(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 466 780 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
22.05.2013 Bulletin 2013/21

(51) Int Cl.:
B60N 2/14 *(2006.01)* ***B64D 11/06*** *(2006.01)*

(21) Application number: **04008245.5**

(22) Date of filing: **05.04.2004**

(54) **Rotation lock mechanism for aircraft seat**

Blockiermechanismus für Flugzeugdrehsitz

Mécanisme de blocage en rotation pour siège d'aéronef

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR

(30) Priority: **07.04.2003 US 409976**

(43) Date of publication of application:
13.10.2004 Bulletin 2004/42

(60) Divisional application:
11004281.9
11004425.2

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Description

FIELD

[0001] The embodiments disclosed herein relate generally to brake systems, and more particularly to brake systems for adjustable seats.

BACKGROUND

[0002] Many airplanes have adjustable seats that can move in several directions. For example, some seats permit a user to move the seat forward and backward, side-to-side, and around a central axis (e.g., rotational motion). For each of these three types of movement, many different systems have been used to control seat positioning.

[0003] One system for controlling rotational movement includes using a disc or ring attached to a base assembly, which is attached to the floor of an airplane. The disc or ring includes gear-like teeth disposed along the outer circumference of the disc'or ring. A mating gear-like locking mechanism is attached to the seat, which can rotate freely when the user disengages the locking mechanism from the disc or ring. When the user wishes to prevent further rotational movement of the seat, the user engages'the locking mechanism, which permits a gear-like tooth to sit between one of the teeth disposed on the disc or ring.

[0004] However, the "gear" design has some drawbacks. For example, there are only a finite number of positions in which a user can securely position the seat. Depending on the width of the gear teeth, the angular distance between positions can be significant.

[0005] In addition, the seat can get stuck "between" teeth (e.g., locking mechanism not properly engaged between gear teeth). This can cause an undesirable situation in which the user incorrectly believes that the seat is locked. For example, in an airplane, a user holding a hot cup of coffee can be burned if a seat that is improperly "locked" jolts into a proper locked position when the airplane turns at a sharp angle or suddenly experiences turbulence.

[0006] WO 03/011640 describes a personal mobility vehicle that includes a seat assembly that can be swiveled and fitted. A braking mechanism comprises a caliper that prevents rotation of the seat assembly.

SUMMARY

[0007] Various embodiments disclosed herein utilize a braking mechanism to control rotational movement of a seat. The braking mechanism may comprise a circular member (e.g., a disc or ring) that is coupled to a base assembly and a caliper, coupled to a seat assembly, to engage the circular member. In a biased position, a braking element of the caliper applies a braking force to the circular member. A user can reduce the braking force by increasing the tension on a cable coupled to the caliper. Once the braking force is sufficiently reduced, the user may rotate the seat until the desired rotational orientation is attained. Upon release of the cable, the braking mechanism re-engages to prevent further rotational movement.

[0008] One alternative embodiment employs a band disposed around the circumference of the disc instead of a caliper. This embodiment may also employ a circumferential recess in the disc to ensure that the band remains engaged with the disc in both the biased and unbiased positions.

[0009] In another alternative embodiment, a brake shoe assembly is used to apply a braking force to a brake drum. One or more brake shoes may be used to apply the braking force to at least one of an inner and an outer surface of the drum.

DESCRIPTION OF THE DRAWINGS

[0010] Various embodiments are illustrated by way of example and not by way of limitation in the figures of the accompanying drawings in which like references indicate similar elements. It should be noted that references to "an," "one," "the," "other," "alternative," or "various" embodiments in this disclosure are not necessarily to the same embodiment, and such references mean at least one.

Figure 1 is an exploded, perspective view of one embodiment of a rotational braking mechanism.

Figure 2 is an assembled, perspective view of the braking mechanism of **Figure 1**.

Figure 3 is a side view of one embodiment of a rotational braking mechanism in combination with a base assembly, a linear bearing track, and a seat assembly.

Figure 4 is a side view of one embodiment of a caliper housing with an external spring to adjust the braking force applied by the caliper in a biased state.

Figure 5 shows one embodiment of a tension splitter that may be used as part of a cable system to actuate a plurality of braking mechanisms.

DETAILED DESCRIPTION

[0011] In the following description, for the purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the various embodiments. It will be apparent to one skilled in the art that the embodiments may be practiced without some of these specific details. In other instances, certain structures. and devices are omitted or simplified in order to avoid obscuring the details of the various embodiments.

[0012] The following description and the accompanying drawings provide examples for the purposes of illustration. However; these examples should not be construed in a limiting sense as they are not intended to provide an exhaustive list of all possible implementations.

[0013] Referring now to **Figure 1**, an exploded, perspective view of one embodiment of a rotational braking system is shown. In various embodiments, the braking system comprises a circular member and a braking mechanism to apply a braking force to the circular member. The circular member can be a brake disc (e.g., solid structure) or ring (e.g., a disc with a substantial opening in the central portion of the disc). The circular member shown in **Figure 1** is brake ring 10.

[0014] In order to reduce the overall weight of the braking system, a plurality of holes and/or grooves can be formed in the circular member. The holes and grooves may be formed by any suitable technique such as, for example, drilling, milling, or molding.

[0015] Once assembled (**Figure 2**), brake ring 10 is coupled to swivel ring 12, which is coupled to base assembly 24 (shown in **Figure 3).** Inner swivel 14 has bearings 16 **(Figure 1)** that can move within track 17 of swivel ring 12. In one embodiment, each bearing 16 only contacts track 17 at two points. For example, each bearing 16 may contact the upper edge of track 17 and the lower edge of track 17. Such a configuration advantageously reduces friction between bearings 16 and track 17 to improve movement of inner swivel 14 relative to swivel ring 12.

[0016] Brake housing 18 is coupled to inner swivel 14 by brake bracket 19. This allows brake housing 18 to rotate with inner swivel 14 relative to brake ring 10 and swivel ring 12. In alternative embodiments, brake housing 18 remains stationary while brake ring 10 is capable of rotation.

[0017] In one embodiment, brake housing 18 comprises a caliper with opening 20 to receive brake ring 10. The caliper may include a first resilient member (e.g., an internal spring) to bias braking element 40 (Figure 4) against at least one of a top side and a bottom side of brake ring 10. In this manner, the caliper is capable of applying a braking force to brake ring 10 via braking element 40.

[0018] **Figure 3** shows an embodiment in which seat assembly 28 is coupled to inner swivel 14 (e.g., via linear bearing 26) so that seat 30 may be rotated relative to base assembly 24. In the embodiment shown, brake ring 10 remains stationary while inner swivel 14 and seat assembly 28 are capable of rotation.

[0019] In various embodiments, cable 34 is provided to enable a user to reduce the braking force applied to the circular member (e.g., brake ring 10) such that seat assembly 28 may be rotated. The proximal end of cable 34 may be attached to cable interface 22 of brake housing 18 (**Figures 3** and **4**). The distal end of cable 34 may be attached to brake handle 32 to permit a user to change the tension on cable 34 in order to effect a change in the amount of braking force applied to brake ring 10. Brake handle 32 is coupled to arm rest 31 of seat 30. However, other suitable manners of changing the tension on cable 34 may be used. In addition, the tension adjustment mechanism (e.g., brake handle 32 or suitable alternative) may be disposed in any suitable location.

[0020] **Figure 4** shows an embodiment in which cable 34 is coupled (e.g., via cable interface 22) to the caliper to control the amount of braking force applied to brake ring 10. In the embodiment shown, the caliper comprises a resilient member (e.g., a spring disposed within brake housing 18) and braking element 40. The connection between cable 34 and the caliper is such that a change in the tension of cable 34 can release the caliper from a biased position, in which braking element 40 is biased against the circular member disposed within opening 20 of the caliper. Thus, when the tension of cable 34 is increased to overcome the bias of the resilient member, the amount of force exerted on the circular member by braking element 40 is reduced to permit movement of seat assembly 28.

[0021] In addition, an adjustable resilient member (e.g., spring 38) can be used to adjust the amount of braking force exerted by the caliper in the biased position on the circular member. In the embodiment shown in **Figure 4**, spring 38 is disposed around cable interface 22 and has one end butted against (or coupled to) brake housing 18 and the other end coupled to stop 36. Such a configuration is only one example of a mechanism for adjusting the braking force applied by the caliper in the biased position.

[0022] The various embodiments discussed herein are concerned with using a braking force to control the rotational movement of seat 30. As mentioned previously, braking force can also be used to control movement in other directions (e.g., fore and aft movement, as well as transverse). The braking mechanisms used to control movement in the other directions may work on the same or different principles as those disclosed herein.

[0023] Regardless of the type of braking mechanisms used to control movement in the various directions, it is contemplated to have a single cable that a user can manipulate in order to control multiple braking mechanisms. **Figure 5** shows one embodiment of a cable system that can actuate a plurality of braking mechanisms associated with the movement of a seat assembly. For example, tension splitter 42 may be coupled to cable 34 such that the tension applied by the user with handle 32 (**Figure 3**) is divided among two or more cables (e.g. 44A, 44B, and 44C) to control different braking mechanisms. In one embodiment, cable 44A could be coupled to the braking mechanism to control fore and aft movement; cable 44B could be coupled to the braking mechanism to control transverse movement; and cable 44C could be coupled to the braking mechanism to control rotational movement.

[0024] The embodiments disclosed herein may be used in combination an aircraft. **Figure 3** shows one example of how base assembly 24 may be coupled to a portion of an aircraft (e.g., floor 23).

[0025] Although the preceding embodiments have been focused on the use of a caliper to effect a braking force on a disc or a ring, there are other alternative em-

bodiments that may be used. For example, various embodiments may include a band that is disposed around the circumference of the disc (or ring) such that the band is biased to apply a frictional force to the disc to prevent rotational movement. The disc may also have a circumferential recess in which the band is disposed. The recess helps the band remain engaged with the disc. When a user wishes to rotate the seat, the user can actuate a cable to reduce to amount of braking force (e.g., friction) exerted on the disc. Similar to the other embodiments, the user may allow the cable to return to the biased position, in which the band tightens around the disc to prevent rotational movement.

[0026] In another alternative embodiment, a drum assembly may be used in place of a brake disc, and a brake shoe assembly may be used in place of a caliper. In operation, at least one brake shoe is biased against the inner and/or the outer surface of the drum assembly. As described above, various embodiments may include a cable to permit a user to reduce the braking force applied to the drum assembly, allowing the seat to rotate. Once the user has chosen a desired rotational orientation, the cable may be released so that the braking mechanism returns to the biased state in which the brake shoe assembly applies enough braking force to prevent rotational movement of the seat.

Claims

1. An aircraft seat apparatus comprising:

a first circular member (10);
a second circular member (14);
a plurality of bearings (16) disposed near the outside diameter of the second circular member for rotatably coupling the second circular member relative to the first circular member, the second circular member circumferentially disposed within the first circular member;
a seat assembly (28) fixedly coupled to the second circular member (14); and
a braking mechanism to prevent rotation of the seat assembly (28), wherein:-the braking mechanism comprises a caliper (18) fixedly coupled to the second circular member (14), the caliper (18) to apply a braking force to the first circular member (10) to prevent rotation of the seat assembly.

2. The apparatus of Claim 1, wherein the first circular member comprises:

a ring.

3. The apparatus of Claim 2, wherein the the first circular member is fixedly coupled to a base assembly and the caliper is movable with the seat assembly.

4. The apparatus of Claim 1, wherein the caliper comprises:

a first resilient member to bias a braking element against at least one of a top side and a bottom side of the first circular member.

5. The apparatus of Claim 4, wherein the first resilient member comprises:

a spring.

6. The apparatus of Claim 4, further comprising:

a second adjustable resilient member to adjust the braking force exerted on the first circular member by the caliper in a biased state.

7. The apparatus of Claim 6, wherein the second adjustable resilient member comprises:

a spring.

8. The apparatus of Claim 1, the apparatus further comprises:

a cable coupled to the caliper, the cable to enable a user to reduce the braking force applied to the first circular member such that the seat assembly may be rotated.

9. The apparatus of Claim 8, wherein the cable is part of a cable system that can actuate a plurality of braking mechanisms associated with the movement of the seat assembly.

10. The apparatus of Claim 9, wherein the cable system comprises:

a tension splitter coupled to the cable and the caliper.

11. An aircraft seat apparatus comprising:

a first circular member (10);
a second circular member (14);
a plurality ofbearings (16) disposed near the outside diameter of the second circular member for rotatably coupling the second circular member relative to the first circular member, the second circular member circumferentially disposed within the first circular member;
a seat assembly (28) fixedly coupled to the second circular member (16); and
a braking mechanism to prevent rotation of the seat assembly (28), wherein:-the braking mechanism comprises a band disposed around the circumference of the first circular member, the

band to apply a frictional force to the first circular member to prevent rotation of the seat assembly.

12. An aircraft seat apparatus comprising:

a first circular member (10);
a second circular member (14);
a plurality of bearings (16) disposed near the outside diameter of the second circular member for rotatably coupling the second circular member relative to the first circular member, the second circular member circumferentially disposed within the first circular member;
a seat assembly (28) fixedly coupled to the second circular member (16); and
a braking mechanism to prevent rotation of the seat assembly (28), wherein:-the braking mechanism comprises a drum assembly, and the braking mechanism comprises a brake shoe assembly.

Patentansprüche

1. Flugzeugsitz-Vorrichtung, die Folgendes umfasst:

ein erstes kreisförmiges Element (10),
ein zweites kreisförmiges Element (14),
mehrere Lager (16), die nahe dem Außendurchmesser des zweiten kreisförmigen Elementes angeordnet sind, um das zweite kreisförmige Element drehbar im Verhältnis zu dem ersten kreisförmigen Element zu koppeln, wobei das zweite kreisförmige Element in Umfangsrichtung innerhalb des ersten kreisförmigen Elementes angeordnet ist,
eine Sitzbaugruppe (28), die unbeweglich an das zweite kreisförmige Element (14) gekoppelt ist, und
einen Bremsmechanismus, um eine Drehung der Sitzbaugruppe (28) zu verhindern, wobei der Bremsmechanismus einen Bremssattel (18) umfasst, der unbeweglich an das zweite kreisförmige Element (14) gekoppelt ist, wobei der Bremssattel (18) dazu dient, eine Bremskraft auf das erste kreisförmige Element (10) auszuüben, um eine Drehung der Sitzbaugruppe zu verhindern.

2. Vorrichtung nach Anspruch 1, wobei das erste kreisförmige Element Folgendes umfasst:

einen Ring.

3. Vorrichtung nach Anspruch 2, wobei das erste kreisförmige Element unbeweglich an eine Basisbaugruppe gekoppelt ist und der Bremssattel mit der Sitzbaugruppe bewegt werden kann.

4. Vorrichtung nach Anspruch 1, wobei der Bremssattel Folgendes umfasst:

ein erstes elastisches Element, um ein Bremselement gegen wenigstens einer von einer oberen Seite und einer unteren Seite des ersten kreisförmigen Elementes vorzuspannen.

5. Vorrichtung nach Anspruch 4, wobei das erste kreisförmige Element Folgendes umfasst:

eine Feder.

6. Vorrichtung nach Anspruch 4, das ferner Folgendes umfasst:

ein zweites, einstellbares, elastisches Element, um die durch den Bremssattel in einem vorgespannten Zustand auf das erste kreisförmige Element ausgeübte Bremskraft einzustellen.

7. Vorrichtung nach Anspruch 6, wobei das zweite vorgespannte Element Folgendes umfasst:

eine Feder.

8. Vorrichtung nach Anspruch 1, wobei die Vorrichtung ferner Folgendes umfasst:

ein an den Bremssattel gekoppeltes Seil, wobei das Seil dazu dient, einen Anwender dazu in die Lage zu versetzen, die auf das erste kreisförmige Element ausgeübte Bremskraft zu verringern derart, dass die Sitzbaugruppe gedreht werden kann.

9. Vorrichtung nach Anspruch 8, wobei das Seil ein Teil einer Seilanlage ist, die mehrere Bremsmechanismen betätigen kann, die mit der Bewegung der Sitzbaugruppe verknüpft sind.

10. Vorrichtung nach Anspruch 9, wobei die Seilanlage Folgendes umfasst:

einen Spannungsverteiler, der an das Seil und den Bremssattel gekoppelt ist.

11. Flugzeugsitz-Vorrichtung, die Folgendes umfasst:

ein erstes kreisförmiges Element (10),
ein zweites kreisförmiges Element (14),
mehrere Lager (16), die nahe dem Außendurchmesser des zweiten kreisförmigen Elementes angeordnet sind, um das zweite kreisförmige Element drehbar im Verhältnis zu dem ersten kreisförmigen Element zu koppeln, wobei das

zweite kreisförmige Element in Umfangsrichtung innerhalb des ersten kreisförmigen Elementes angeordnet ist,
eine Sitzbaugruppe (28), die unbeweglich an das zweite kreisförmige Element (14) gekoppelt ist, und
einen Bremsmechanismus, um eine Drehung der Sitzbaugruppe (28) zu verhindern, wobei der Bremsmechanismus ein Band umfasst, das um den Umfang des ersten kreisförmigen Elementes angeordnet ist, wobei das Band dazu dient, eine Reibungskraft auf das erste kreisförmige Element auszuüben, um eine Drehung der Sitzbaugruppe zu verhindern.

12. Flugzeugsitz-Vorrichtung, die Folgendes umfasst:

ein erstes kreisförmiges Element (10),
ein zweites kreisförmiges Element (14),
mehrere Lager (16), die nahe dem Außendurchmesser des zweiten kreisförmigen Elementes angeordnet sind, um das zweite kreisförmige Element drehbar im Verhältnis zu dem ersten kreisförmigen Element zu koppeln, wobei das zweite kreisförmige Element in Umfangsrichtung innerhalb des ersten kreisförmigen Elementes angeordnet ist,
eine Sitzbaugruppe (28), die unbeweglich an das zweite kreisförmige Element (14) gekoppelt ist, und
einen Bremsmechanismus, um eine Drehung der Sitzbaugruppe (28) zu verhindern, wobei der Bremsmechanismus eine Trommelbaugruppe umfasst und der Bremsmechanismus eine Bremsbackenbaugruppe umfasst.

Revendications

1. Dispositif pour siège d'avion, comprenant :

un premier élément circulaire (10) ;
un deuxième élément circulaire (14) ;
plusieurs paliers (16), agencés près du diamètre extérieur du deuxième élément circulaire, pour accoupler de manière rotative le deuxième élément circulaire au premier élément circulaire, le deuxième élément circulaire étant agencé de manière circonférentielle dans le premier élément circulaire ;
un assemblage de siège (28), accouplé fermement au deuxième élément circulaire (14) ; et
un mécanisme de freinage, pour empêcher la rotation de l'assemblage de siège (28), dans lequel :

le mécanisme de freinage comprend un étrier (18), accouplé fermement au deuxième élément circulaire (14), l'étrier (18) servant à appliquer une force de freinage au premier élément circulaire (10) pour empêcher la rotation de l'assemblage de siège.

2. Dispositif selon la revendication 1, dans lequel le premier élément circulaire comprend :

une bague.

3. Dispositif selon la revendication 2, dans lequel le premier élément circulaire est accouplé fermement à un assemblage de base, l'étier pouvant se déplacer avec l'assemblage de siège.

4. Dispositif selon la revendication 1, dans lequel l'étier comprend :

un premier élément élastique, pour pousser un élément de freinage contre au moins un côté supérieur et un côté inférieur du premier élément circulaire.

5. Dispositif selon la revendication 4, dans lequel le premier élément circulaire comprend :

un ressort.

6. Dispositif selon la revendication 4, comprenant en outre :

un deuxième élément élastique ajustable, pour ajuster la force de freinage exercée sur le premier élément circulaire par l'étrier dans un état de poussée.

7. Dispositif selon la revendication 6, dans lequel le deuxième élément élastique ajustable comprend :

un ressort.

8. Dispositif selon la revendication 1, le dispositif comprenant en outre :

un câble, accouplé à l'étrier, le câble servant à permettre à un utilisateur de réduire la force de freinage appliqué au premier élément circulaire, de sorte à permettre la rotation de l'assemblage de siège.

9. Dispositif selon la revendication 8, dans lequel le câble fait partie d'un système de câble pouvant actionner plusieurs mécanismes de freinage associés au déplacement de l'assemblage de siège.

10. Dispositif selon la revendication 9, dans lequel le système de câble comprend :

un diviseur de tension accouplé au câble et à l'étrier.

11. Dispositif pour siège d'avion, comprenant :

un premier élément circulaire (10) ;
un deuxième élément circulaire (14) ;
plusieurs paliers (16), agencés près du diamètre extérieur du deuxième élément circulaire, pour accoupler de manière rotative le deuxième élément circulaire au premier élément circulaire, le deuxième élément circulaire étant agencé de manière circonférentielle dans le premier élément circulaire ;
un assemblage de siège (28), accouplé fermement au deuxième élément circulaire (14) ; et
un mécanisme de freinage, pour empêcher la rotation de l'assemblage de siège (28), dans lequel :

le mécanisme de freinage comprend une bande, agencée autour de la circonférence du premier élément circulaire, la bande servant à appliquer une force de frottement au premier élément circulaire pour empêcher la rotation de l'assemblage de siège.

12. Dispositif pour siège d'avion, comprenant :

un premier élément circulaire (10) ;
un deuxième élément circulaire (14) ;
plusieurs paliers (16), agencés près du diamètre extérieur du deuxième élément circulaire, pour accoupler de manière rotative le deuxième élément circulaire au premier élément circulaire, le deuxième élément circulaire étant agencé de manière circonférentielle dans le premier élément circulaire ;
un assemblage de siège (28), accouplé fermement au deuxième élément circulaire (14) ; et
un mécanisme de freinage, pour empêcher la rotation de l'assemblage de siège (28), dans lequel :

le mécanisme de freinage comprend un assemblage de tambour, et le mécanisme de freinage comprenant un assemblage de mâchoire de frein.

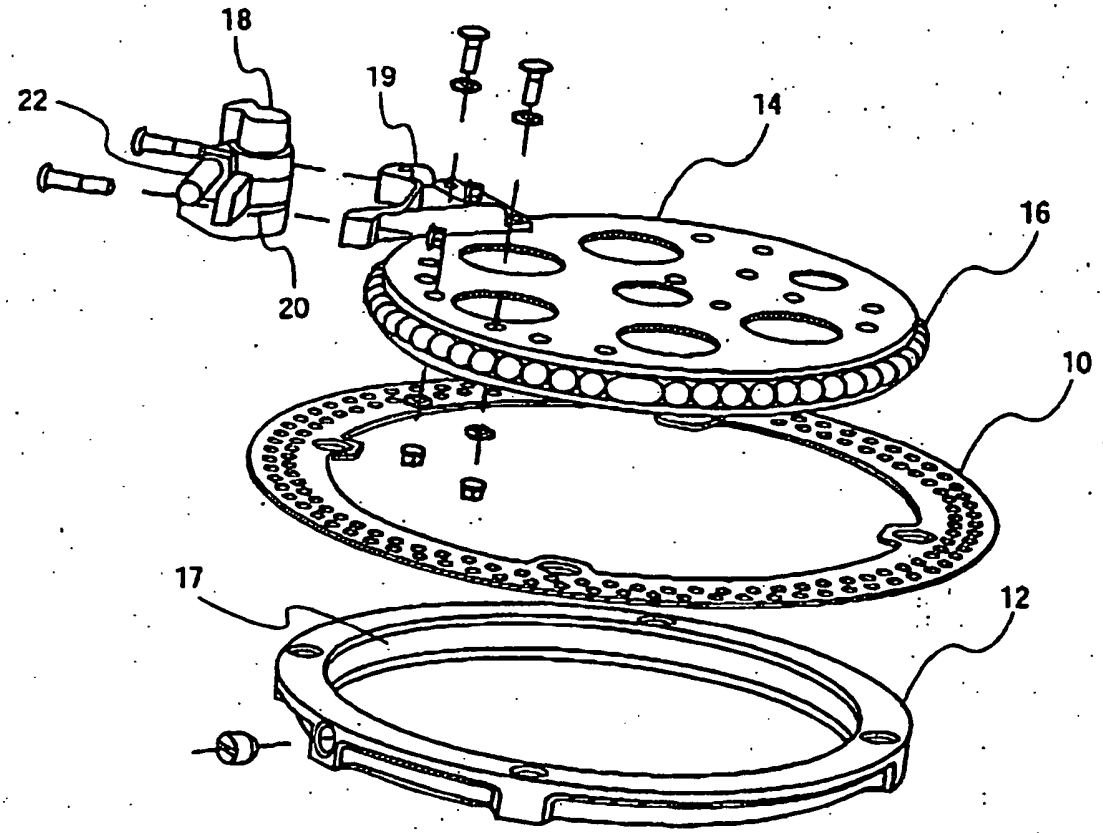

FIG. 1

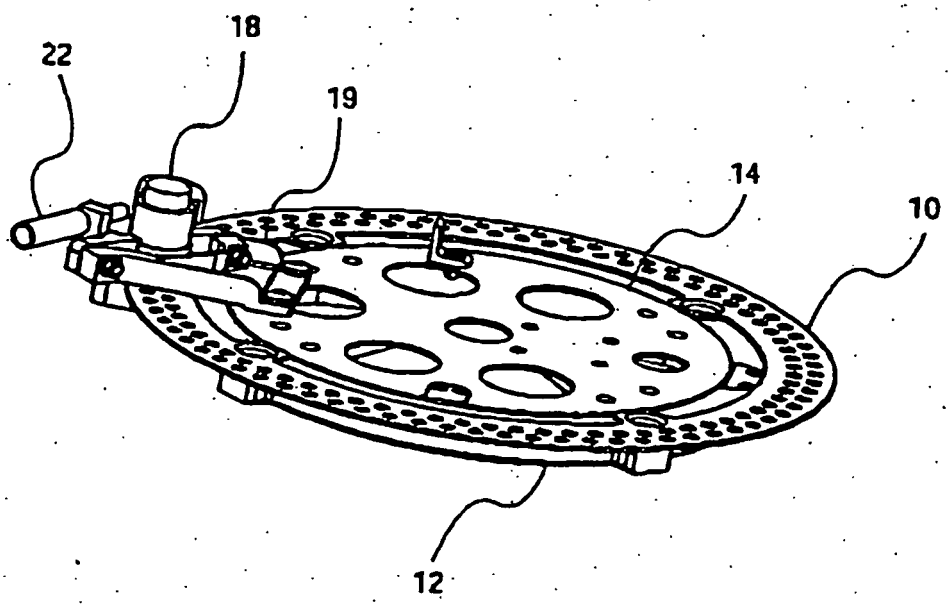

FIG. 2

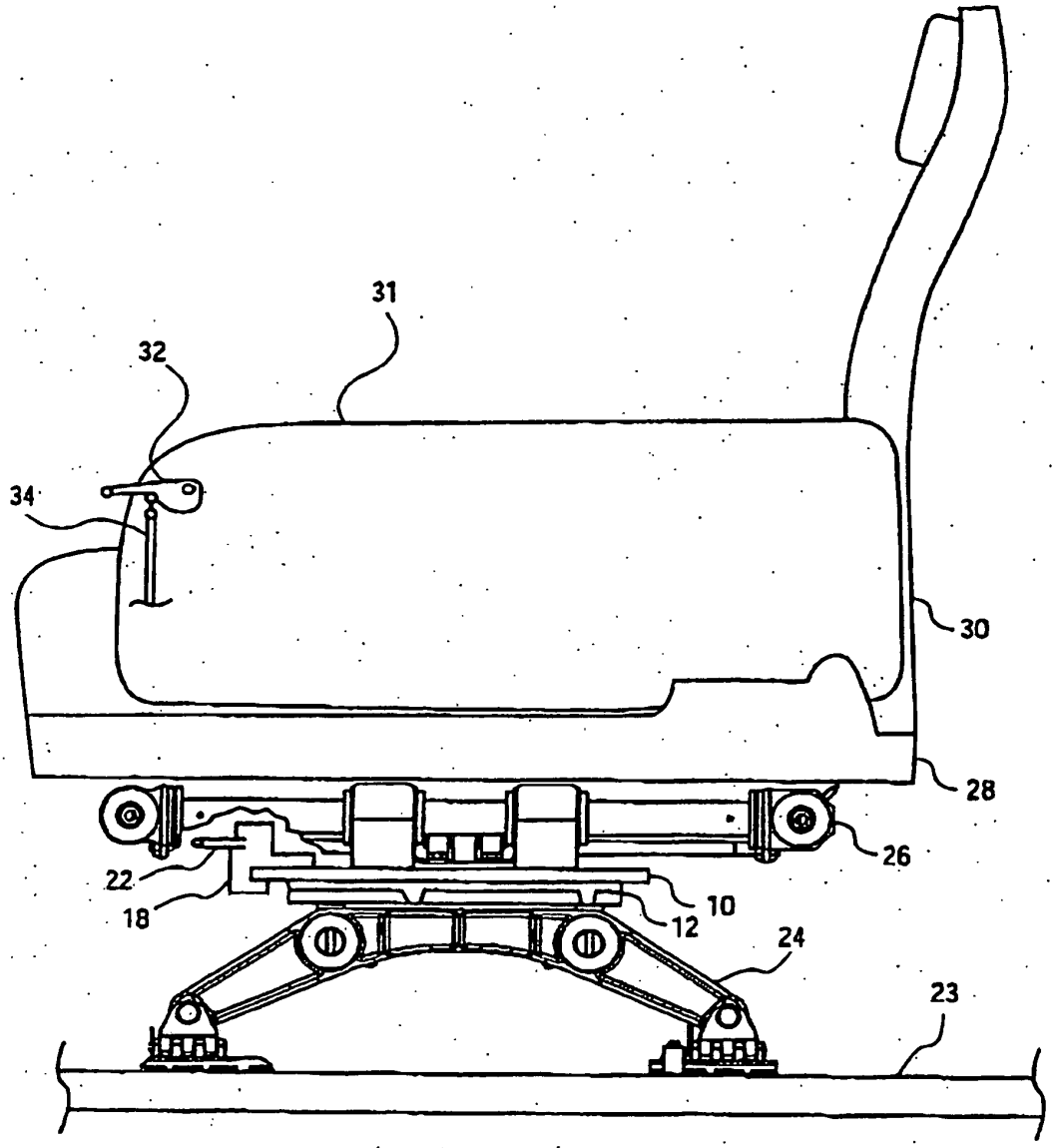

FIG. 3

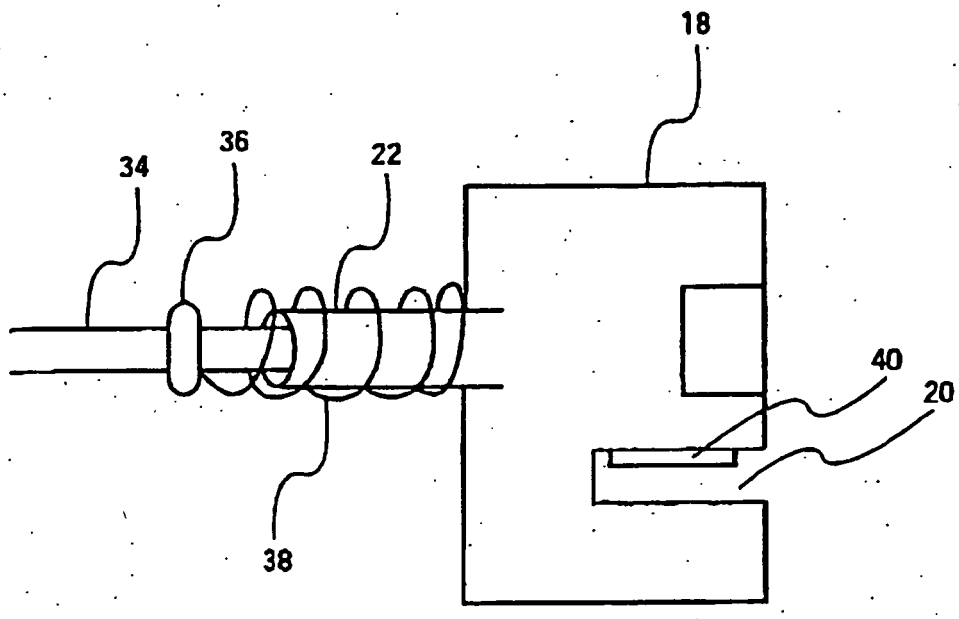

FIG. 4

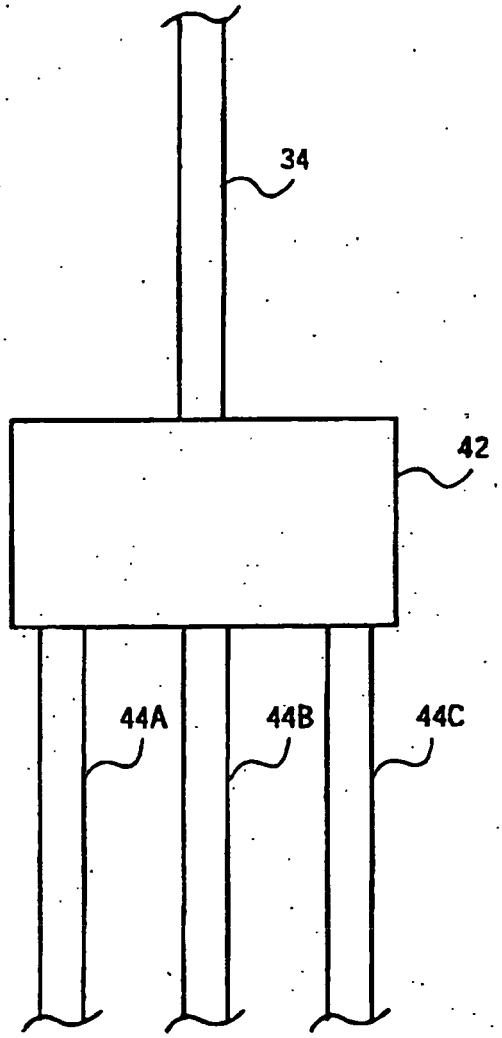

FIG. 5

REFERENCES CITED IN THE DESCRIPTION

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