means of clips 69 attached to the side members, clips 70 attached to the arms 60 of the seat member, linkage bar 71, and pivot pins 72 in the manner described above for the embodiment of Figure 1. Coil springs 73 connect the bar 54 and the bar 63.

The operation of the embodiment of Figure 9 is substantially the same as the operation of the species shown in Figure 1.

The foregoing describes in detail the novel features which are inherent in the chair of the invention. It is evident that it is adapted for use as an aircraft seat, as an invalid chair, or as a porch or lawn chair. Among the changes that may be made within the purview of the invention are those of changing the exact location of the springs; the exact point of connection of these springs is not important, so long as they perform the function of restraining the backward reclining motion of the seat member and serve to return the seat member to its original upright position when the chair is unoccupied, or when the occupant moves his weight forward.

While certain novel features of the invention have been shown and described and one pointed out in the annexed claims, it will be understood that various omissions, substitutions, and changes in the forms and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

The invention having been thus described, what is claimed as new and desired to secure by Letters Patent is:

1. A chair, comprising: a base member having two parallel upright side members substantial portions of which are substantially horizontal and extending longitudinally of the chair, cross braces joining said side members, a tilting seat member shaped approximately to the sitting posture of a person and having a leg rest, said seat member having cross braces adjacent to its extremities, a hammock of flexible construction joining said cross braces of the seat member and hanging freely therebetween, said seat member and hammock being suspended between the side members by means of two linkage bars, the upper portion of each linkage bar being pivotally attached to the horizontal portion of its respective side member, the lower portion of each link being pivotally attached to a portion of the seat member adjacent to the respective side member, the entire seat member being held in an upright position and restrained in its rearward tilting and swinging by at least one spring extending from a cross brace of the base member to a cross brace of the seat member located forwardly of the linkage bars.

2. A chair, comprising: two parallel upright side members fixed with respect to a supporting surface, cross braces joining said side members, a seat member consisting of a frame and cross braces running thereacross near the extremities thereof, a hammock consisting of a series of parallel slats joined in series by coil springs, the said hammock being fastened at its ends to the cross braces of the seat member and hanging freely therebetween, said seat member and hammock being suspended between the side members by means of linkage bars in such manner as to permit a backward and forward tilting and swinging, at least one coil spring restraining said tilting and swinging extending from adjacent said supporting surface and connected to the seat member, a leg rest forming a part of the seat member and comprising at least two cross bars, a cushion overlying the upper side of the hammock and fixed relative to the upper portion of the seat member.

3. A chair, comprising: a base member having two parallel upstanding side members fixed relative to one another and consisting of teardrop shaped flat springs, a seat member of frame construction having cross braces running transversely adjacent to the extremities thereof, a

hammock consisting of a series of transverse slats connected by coil springs and attached to said cross braces so as to hang freely therebetween, said seat member and hammock being suspended between the side members by means of two linkage bars, each linkage bar being horizontally pivotally attached at its upper portion to the uppermost horizontal portion of its respective side member and at its lower portion to the seat member, whereby the seat member is free to rotate about a horizontal axis defined by the points of attachment of the linkage bars to the seat member and a swinging motion about a horizontal axis defined by the points of attachment of the linkage bars to the side members, both the rotative and the swinging motion being resiliently restrained.

4. A chair, comprising: a base member having two upright side members fixed relative to one another and of tear-drop form formed from flat-spring material, a swinging and tilting seat member suspended between said side members by means of two linkage bars, said seat member having as a part thereof a hammock the ends of which are fixed to the seat member adjacent to the extremities thereof and the intermediate portion of which hangs freely, said hammock comprising transverse slats joined by coil springs, each of said linkage bars being horizontally pivoted at its upper portion to the upper, generally horizontal portion of its respective side member and at its lower portion to the seat member adjacent to the respective side member, the seat member being normally held in an upright position and restrained in its swinging and tilting movement by at least one coil spring extending from the seat member to the base member forwardly of the axes of swinging and pivoting of the seat member, the forward portion of the seat member being formed to act as a leg rest and presenting a plurality of cross bars for selective use, a cushion constructed of buoyant material extending over the top of the seat member and extending over the surface of the hammock.

5. A chair, comprising: a base member having two parallel upright side members in spaced relationship, a seat member suspended swingably and tiltably from and between said side members, a pair of linkage bars constituting the means of said suspension attached at their one ends to their respective side members on a horizontal pivot line constituting the axis of swinging and similarly attached at their other ends to the seat member on a horizontal pivot line constituting the axis of tilting, said seat member being resiliently restrained in its swinging and tilting movement backwardly of a normal, upright position, and said axis of tilting being situated adjacent the center of gravity of a person seated in the seat member in a normal manner.

6. A chair, comprising: a base member having two parallel upright side members in spaced relationship, a seat member suspended swingably and tiltably from and between said side members, said seat member being of frame construction and having a hammock attached adjacent to the extremities of the seat member and hanging freely therebetween, a pair of linkage bars constituting the means of suspension of the seat member, said linkage bars being horizontally pivotally attached at their upper ends to substantial longitudinal horizontal portions of their respective side members and similarly attached at their other ends to the seat member, said member being resiliently restrained in its swinging and tilting movement backwardly of a normal, upright position.

7. A chair, comprising: a base member having two parallel upright side members fixed relative to one another each of which is formed with a substantial longitudinal horizontal portion, stop pins protruding inwardly in the rear portions of the side members, a seat member swingably and tiltably suspended between said side members, said stop pins serving to limit the backward tilting of said seat member, said seat member comprising a back portion and a foot rest portion, cross members adjacent to the extremities of said seat member, a hammock attached to said cross members and hanging freely therebetween, said seat member being suspended from the horizontal portions of the side members by means of linkage bars which are horizontally pivotally attached to the seat members and the side members, at least one spring connected between the forward portion of the seat member and the base member.

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