United States Patent [19]

Kery

[11] **3,792,501**

[45] **Feb. 19, 1974**

[54] **AIR CHAIRS AND CONVERTIBLE SOFAS**

[76] Inventor: **Edmund Kery,** 908 E. 55th St., Brooklyn, N.Y. 11234

[22] Filed: **June 18, 1973**

[21] Appl. No.: **370,919**

[52] **U.S. Cl.** ..... **5/348 R,** 5/12 R, 5/37 R, 297/355, 297/456

[51] **Int. Cl.** **A47c 27/08,** A47c 17/14

[58] **Field of Search** .... 5/DIG. 2, 12, 37 R, 42, 348, 5/349; 297/284, 355, 456, DIG. 3

[56] **References Cited**

UNITED STATES PATENTS

2,249,266	7/1941	Bell	5/37 R
2,779,034	1/1957	Arpin	5/DIG. 2
2,880,426	7/1959	Goldstein	5/37 R
2,814,053	11/1957	Sevick	5/348
2,938,570	5/1960	Flajole	5/349
3,583,008	6/1971	Edwards	5/349
3,605,145	9/1971	Graebe	5/348

Primary Examiner—Casmir A. Nunberg
Attorney, Agent, or Firm—Sydney B. Schlessel, Esq.

[57] **ABSTRACT**

An air chair consisting of a frame having a seat support over a base chamber and a back support before a rear chamber in communication with the base chamber, with an inflatable cushion on the seat support in air communication with a bellows-shaped air spring in the base chamber through an intermediate tube, and an inflatable back cushion in air communication with a second similar air spring in the base chamber through an intermediate tube. The air springs are tensioned against entry of air from the cushions except under body pressure, the air forced back into the cushions when pressure is lifted. Air lines pump air initially into the cushions through valves. A convertible sofa of three cushions secured together as a unit and three back cushions similarly united, with above described air systems. The sofa back section is selectively rotative with respect to the seat section to lie on the same plane and form a bed, or pivoted to form the back rest of the sofa.

10 Claims, 9 Drawing Figures

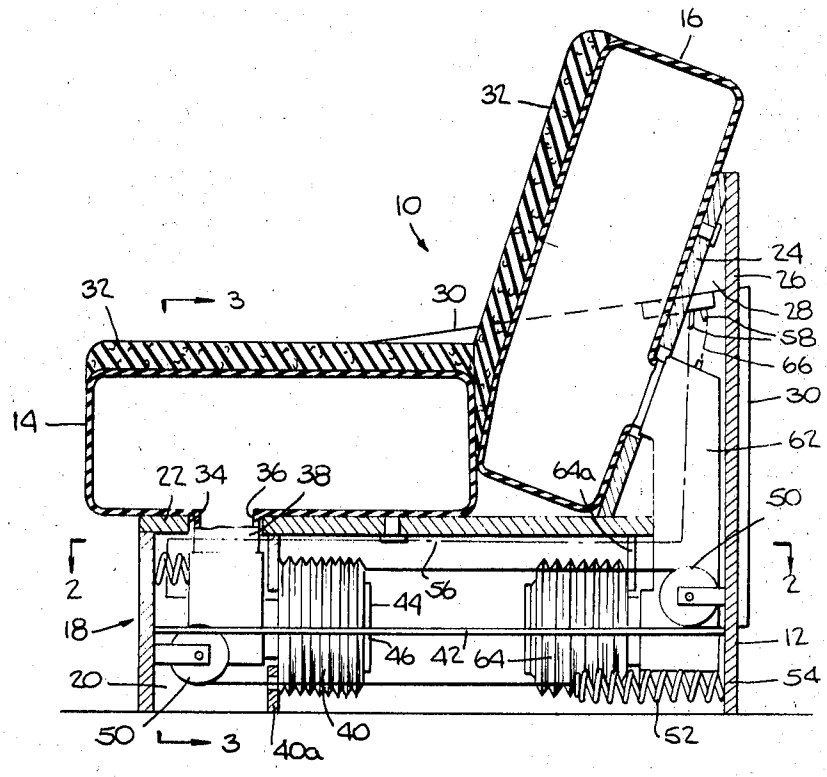


Fig. 1.

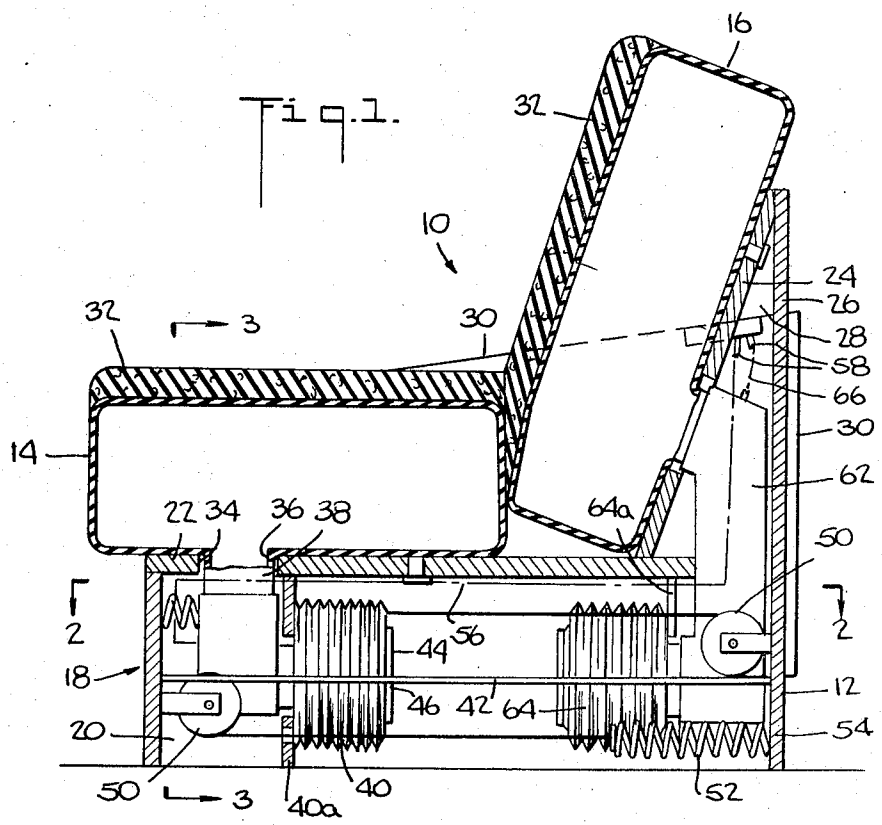
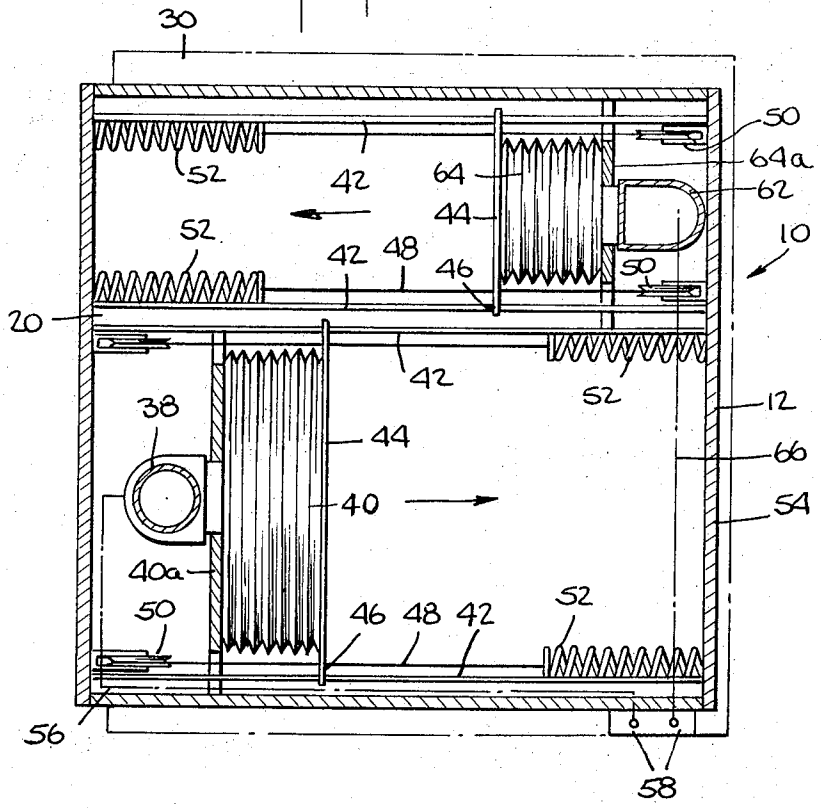

16
32
10
24
26
28
58
66
30
62
32
3
30
14
22 34 36 38
64a
50
2
2
56
44
18
46 42 64
12
20
54
50
3
40a
40
52

Fig. 2.


30
50
52
42
64
64a
62
44
10
52
42 48
46
50
20
42
52
12
38
44
66
40
54
40a
50
46 48 42
52
56
58

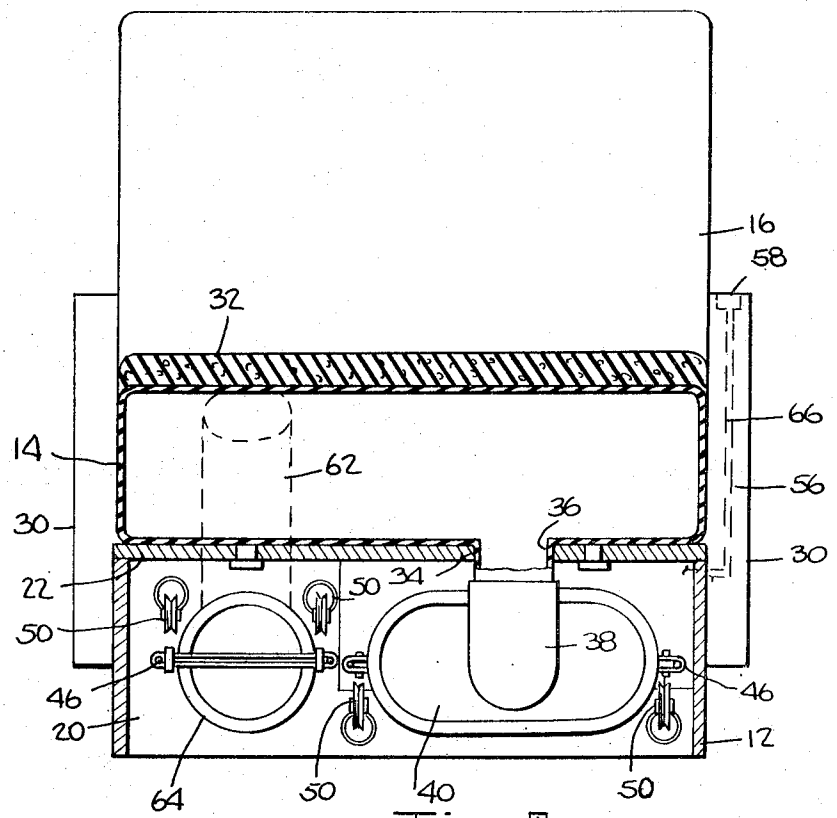

16
58
32
66
14
62
56
36
30
30
22
50
34
50
38
46
46
20
12
64
50
40
50

Fig. 3.

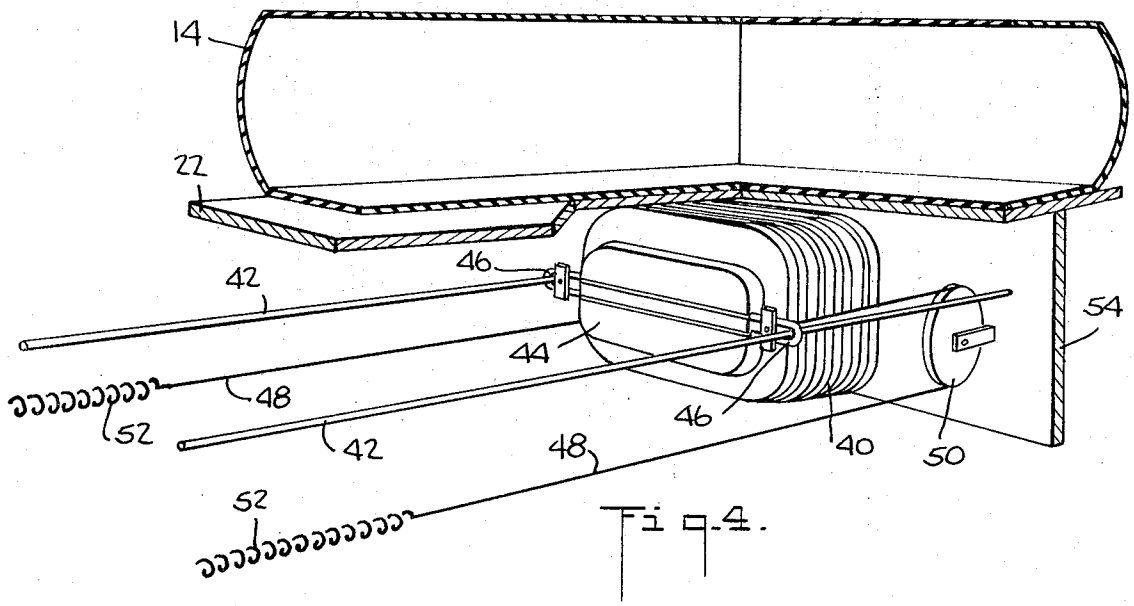

14
22
46
42
54
44
48
52
42
46
40
50
48
52

Fig. 4.

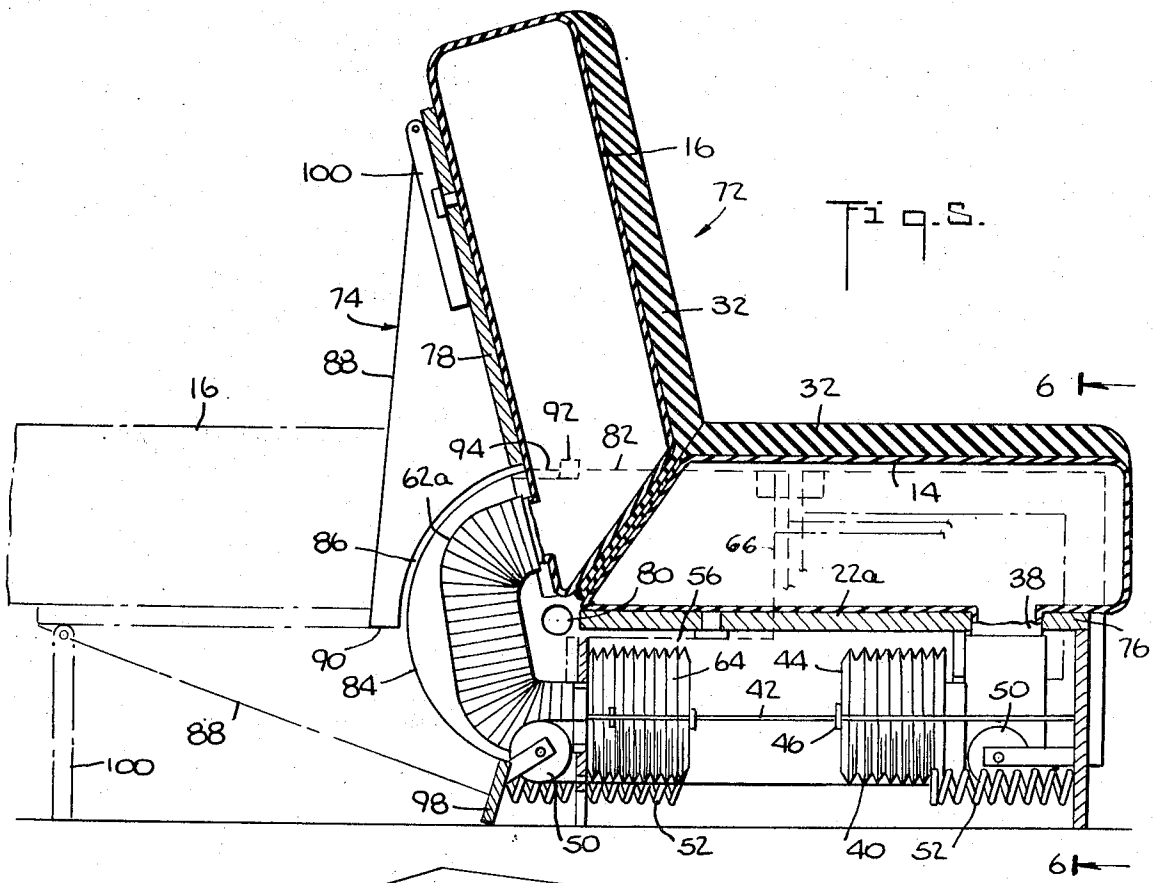


Fig. 5.

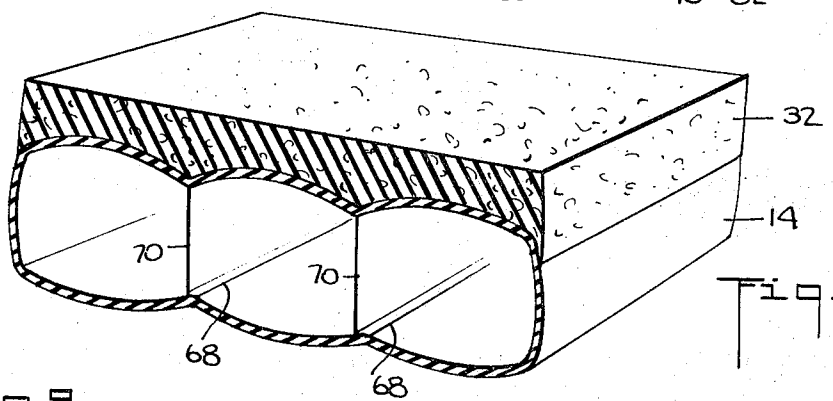


Fig. 8.

Fig. 9.

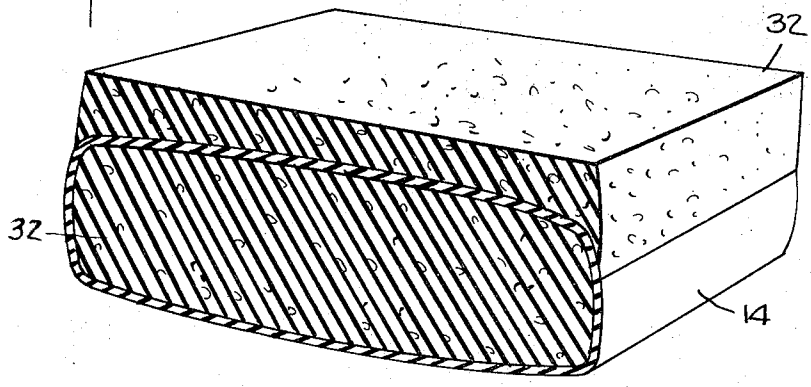


Fig. 6.

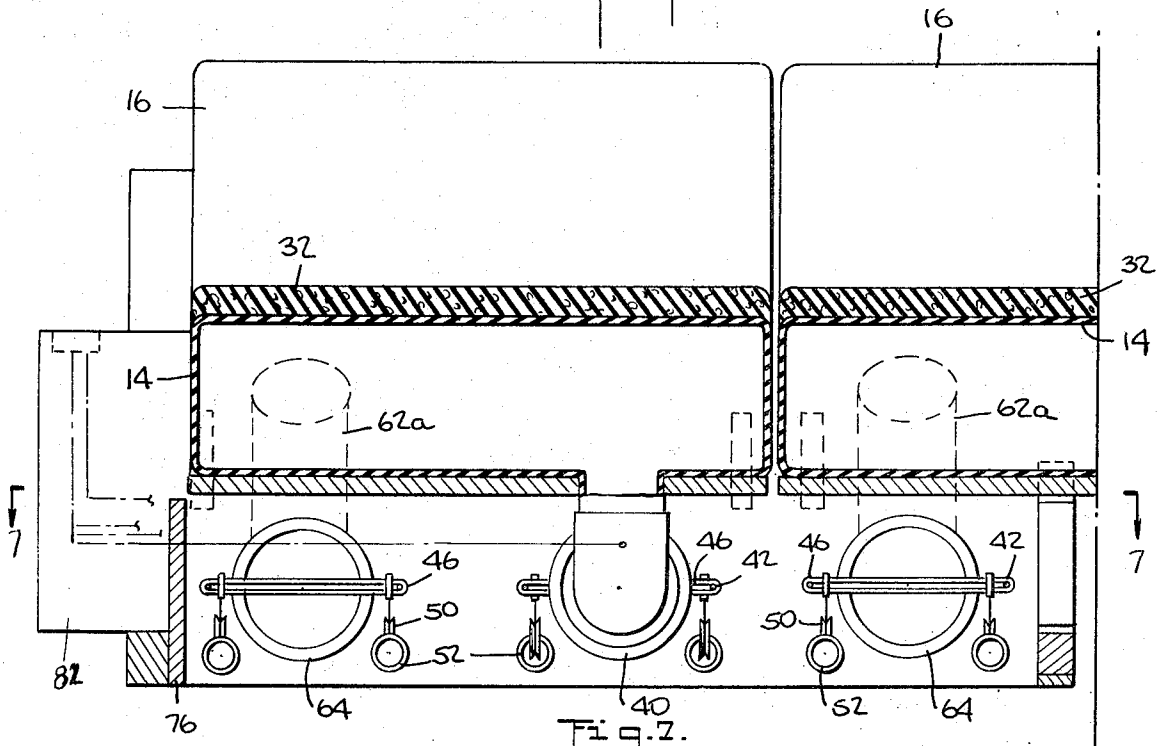
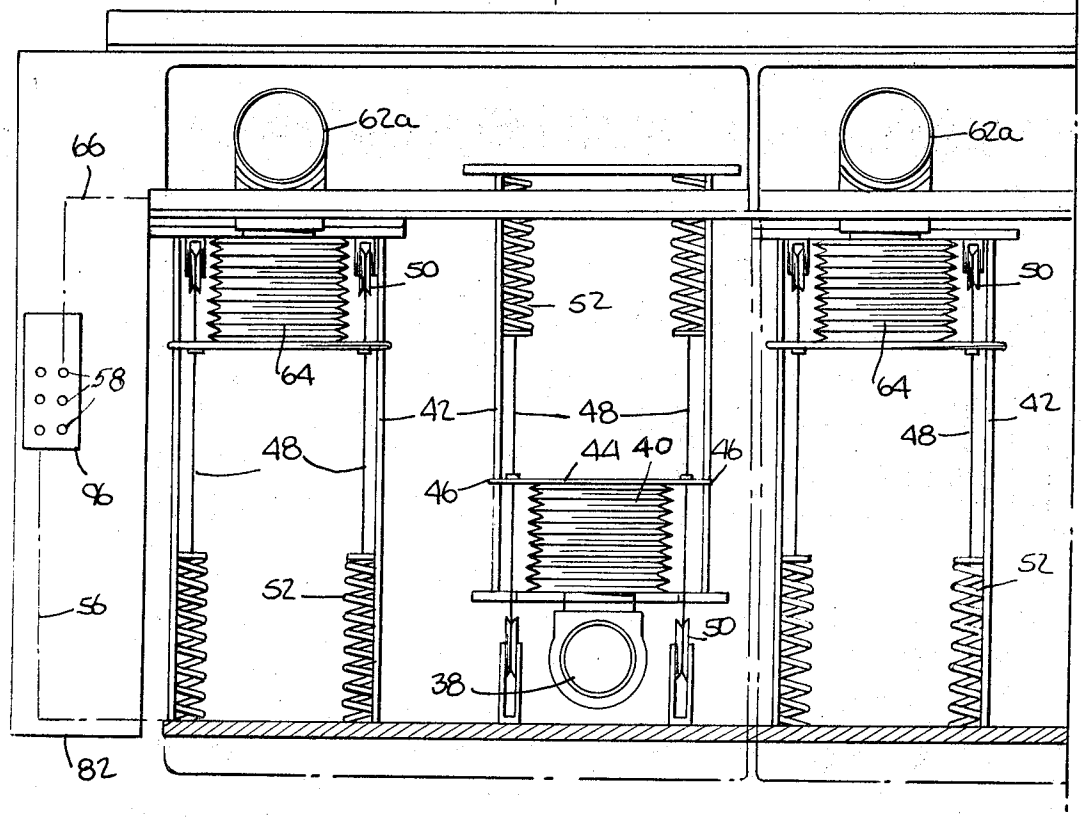

16
16
32
32
14
14
62a
62a
7
7
46
46
42
46
42
50
50
52
52
82
76
64
40
52
64

Fig. 7.


62a
62a
66
50
50
52
64
64
58
42
48
42
48
48
44
40
46
46
96
52
52
56
50
38
82

AIR CHAIRS AND CONVERTIBLE SOFAS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the field of furniture, and has for its objective the creation of upholstered chairs and convertible sofas where basic support for body weight and pressure lies in the provision of air-filled seats and back rest cushions, with provision made for the temporary displacement of a portion of the air contained in the seat and backrest cushions when weight is applied, such as by a seated body, and for the return of the displaced air into the respective cushions when the weight is removed, thereby returning the chairs and sofas to their normal and original shape and resiliency. The provision for the temporary displacement of a portion of the air contained in the cushions provides for greater ease and comfort to the seated to reclining person than is possible with merely the compression, under pressure, of all of the contained air in the cushions, without temporary escape, in which event an uncomfortable resistance to the body weight may be experienced.

2. Prior art

In the present state of the art there are to be found numerous forms of air cushions and mattresses. Some of these structures provide for inflation as a single unit, so that, when pressure is applied to the unit, as by a seated or a reclining body, the contained air merely compresses, and in some instances is forced from the weighted area to an unweighted one, with the greatest compression and cavity beneath the greatest weight, obviously not uniformly, with the result that the air cushion or mattress assumes a grotesque shape and, with the shifting of the weight, becomes wobbly and uncomfortable. In some other known forms the inflatable portion of the cushion or mattress has been subdivided by partitions into pockets, requiring each pocket to be in dividually inflated. Wobble, and shift of compresed air, by changes in weight distribution is thus restricted, but in view of the fact that the air is confined in smaller pockets, the air becomes resistant to compression when weight is applied, since it remains confined in the pockets, limiting resiliency of the cushion or mattress and thereby reducing comfort of the user. In still other forms chairs and recliners have been made solely of a vinyl material, with the entire structure, including the base, inflatable with air. With the application of body weight such as when a person sits or reclines on the chair or sofa, there is not only compression of air in the weighted areas but displacement, as well, into other portions, including the base, frequently causing the chair or sofa to topple over or, or, at best, to provide uncomfortable support. In all of these forms, it is to be noted, no provision is made for the temporary displacement of a portion of the contained air into an area not subject to pressure from the applied weight, such as an auxiliary reservoir adapted to accomodate air only under pressure, thereby avoiding the discomfort of overcompression of the air contained in the cushion or sofa, and attendant disadvantages.

BRIEF SUMMARY OF THE INVENTION

The aforementioned disadvantages are overcome by my invention which provides, in one form, for an upholstered chair of which the seat cushion and back rest

cushion are formed of inflatable material, overlaid by standard supporting materials, such as foam rubber and upholstery material, with provision below the seat for a chamber containing air springs or bellows, one in air communication with the seat cushion and one with the back rest cushion, and acting as temporary air reservoirs, whereby weight applied, respectively, to the seat or back rest will cause temporary displacement of a portion of the compressed air into the respective air spring, or communicating reservoir, and whereby, with the removal of the weight, the displaced air will be forced back into the respective seat and back rest cushion, to return them to their original shape. In another form my invention comprises a convertible sofa, which is convertible into a bed, of similar construction and function but comprised of two or three seat cushions secured together and a similar number of back rest cushions, similarly secured together, on a frame large enough to support them, with the supports for the seat cushions and the back rest cushions adjustable from a position at an angle to one another to a position of lying on the same plane, so as to provide a bed surface.

It is therefore the principal object of my invention to provide an air chair or convertible sofa wherein the body supporting portions are filled with air, with provision for temporary displacement of portions of the air, underpressure, to communicating air reservoirs, or air springs, to be returned to the body supporting portions upon removal of the pressure.

A second important object of my invention lies in the provision of an air chair or convertible sofa wherein the resiliency or buoyancy of the body supporting portions is adjustable to any degree of firmness or softness, dependent upon the amounts of air introduced.

A third important object of my invention lies in the provision of an air chair or convertible sofa as above described, wherein the shifting of body weight will cause an even distribution of air displacement from the seat or body rest cushion

Still another important object of my invention lies in the provision of a convertible sofa as above described, wherein the back rest portion can be lowered to lie level with the seat portion so as to form a bed.

Yet another important object of my invention lies in the provision of an air chair or convertible sofa which is economical to produce and simple to prepare for use.

These and other salient objects, advantages and functional features of my invention, together with the novel features of construction, composition and arrangement of parts, will become more readily apparent from an examination of the following description, taken with the accompanying drawings, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side, cross-sectional view of an air chair made in accordance with my invention;

FIG. 2 is a cross-sectional view taken on lines 2—2 of FIG. 1;

FIG. 3 is a cross-sectional view, taken on lines 3—3 of FIG. 1;

FIG. 4 is an enlarged view, in section, showing construction of one of the air springs or reservoirs disposed below the chair seat and within the chair framework;

FIG. 5 is a cross-sectional side view of a convertible sofa made according to my invention;

FIG. 6 is a cross-sectional view, taken on lines 6—6 of FIG. 6;

FIG. 7 is a cross-sectional view, taken on lines 7—7 of FIG. 6;

FIG. 8 is an enlarged side perspective view of one of the cushions, partly broken away to show inner construction; and

FIG. 9 is a view similar to FIG. 8 of a modified form of construction.

Similar reference characters designate similar parts throughout the different views.

DETAILED DESCRIPTION OF FIRST EMBODIMENT

Illustrative of the embodiment shown by FIGS. 1–4, there is shown an air chair **10** comprising a frame **12**, preferably of wood, although other suitable materials may serve as well, on which are secured a seat cushion **14** and a back rest cushion **16**, both of the cushions **14** and **16** formed of flexible material, such as rubber, vinyl plastic or the like, defining internal chambers adapted to be filled with air, as shown in FIG. **1**. The frame **12** is formed with an enclosed base **18** defining a chamber **20**, with the roof **22** of the base **18** forming the support for the seat cushion **14** and the enclined back **24** forming, with a rear wall **26** a wedge-shaped chamber **28** connecting with chamber **20**, and the back **24** forming the support for the back rest cushion **16**. Arm rests **30** are provided for the sides of the frame **12**. The top surfaces of seat cushion **14** and back cushion **16** are formed with an integral layer of foam rubber **32**, to give body and resiliency to these members and provide a resilient support for the chair occupant, with the seat cushion **14** and back cushion **16**, as well as other portions of the chair **10** thereafter covered with upholstery material (not shown), as is well known in the art. The seat support **22** is provided with a central opening **34** in registry with an opening **36** leading into the interior of seat cushion **14**, and through the opening **34** there is disposed a flexible plastic tube **38** which is engaged, at its upper end, to the seat cushion opening **36** and at its other end to an air spring or reservoir **40**, mounted on a support member **40a** and disposed in the base chamber **20**, to provide air communication between the interior of the seat cushion **14** and the air spring **40**. The air spring **40** is preferably made of plastic material and in the form of a bellows adapted to expand and contract in accordance with air pressure and tension, as will be hereinafter described. Referring particularly to FIGS. **2** and **4**, the air spring **40** is supported in a horizontal position and is reciprocally mounted on a pair of guide rails **42**, secured to the front and rear wall of the base **18**, by means of a plate **44** secured to the free end of the air spring **40** and which is provided with adjustable lugs **46** through which the respective guide rails **42** pass. A cable **48** is secured to each of the lugs **46** and extends to the rear of base **18**, to encicle and ride in a pulley **50** which is mounted on the rear wall **26** of the base **18**, the other end of each cable **48** being attached to a spiral tension spring **52**, whose other end is secured to the front wall **54** of the base **18**, the spring **52** being so tensioned as to force the air spring **42** into a contracted state, as shown in FIG. **4**, but extensible to permit selective expansion of the air spring **40** when air is forced into it from the seat cushion **14** through communicating tube **38**. Air is introduced into, and may be expelled from, the seat cushion **14** through an air line **56** leading into the tube **38** from an air valve **58** disposed in arm rest **30**.

Air is similarly introduced into, and may be expelled from, the back cushion **16** by its engagement, through opening **60** in the inclined back **24** of the chair **10**, to a plastic tube **62** which, in turn, is secured to an air spring or reservoir **64**, mounted on a support member **64a** and disposed in the chamber **20**, as shown in FIGS. **2** and **3**, the air spring **64** being of similar construction as the air spring **40**, but smaller in diameter since less body pressure is generally applied to the back of the chair than to its seat, and the air spring **64** being similarly mounted and reciprocatively extended and contracted as by guide rods **42** through lugs **40** of end plate **44**, with cables **48** attached to lugs **44** and spiral tension springs **52** around pulleys **50**. The tube **62** is disposed in chamber **28** which opens into chamber **20**. Air is introduced into the back cushion **16** by an air line **66** providing communication between the tube **62** and an air valve **58** seated in arm rest **30**.

As shown by FIGS. **8** and **9**, the seat cushion **14** and back cushion **16** may either be formed with horizontal stays **68** and vertical stays **70** of flexibility, to provide shaping structure for the seat and back cushions **14** and **16**, as shown in FIG. **8**, or the interiors may be filled partially with foam rubber or other porous material enabling air to pass freely around and through the material, as seen in FIG. **9**.

Referring now to the modified embodiment shown by FIGS. **5–7**, there is shown a three-sectional, or three-seater, convertible sofa **72** (a two-section recliner sofa is likewise within the scope of the invention), only a portion deemed sufficient to disclose structure and operation being shown by the figures, the construction and disposition of the seat cushions **14** and back cushions **16**, and their respective air springs **40** and **64**, as well as the structures for expansion and contraction of the latter being identical with those shown in the first embodiment, except that the seat cushions **14** are secured together as a unit, and the back cushions **16** are likewise secured together as a unit, and tubes **62***a*, uniting the back cushions **16** with their respective air springs **64**, being bellows-shaped, for reasons to be hereinafter disclosed.

The convertible sofa **72** comprises a framework **74** formed of a base or seat section **76** and a back or support section **78**, which are pivotally secured together at their abutting edges as by hinges (not shown) secured around a central axle **80**, as is well known in the art. The base section **76** is provided with arm rests **82** having semi-circular rear surfaces extending into channels **86** acting as guides and retainers for projections (not shown) extending therethrough from the sides of the back section **78**, permitting rotation of the back section **78** from its position as shown by the solid lines of FIG. **5** to the position shown by the broken lines of the FIG. **5**, the rear surface **88** of back section **76** being so formed as to have its bottom portions **90** abut against the back of the base section surface **98**, to support the back section **76** with its cushions **16** level with cushions **14**, thereby to define a sleeping surface from both cushions **14** and **16**. The projections (not shown) extending from the sides of back section **78** terminate in lock members **92** adapted to lock within slots **94** in the arm rests **82**, when the back section **78** is raised, as shown by the solid lines of FIG. **5**, to serve as a sofa instead of a bed. The back section **78** is further provided at

each end with a leg **100** pivotally mounted thereon and adapted, when the back section **78** is lowered, to pivot gravitationally to a vertical position to support the back section **78,** as shown in FIG. **5.**

As is to be noted, plastic tube **62***a* connecting each back cushion **16** with its respective air spring **64,** is bellows-shaped, permitting it to flexibly conform to the shape required when the back section **78** is raised and when it is lowered. Air lines **56** connect each of the tubes **38** and **62**a to an individual air valve **58,** with all six valves mounted in a panel fitted into one of the arm rests **82,** and individually designated with respect to the cushion **14** or cushion **16** to which it functions.

OPERATION OF THE INVENTION

In the utilization of the embodiment of FIGS. **1–4,** the cushions **14** and **16** are inflated through their respective air valves **58,** either by a manual pump or by an air compressor, to the selected air pressure required to fill the cushions **14** and **16** to a firm buoyancy while retaining their respective air springs **40** and **64** contracted, due to the tension imposed by the springs **52,** so that the introduced air remains almost entirely within the cushions **14** and **16.** When pressure is applied to these cushions **14** and **16,** as by the weight of a seated body, air is forced thereby out of the cushions **14** and **16,** in accordance with the amount of pressure applied, forcing a portion of the contained air to escape into the respective air springs **40** and **64,** thereby extending them against the tension of the springs **52,** and providing a comfortable resiliency to the seat and back cushions **14** and **16.** When the weights are removed, as when the seated person arises, the release of the weight permits the springs **52** to force the displaced air from the air springs **40** and **64** back into the respective cushions **14** and **16,** thereby restoring them to normal firmness and shape.

The convertible sofa **72** is similarly inflated with air introduced into seat cushions **14** and back cushions **16,** for use as a sofa. When it is desired for use as a bed the lock members **92** are released and the back section **78** lowered to the position shown by the broken lines of FIG. **5,** with the feet **100** falling into place to support the back section **78.**

It is to be noted that while same has not been described, provision may be made, as by removeable panels, for ready access to the interior chambers **20** and **28** of the air chair **10,** and the corresponding chambers in the convertible sofa **72.** It is also to be noted that while the seat cushions and back cushions are disposed as units, they are not attached to one another, although securely fixed. They may, however, be removeably secured together as by snaps or zippers, as is well known in the art.

Further modifications are to be considered as within the scope of the invention. For example, the air lines **56** and **66** in both the chair **10** and sofa **72** may be coupled to a single air valve **58,** for simultaneous inflation of both the cushions **14** and **16.** In the embodiment of FIGS. **1–4** the chamber **20** housing the air springs **40** and **64** may be entirely behind the back rest **24.** In the embodiment of FIGS. **5–7** the convertible sofa **72** may be constructed as a bed, in that the seat section **76** and back or support section **78** may be constructed as a single, rigid framework forming a flat level surface for the cushions **14** and **16.**

As is therefore apparent, from the foregoing, the embodiments shown and described are by way of illustration and not of limitation, and that various changes may be made in the construction, composition and arrangement of parts without limitation upon or departure from the spirit and scope of the invention or sacrificing any of the advantages thereof inherent therein, all of which are claimed.

Having described my invention, I claim:

1. An air chair comprising a frame provided with a seat support, a back support and a chamber disposed below and seat support and extending behind the back support, an aperture in the seat support and an aperture in the back support opening into the chamber, an inflatable cushion disposed on the seat support, an air spring disposed in the chamber, an intermediate tube connecting the air spring and the seat cushion through the seat aperture to afford air intercommunication thereinbetween, an inflatable cushion disposed on the back support, a second air spring disposed in the chamber, an intermediate tube connecting the second air spring and the back cushion through the back support aperture to afford air intercommunication thereinbetween, and means to selectively inflate the cushions individually, the air springs being bellows-shaped and adapted to be expanded by displacement of air thereinto from their respective cushions under pressure exerted on the latter, and to contract to force the displaced air back into the respective cushions on withdrawal of the pressure, the expansion and contraction of the air springs regulated by spring means secured to the respective air springs and adapted to tension them against expansion.

2. An air chair as described in claim **1,** the means to inflate the air cushions comprising an air line connected to each of the intermediate tubes and leading to an air valve disposed on the chair frame.

3. An air chair as described in claim **2,** the spring tensioning means for each air spring comprising a pair of coil springs secured in parallel to the chamber wall opposite the air spring-retaining wall, with the free end of each coil spring secured to a cable passed around a pulley disposed on the air spring-retaining wall, the other ends of the cables secured to the sides of the air spring at its free ends, thereby to retain the latter normally in a contracted state and to permit expansion of the latter upon the forcing of air thereinto under pressure exceeding the tension of the coil springs.

4. An air chair as described in claim **3,** each of the inflatable cushions formed with flexible stays in the interior thereof to support the cushion walls.

5. An air chair as described in claim **3,** the interior of each of the cushions provided with porous material adapted to shape the cushions.

6. A convertible sofa comprising an elongated frame formed of a back section and a seat section, means to selectively pivot the back section from a position angular to the seat section to a position to lie on the same plane therewith, means to lock the back section in each position, a chamber disposed below the seat section, a plurality of inflatable seat cushions disposed on the seat section, an aperture in the seat section below each seat cushion, opening into the chamber, an air spring disposed in the chamber beneath each seat cushion, an intermediate tube connecting each air spring with its corresponding seat cushion through a seat aperture to afford air intercommunication thereinbetween, a plural-

ity of inflatable back cushions disposed on the back section, an aperture in the back section behind each back cushion and a corresponding aperture in the rear wall of the chamber, a secondary air spring disposed in the chamber beneath each back cushion, an intermediate tube connecting each secondary air spring with its corresponding back cushion through the apertures provided to afford air intercommunication thereinbetween, and means to selectively inflate the cushions, the air springs being bellows-shaped and adapted to expand by displacement of air therein from their respectively engaged cushions under pressure exerted upon the latter, and to contract to force the displaced air back into their respectively engaged cushions on withdrawal of the pressure, the expansion and contraction of air springs being regulated by spring means secured to the respective air springs and adapted to tension them against expansion, the intermediate tubes connecting each secondary air spring with its respective back cushion being bellows-shaped to permit pivotal movement of the back section of the sofa without disengagement.

7. A convertble sofa as described in claim **6,** the means to selectively pivot the back section comprising a plurality of hinges secured to the abutting edges of the back and seat sections and mounted upon a central axle.

8. A convertible sofa as described in claim **6,** the means to selectively inflate the seat and back cushions comprising an air line connected to each of the respective intermediate tubes and leading to an air valve mounted in the sofa frame.

9. A convertible sofa as described in claim **6,** the spring tensioning means for each air spring comprising a pair of coil springs secured in parallel to the chamber wall opposite the air spring-retaining wall, with the free end of each coil spring secured to a cable passed around a pulley disposed on the air spring-retaining wall, the other ends of the cables secured to the sides of the free end of the spring, thereby to retain the latter normally in a state of contraction and adapted to permit expansion of the air springs upon the forcing of air thereinto under pressure exceeding the tension of the coil springs.

10. A convertible sofa as described in claim **6,** the means to selectively inflate the seat and back cushions comprising an air line connected to each of the respective intermediate tubes, all of the air lines leading to and coupled to a single air valve mounted in the frame.

* * * * *