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(54) Flexible chair with post base

(57) A flexible chair 10 has a seat bottom 14 supported by a seat frame 18. A seat back 16 has a lower portion thereof rotatably attached to the seat frame 18. A back frame 20 is rotatably attached to an upper portion of the seat back 16. The back frame includes a pair of lower ends 20b that are each slidably engaged with the seat frame 18 or the seat bottom 14. A support post 12 is attached to and supports the back frame 20. A pair of springs 30 apply a bias force between the lower ends 20b and the seat frame 18 or the seat bottom 14. As a user sits on the seat bottom 14 and leans back against the seat back 16, the seat back pivots and the seat bottom slides forward. Alternately, a link member 42 can be used between the seat bottom 14 or seat frame 18, and the post 12, to lift the seat bottom as it moves forward.

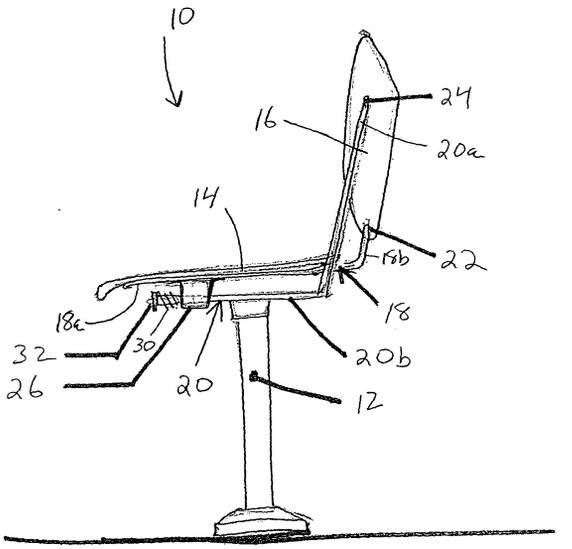

Fig 2

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to chairs, and more particularly to flexible chairs that combine functionality and comfort.

BACKGROUND OF THE INVENTION

[0002] It is presently known to make a chair that flexes, where as the back tilts, the seat travels forward and slightly upward. Such a chair is illustrated in Fig. 1, and is disclosed in U.S. Patent Re. 36, 335, which is incorporated herein by reference. The chair includes a single continuous frame 1, a seat 2 and a pivoting back 3 attached thereto. Ergometric adjustment of the chair is accomplished by tilting of the back 3 and flexure of the frame 1. Flexure of the frame 1 urges the back 3 into a normal upright position for stacking and uniform appearance. The back 3 is curved and hollow, and engages the frame 1 at upper and lower curved sections of the frame 1, which sections have radii of curvatures less than that of the back 3 and which sections are positioned at a downward angle such that the effective horizontal radii of the sections in the upright position is shorter than the actual radii, causing the back 3 to rest against the curved sections and limit forward tilting of the back 3. When the back 3 is tilted, the radial movement disengages the back 3 from the curved sections due to the difference in radii, until the angle of tilt is such that the effective radii are again equal and the back 3 again rests against the curved sections of the frame and limits tilting backward.

[0003] The above described chair relies on the flexing of that portion of the chair frame that forms the chair's legs. Such a chair, therefore, is not compatible with a post base, and is not adjustable.

SUMMARY OF THE INVENTION

[0004] The present invention is a flexible chair that provides a back that tilts and a seat that travels forward and slightly upward, but in a manner that is adjustable and that is compatible with a post base.

[0005] The present invention is a chair on which a user can sit and recline, that includes a seat frame, a seat bottom attached to the seat frame, a seat back have a lower portion thereof rotatably attached to the seat frame, a back frame rotatably attached to an upper portion of the seat back and having at least one lower end that is slidably engaged with the seat frame or the seat bottom, a support post attached to and supporting the back frame, and at least one spring for applying a bias force between the lower end and the seat frame or the seat bottom. As a user sits on the seat bottom and leans back against the seat back, the seat back pivots and the seat bottom slides forward.

[0006] In another aspect of the present invention, the chair on which a user can sit and recline includes a seat frame, a seat bottom attached to the seat frame, a seat back have a lower portion thereof rotatably attached to the seat frame, a back frame rotatably attached to an upper portion of the seat back, a support post attached to and supporting the back frame, and a link member rotatably attached to the seat frame or the seat bottom, and attached to the support post. As a user sits on the seat bottom and leans back against the seat back, the seat back pivots and the seat bottom slides forward.

[0007] In yet one more aspect of the present invention, the chair on which a user can sit and recline includes a seat frame, a seat bottom attached to the seat frame, a seat back have a lower portion thereof rotatably attached to the seat frame, a back frame rotatably attached to an upper portion of the seat back and having a pair of lower ends that are each slidably engaged with the seat frame or the seat bottom, a support post attached to and supporting the back frame, and a pair of springs each for applying a bias force between one of the lower ends and the seat frame or the seat bottom. As a user sits on the seat bottom and leans back against the seat back, the seat back pivots and the seat bottom slides forward.

[0008] Other objects and features of the present invention will become apparent by a review of the specification, claims and appended figures.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Fig. 1 is a side view of a conventional flexible chair.

Fig. 2 is a side view of the flexible chair of the present invention.

Fig. 3A is a back view of the flexible chair of the present invention.

Fig. 3B is a bottom view of the flexible chair of the present invention.

Fig. 4 is a partially broken away perspective view of the flexible chair of the present invention.

Fig. 5 is a side view of the flexible chair of the present invention, illustrating the critical angles and dimensions thereof.

Fig. 6 is a side view of an alternate embodiment of the flexible chair of the present invention.

Fig. 7 is a partially broken away perspective view of another alternate embodiment of the flexible chair of the present invention.

Fig. 8A is a perspective view of the flexible chair of the present invention mounted to a pivot arm.

Fig. 8B is a perspective view of the flexible chair of the present invention mounted to a castor base.

Fig. 9 is a perspective view of the flexible chairs of the present invention mounted to a horizontal beam.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0010] Figs 2-4 illustrate the chair 10 of the present invention. The chair 10 is mounted on a post 12, and includes a seat bottom 14, a seat back 16, a seat frame 18, and a back frame 20.

[0011] The seat bottom 14 is supported by the seat frame 18. Frame 18 includes a pair of first (lower) portions 18a on which the seat bottom 14 rests, and second (upper) portions 18b that rotatably attach to a lower portion of the seat back 16 (at lower pivot points 22). The seat frame 18 can terminate at the lower pivot points 22, or can extend across the seat back 16 in a continuous fashion (in the same manner as disclosed in U.S. Patent Re. 36,335, which is incorporated herein by reference).

[0012] The back frame 20 includes first (upper) portions 20a that extend up and rotatably attach to the seat back 16 (at upper pivot points 24). The back frame upper portions 20a can terminate at the upper pivot points 24, or can extend across the seat back 16 in a continuous fashion (in the same manner as disclosed in U.S. Patent Re. 36,335). The back frame 20 also each includes second (lower) portions 20b that extend under the seat bottom 14 (to form rails on which the seat bottom 14 glides as further explained below).

[0013] A pair of glide blocks 26 are connected to the seat bottom 14, or to the seat frame lower portions 18a directly or to one of one or more cross members 28 that extend between the seat frame lower portions 18a (as illustrated in Fig. 4). The glide blocks 26 each include an aperture 26a through which one of the back frame lower portions 20b slidably extend. The glide blocks 26 are preferably made of a low friction material, such as acetal, brass, etc. Compression springs 30 are mounted to exert a bias force between the glide blocks 26 and flanges 32 at the ends of back frame lower portions 20b. This bias force pushes the seat frame 18 backward (relative to the back frame 20) to return the seat bottom and back 14/16 to their default positions. The back frame 20 is attached to the post 12, preferably via a cross member 34 extending between the back frame lower portions 20b. The post 12 is fixed to the ground. Preferably, in the default and/or reclined positions, the back frame lower portions 20a extend down at a forward angle or position, so when the chair is in the reclined position, the back frame lower portions 20a do not protrude rearwardly to create a hazard in a row of auditorium seating behind the chair. The post 12 is preferably centralized and minimized, to prevent vandalism (gum, etc.) and abuse (feet, etc.) coming from the rear row.

[0014] As a user sits on the seat bottom 14 and leans back against the seat back 16, the seat back 16.pivots (so that the lower portion thereof moves forward), and the seat bottom 14 slides forward, all against the bias force of spring 30. Also, the seat bottom 14 lifts up as it slides forward. As a user leans forward or stands up, the seat back 16 pivots in the reverse direction, and the seat bottom 14 slides/drops back, until the chair 1 is back in its default position.

[0015] Fig. 5 illustrates the critical dimensions that adjust the feel and operation of the chair 1. The angle A2 (between vertical V and seat frame first portions 18a) affects how reclined the seat is, relative to the floor. The angle A1 (between vertical V and back frame lower portions 20b) dictates how much the seat bottom 14 lifts as it moves forward. The greater A1 is, the more the seat bottom 14 lifts during its forward motion. The dimension B (horizontal distance from the post 12 and the upper pivot points 24) helps dictate the force needed to recline the chair 1. When the user tries to recline the chair by leaning back, the seat back 16 tilts back and pushes the seat bottom 14 forward and slightly up, in the direction of the arrows. When the seat bottom 14 travels forward, the springs 30 apply a backward force on the seat frame 18 (against the reclining force of the user). This backward force can slightly bend backward the back frame upper portions 20a. The longer dimension B is, the more the back frame upper portions 20a bend. The greater the spring constant for springs 30, the more the back frame upper portions 20a may bend. Conversely, the bigger the diameter for back frame upper portions 20a, or other methods of stiffening them (i.e. material choice, cross-section), the less they bend. Thus, adjusting the dimension B, the stiffness of back frame upper portions 20a, and/or the spring constants for springs 30 will modify the feel of the chair for optimal comfort. A manual adjustment for adjusting the spring constant for or the bias force from springs 30 can be included. For example, the flange 32 can be threaded onto the end of back frame lower portion 20b to extend its length, thus reducing the bias force of the spring. When the user leaves the chair, it returns to its default position under the bias force of the springs 30.

[0016] Fig. 6 illustrates an alternative embodiment, where a pivoting link assembly 40 supports the seat frame 18, and the back frame 20 is fixed to the post without any sliding contact with the seat frame/bottom 18/14. Pivoting link assembly 40 includes an L shaped link member 42 that is rotatably connected to the seat frame 18 and the post 12, and a spring 44 (e.g. torsion or leaf spring) that exerts a bias force downward on one end of link member 42. As the user sits and reclines backward, the seat bottom 14 moves forward against the bias of spring 44, and the link member 42 slightly lifts the seat bottom 14. This configuration does not rely on any sliding parts for a better and smoother feel. Also, it is potentially cheaper.

[0017] Fig. 7 illustrates another alternate embodiment of the flexible chair 1, where back frame lower portions 20b are attached to post 12 (without sliding contact with seat frame 18), and a U-shaped link member 50 is attached (e.g. with a weld joint 51) to the post 12 at its center. The ends of link member 50 are rotatably attached (e.g. with a pin joint 52) to the seat frame 18. When the user reclines, the seat bottom 14 moves for-

ward against the torsion movement of link member 50, which essentially acts as the return spring.

[0018] Fig. 8A illustrates how post 12 can include a bottom portion 60 rotatably supporting a cantilevered swing arm 62 on which the chair 1 of the present invention (of any of the above described embodiments) is mounted. The bottom portion 60 may also serve as a leg for a table 64, as shown in Fig. 8A. Fig. 8B illustrates how post 12 can include a standard piston (for adjusting elevation) and a 5 star caster base 70 at its lower end.

[0019] Fig. 9 illustrates how post 12 can include a horizontal beam 80 on which a plurality of chairs 1 of the present invention (of any of the above described embodiments) can be mounted, for compact auditorium seating.

[0020] It is to be understood that the present invention is not limited to the embodiment(s) described above and illustrated herein, but encompasses any and all variations falling within the scope of the appended claims. For example, the lower portions 18a of frame 18 can be omitted, and the seat bottom 14 can be supported by the frame 18 attached to the edge of seat bottom 14. In that case, the seat frame could be a hinge or other member attached to or even integrally extending from the seat bottom, that provides a rotatable connection between the seat bottom and the seat back. In addition, seat frame 18 could be combined into a single member attached between the seat bottom/back 14/16. Likewise, back frame could be configured to have a single lower portion slidably engaged with the seat bottom 14.

Claims

1. A chair on which a user can sit and recline, comprising:

a seat frame;
a seat bottom attached to the seat frame;
a seat back have a lower portion thereof rotatably attached to the seat frame;
a back frame rotatably attached to an upper portion of the seat back and having at least one lower end that is slidably engaged with the seat frame or the seat bottom;
a support post attached to and supporting the back frame; and
at least one spring for applying a bias force between the lower end and the seat frame or the seat bottom;

wherein as a user sits on the seat bottom and leans back against the seat back, the seat back pivots and the seat bottom slides forward.

2. The chair of claim 1, wherein the seat bottom lifts up as the seat bottom slides forward.

3. The chair of claim 1, further comprising:

at least one glide block attached to seat frame or the seat bottom and having a aperture formed therein, wherein the lower end is slidably engaged through the aperture, and

wherein the spring applies the bias force between the lower end and the glide block.

4. The chair of claim 3, wherein the lower end terminates in a flange, and wherein the spring extends between and engages the flange and the glide block.

5. The chair of claim 3, wherein the seat frame includes a pair of lower portions with a cross member extending therebetween, and wherein the glide block is attached to the cross member.

6. The chair of claim 4, wherein a length of the lower end is adjustable to adjust the bias force.

7. The chair of claim 1, wherein the back frame includes a second lower end and a cross member extending between the lower end and the second lower end, and wherein the post is attached to the cross member.

8. The chair of claim 1, wherein the post includes a bottom portion and a swing arm portion attached to the post bottom portion in a cantilevered manner.

9. The chair of claim 1, further comprising:

a base having a plurality of caster wheels.

10. The chair of claim 1, further comprising:

a horizontal beam for supporting the post.

11. A chair on which a user can sit and recline, comprising:

a seat frame;
a seat bottom attached to the seat frame;
a seat back have a lower portion thereof rotatably attached to the seat frame;
a back frame rotatably attached to an upper portion of the seat back;
a support post attached to and supporting the back frame; and
a link member rotatably attached to the seat frame or the seat bottom, and attached to the support post;

wherein as a user sits on the seat bottom and leans back against the seat back, the seat back piv-

ots and the seat bottom slides forward.

12. The chair of claim 11, wherein the link member is rotatably attached to the support post, and wherein the link member lifts the seat bottom up as the seat bottom slides forward.

13. The chair of claim 11, further comprising:

a spring for exerting a bias force on the pivot member.

14. The chair of claim 13, wherein the link member is L-shaped.

15. The chair of claim 11, wherein the link member includes a center portion that is rigidly attached to the post, and a pair of end portions each rotatably attached to the seat frame.

16. The chair of claim 15, wherein the link member is U-shaped.

17. The chair of claim 11, wherein the post includes a bottom portion and a swing arm portion attached to the post bottom portion in a cantilevered manner.

18. The chair of claim 11, further comprising:

a base having a plurality of caster wheels.

19. The chair of claim 11, further comprising:

a horizontal beam for supporting the post.

20. A chair on which a user can sit and recline, comprising:

a seat frame;
a seat bottom attached to the seat frame;
a seat back have a lower portion thereof rotatably attached to the seat frame;
a back frame rotatably attached to an upper portion of the seat back and having a pair of lower ends that are each slidably engaged with the seat frame or the seat bottom;
a support post attached to and supporting the back frame; and
a pair of springs each for applying a bias force between one of the lower ends and the seat frame or the seat bottom;

wherein as a user sits on the seat bottom and leans back against the seat back, the seat back pivots and the seat bottom slides forward.

21. A chair on which a user can sit and recline, comprising a seat bottom, a seat back, and a supporting structure, an upper portion of the back being rotatably attached to the supporting structure and the seat bottom being rotatably attached to a lower portion of the seat back, **characterised in that** the supporting structure includes a support post which is attached to and supports a back frame, the upper portion of the seat back being rotatably attached to the back frame, the seat bottom being mounted for movement backwards and forwards relative to the post, and including means for biasing the seat bottom backwards in the direction of the seat back, wherein as a user sits on the seat bottom and leans back against the seat back, the seat back pivots and the seat bottom moves forwards.

22. A chair according to claim 21 in which the supporting structure includes a seat frame and a seat back having a lower portion rotatably attached to the seat frame whereby the seat bottom is rotatably attached to a lower portion of the seat back.

23. A chair according to claim 22 in which the back frame has at least one lower end that is slideably engaged with the seat frame or the seat bottom.

24. A chair according to claim 23 in which the biasing means comprise at least one spring for applying a bias force between the lower end of the back frame and the seat frame or the seat bottom.

25. A chair according to claim 24 in which the back frame includes a pair of lower ends that are each slideably engaged with the seat frame or seat bottom and in which the biasing means comprise a pair of springs each for applying a bias force between one of the lower ends and the seat frame or the seat bottom.

26. A chair according to claim 22 including a link member rotatably attached to the seat frame or the seat bottom, and attached to the support post.

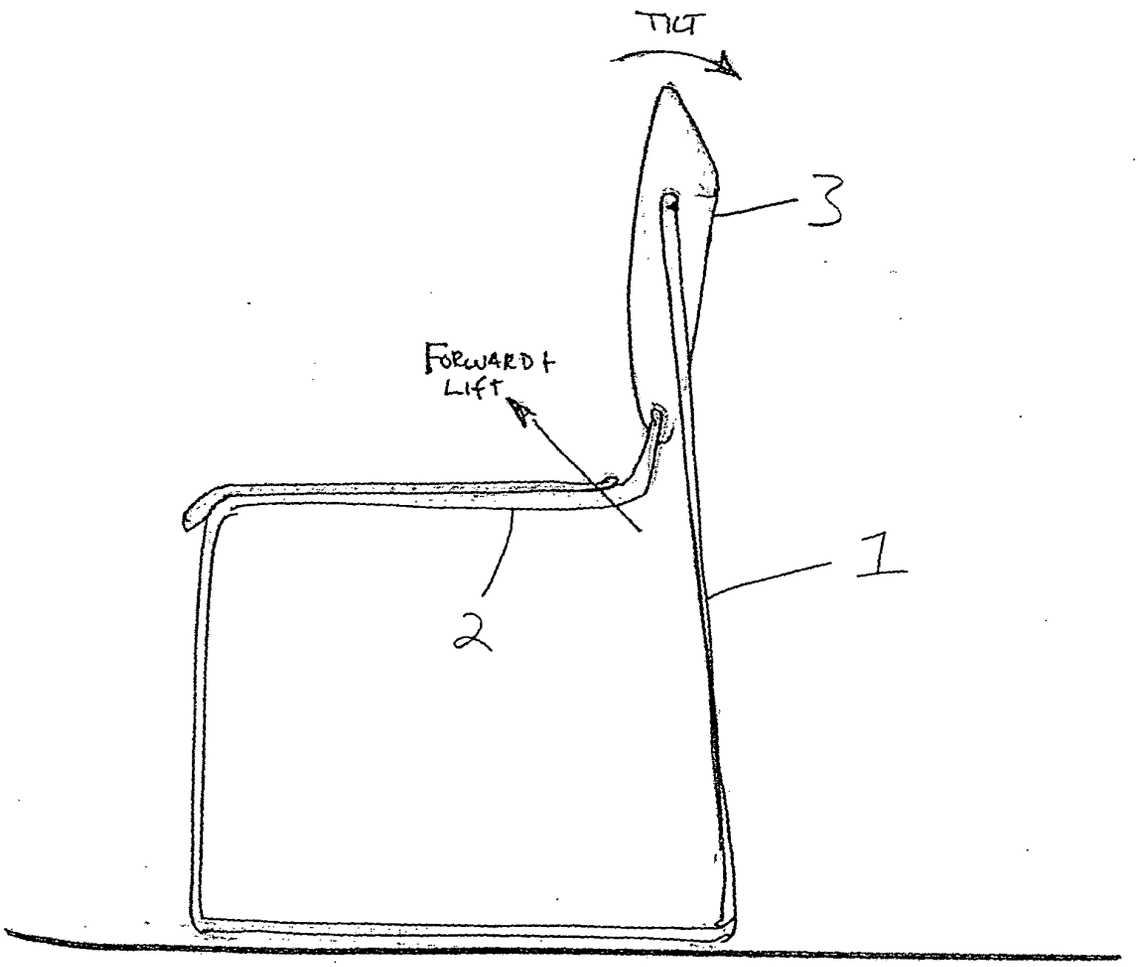

Fig 1

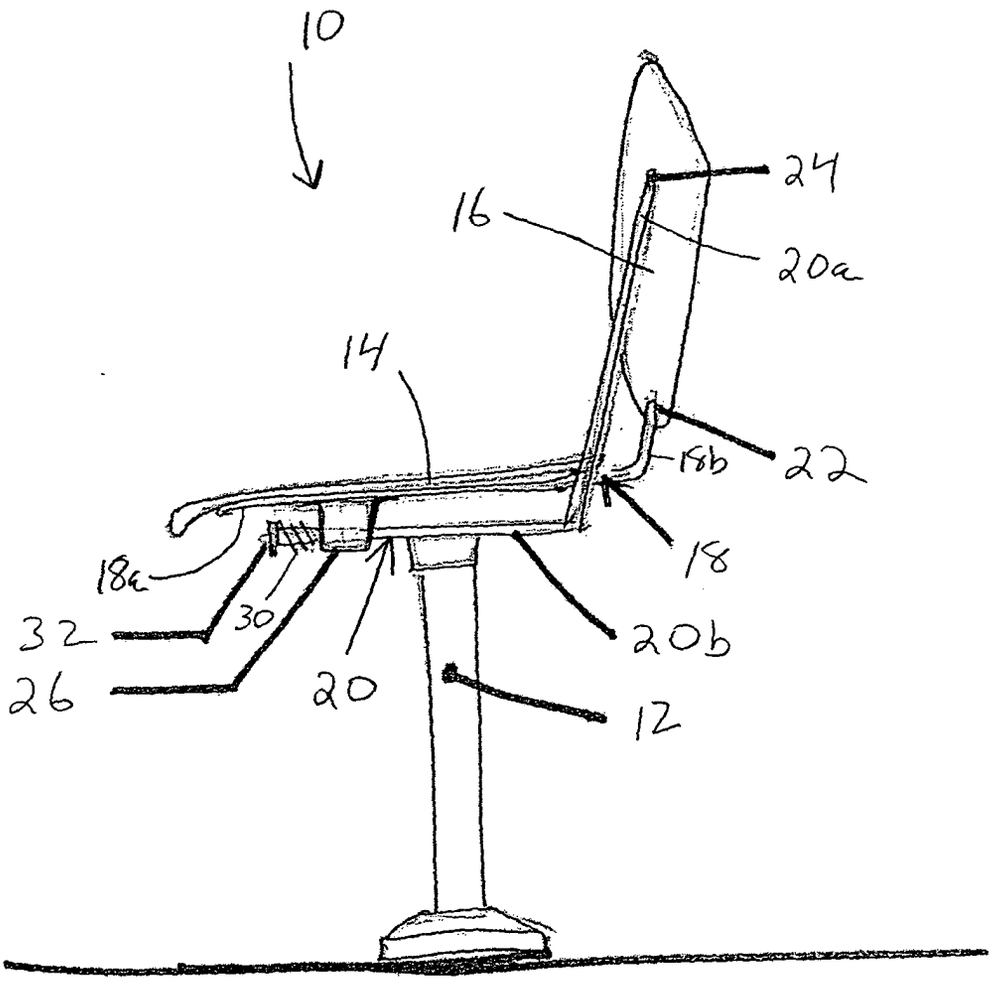

Fig 2

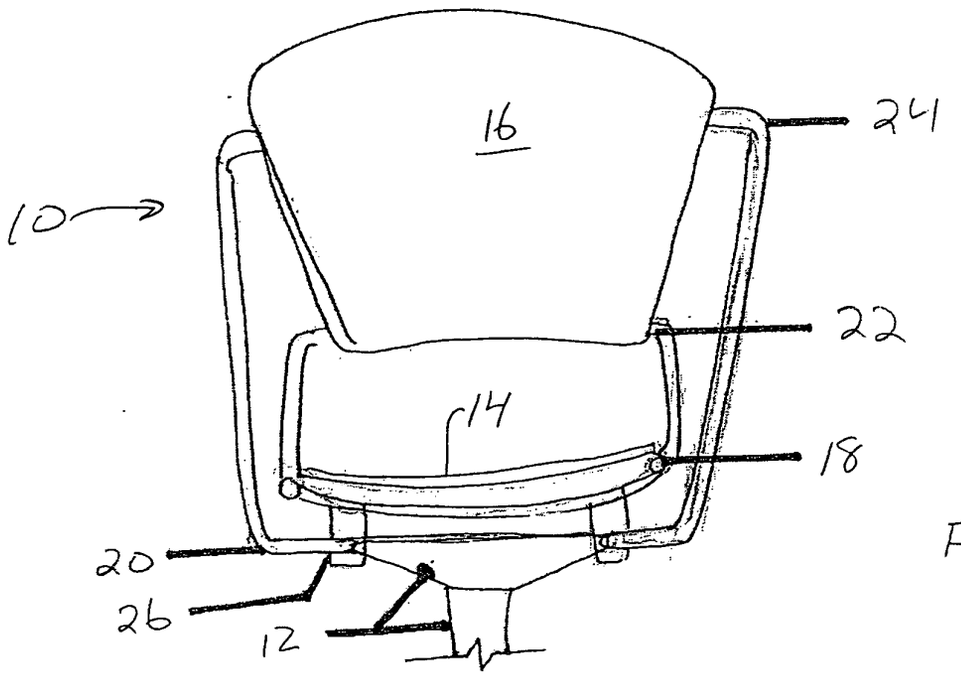

Fig 3A

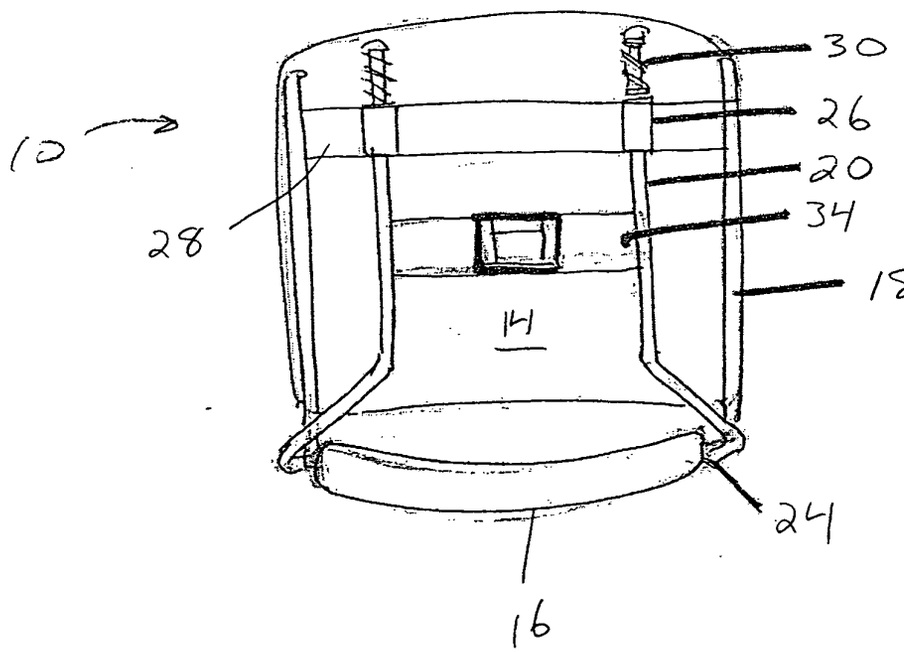

Fig 3B

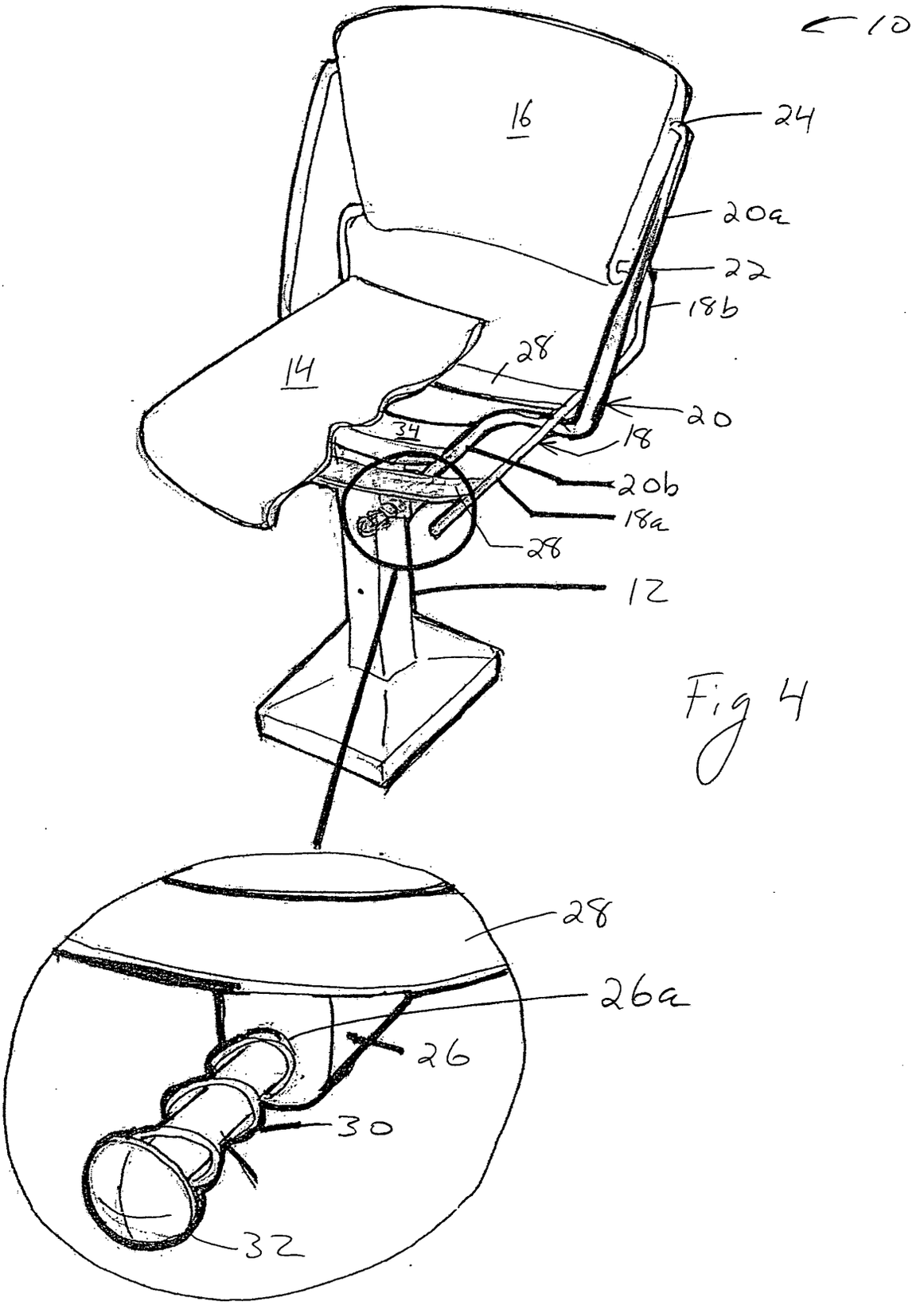

Fig 4

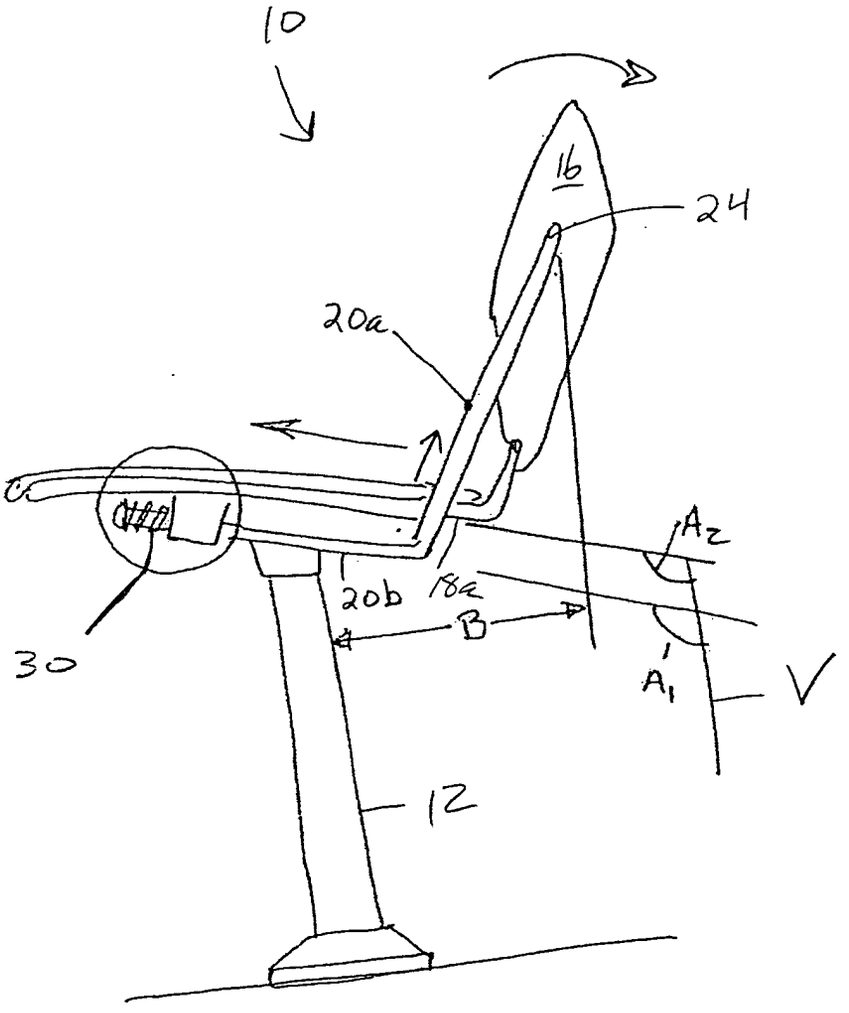

Fig 5

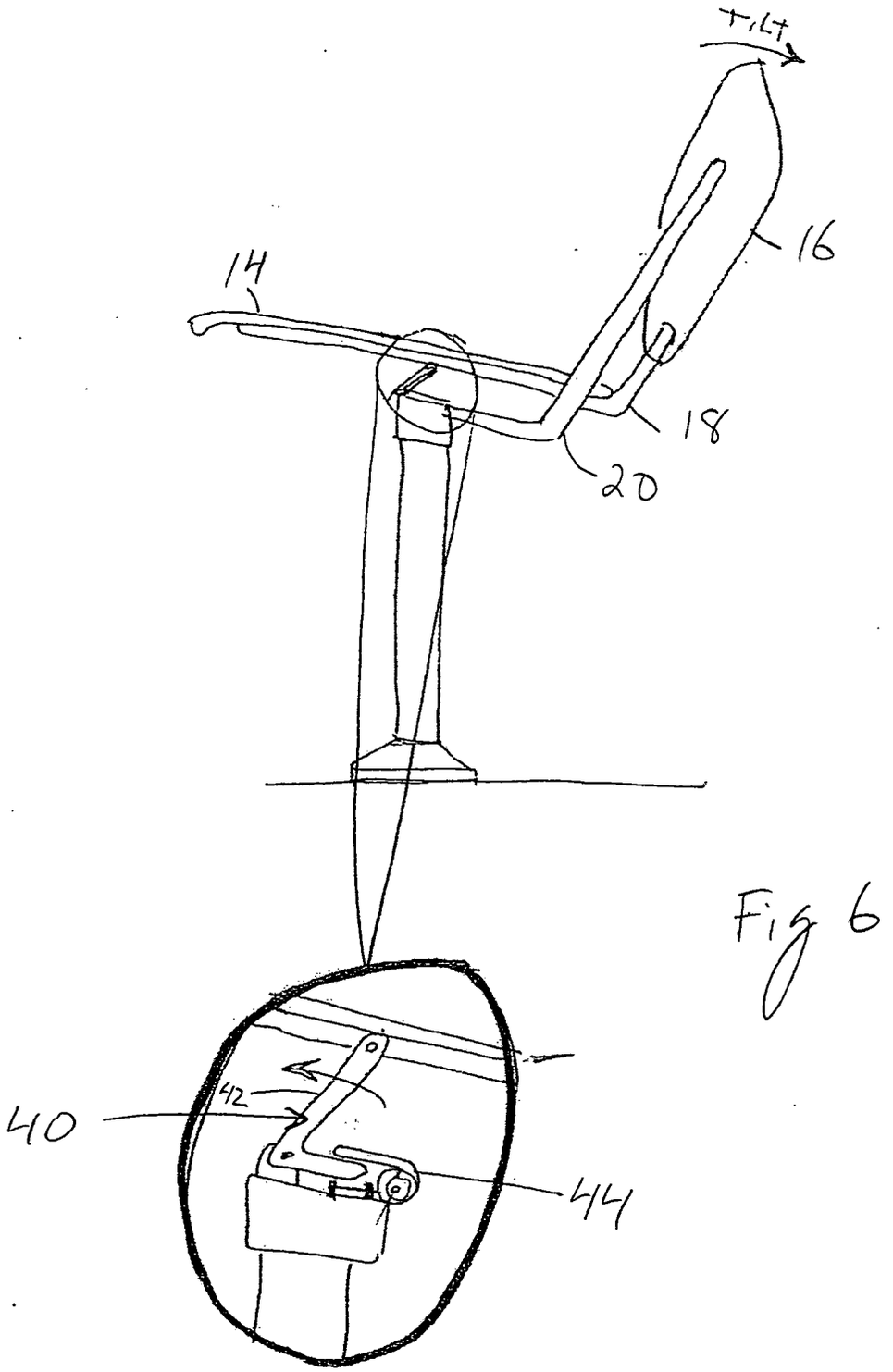

Fig 6

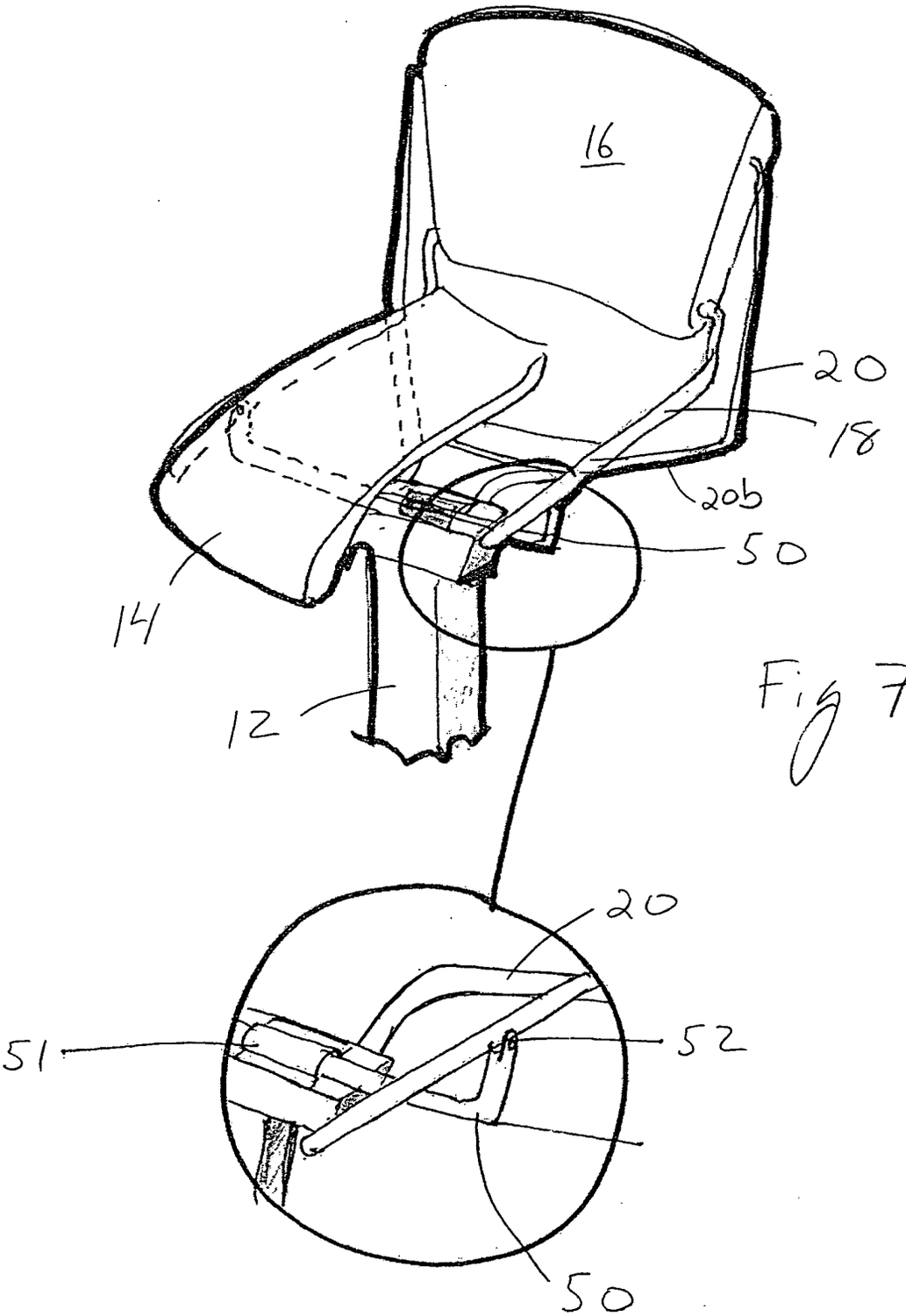

Fig 7

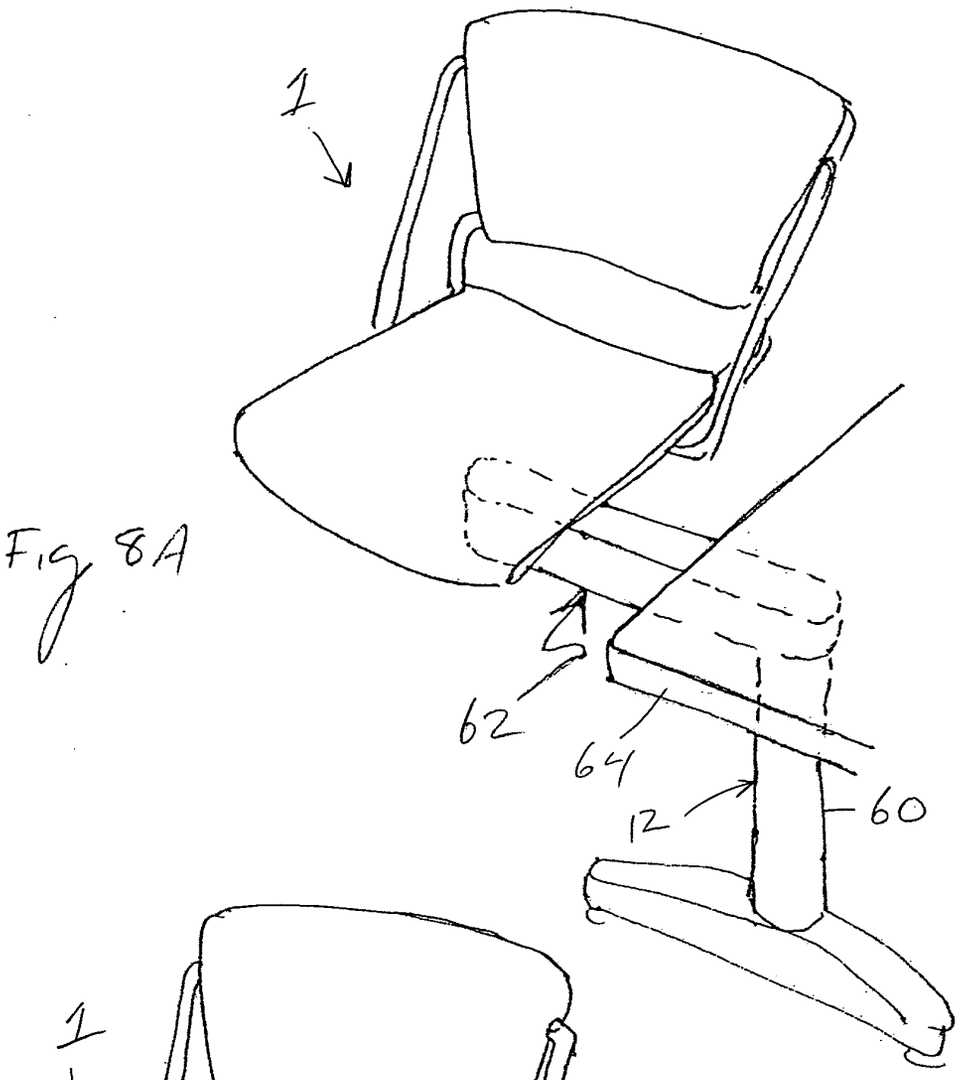

Fig 8A

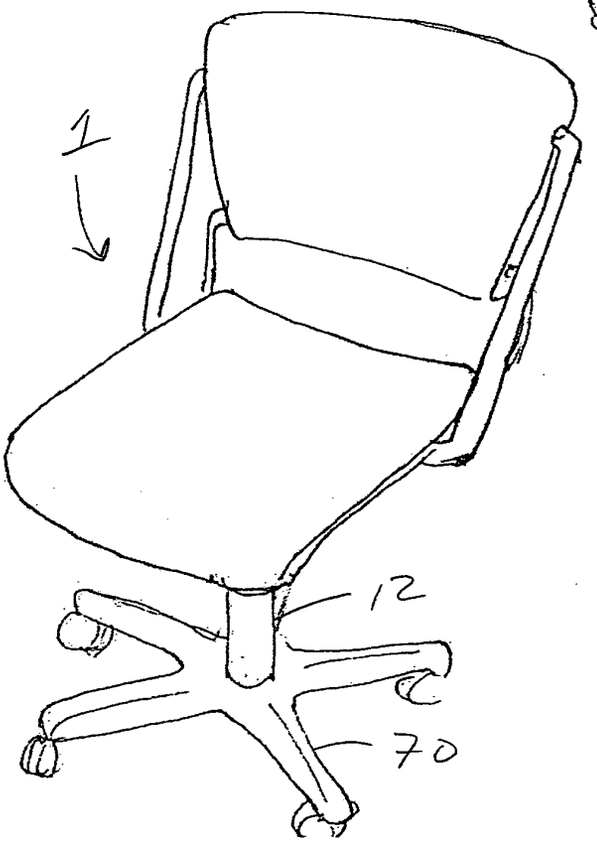

Fig 8B

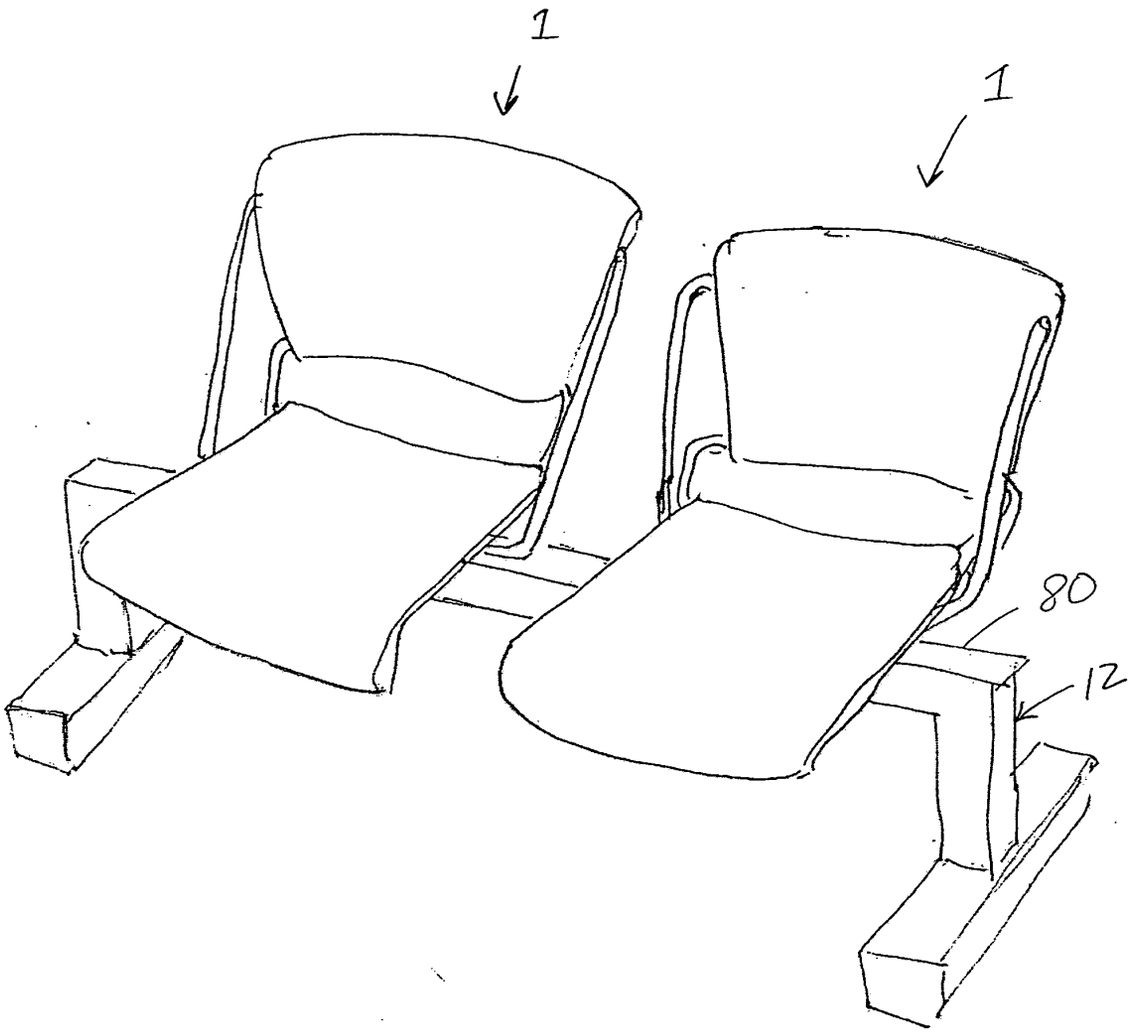

Fig 9