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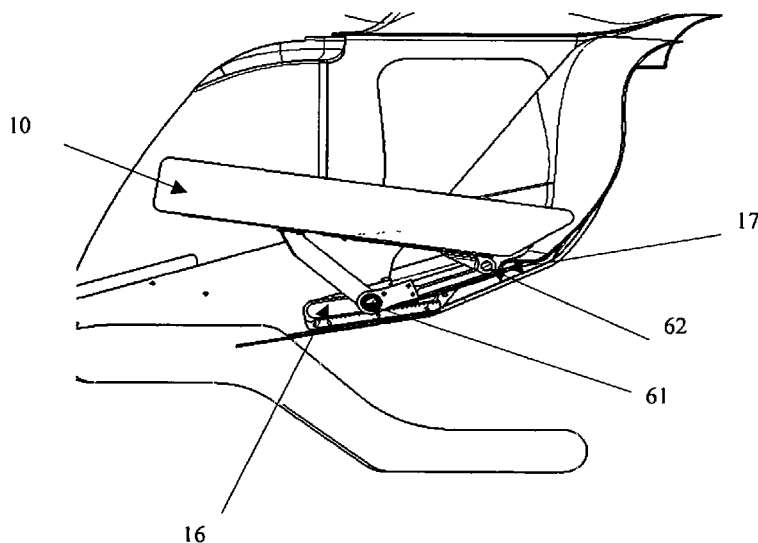


Figure 6

(57) Abstract: A reclining seat comprising a seat base (10) and a backrest (11), wherein the seat base is mounted on a support structure move able along at least one guide path (16, 17) whereby the seat base is move able between upright and reclined use or seating positions and a retracted state, control means being provided for controlling movement of the seat base along said at least one guide path, preferably with infinite adjustment, between said upright and reclined seating positions.

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**Reclining Seat**

The present invention relates to reclining seats, especially for vehicles and most particularly for aircraft.

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Conventional reclining seats have a seat base and a backrest and are operable between an upright state, in which the seat base and the back rest adopt a first orientation relative to one other, and a reclined state in which the seat base and the backrest adopt a second orientation with respect to one another. In each state, the respective profiles of the seat base and  
10 backrest remain the same.

However, the distribution of the seat occupant's weight differs between the upright and reclined states. It is considered, therefore, that the profile of at least the backrest or back support area connected to the translation of the seat base should be adaptable to  
15 accommodate varying weight distributions.

GB 2,429,908 a reclining seat comprising a generally rigid outer shell 18 containing a seat base 16 and a back rest 14. The seat base and back rest are coupled together for movement with respect to the shell from an upright state to a reclined state by guided forward sliding  
20 movement of the seat base and corresponding downward movement of the top edge of the back rest. Adjustment of the seat base and back rest between the upright and reclined states is provided by means of a ratchet and pawl arrangement defining a number of discrete positions between said upright and reclined states. The pawl may be disengaged from the ratchet by pulling upwardly on a bar 62, against the bias of a spring 66. While this  
25 arrangement provides a number of advantages over other reclining seats, adjustment of the seat requires the user to reach underneath the seat, pull up on the bar 62 and physically slide the seat base to the required location, requiring considerable dexterity and strength on the part of the user. Furthermore, such arrangement only provides a discrete number of fixed positions and thus the user may not be able to find the ideal seating position.

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According to the present invention there is provided a reclining seat comprising a seat base and a backrest, wherein the seat base is mounted on a support structure moveable along at least one guide path whereby the seat base is moveable between upright and reclined positions and between a use state and a retracted state, control means being provided for

controlling movement of the seat base along said at least one guide path, preferably with infinite adjustment, between said upright and reclined seating positions.

Preferably the control means is adapted to enable the seat base to be translated towards its upright position along said at least one guide path without requiring actuation of a user control interface associated with the control means, such as a lever or button or other actuation member, while preventing the seat base from being translated towards its reclined position without actuation of said user control interface.

10 In one embodiment, said control means comprises at least one rotary member rotatably mounted on the support structure and arranged to roll along said at least one guide path, locking means being provided for selectively preventing rotation of said rotary member in at least one direction and actuation means permitting manual release of the locking means to permit rotation of the rotary member and thus adjustment of the seat base. Preferably said  
15 locking means comprises a clutch mechanism for selectively locking the rotary member against rotation.

Preferably said at least one rotary member is mounted upon a shaft, said shaft being rotatably mounted upon said support structure, said locking means acting upon said shaft to  
20 selectively prevent rotation of the shaft in said at least one direction.

In one embodiment, the locking means may comprise an elongate member wrapped around said shaft and having one end fixed to said support structure to permit the shaft to rotate in a first direction when the at least one rotary member moves along said at least one guide  
25 means in a direction corresponding to the translation of the seat base towards its upright position, application of a torque on the shaft in a second, opposite direction causing the elongate member to tighten around the shaft, thus preventing the shaft from rotating in said second direction to prevent translation of the seat base towards its reclined position, said actuation means acting on the free end of the elongate member to release the grip of the  
30 elongate member on the shaft.

The at least one rotary member may comprise a gear wheel, said at least one guide path comprising a rack whereby said gear wheel meshes with said rack.

The actuation means may comprise a release button provided on a user accessible location operatively connected to said actuation means by a mechanical linkage, such as a cable or rod, or by an electrical connection, said actuation means comprises an electrical actuator, such as a solenoid.

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A damping device may be operably connected to the rotary member to dampen rotation of the rotary member and thus dampen movement of the seat base between its upright and reclined positions.

10 Preferably the control means is adapted to enable the seat base to be translated towards its upright position along said at least one guide path without requiring actuation of a user control interface associated with the control means, such as a lever or button or other actuation member, while preventing the seat base from being translated towards its reclined position without actuation of said user control interface.

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Preferably the seat base and back rest are coupled together for movement with respect to a generally rigid outer shell, containing the seat base and back rest, from the upright state to the reclined state by forward sliding movement of the seat base and corresponding downward movement of the top edge of the back rest. In one embodiment, the back rest  
20 may be rotatable about a substantially horizontal axis which is slidable along a first downwardly and forwardly extending guide path when the seat base moves from the upright state to the reclined state and wherein the seat base support structure is slideable along both the first guide path and a second downwardly and forwardly extending guide path when the seat moves from the upright state to the reclined state, and wherein the second guide path  
25 makes a lesser angle to the horizontal than the first guide path whereby the forward sliding movement of the seat base is accompanied by a slight downward tilting of the rear of the seat base, said control means being associated with at least one of said first and second guide paths. Preferably the support structure comprises first and second link members each pivoted at one end to the underside of the seat base at respective locations spaced in the  
30 front-to-rear direction of the seat, the other ends of the link members being pivotable at respective locations a fixed distance apart and slidable along the first and second guide paths respectively.

Where the control means comprises a gear wheel and rack, said rack may be provided on one of said first and second guide paths.

In one embodiment, the support structure comprises first and second link members each pivoted at one end to the underside of the seat base at respective locations spaced in the front-to-rear direction of the seat, the other ends of the link members being pivotable at respective locations a fixed distance apart and slidable along the first and second guide paths respectively.

10 The back rest may comprise a flexible diaphragm.

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

15 Figure 1 is a side view of a seat embodying the invention;

Figure 2 is a isometric overview of a seat embodying the invention;

Figure 3 is a schematic view of the seat mechanism;

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Figure 4 is a schematic view of the seat mechanism;

Figure 5 is a section schematic of the mechanism in the in upright and in use state;

25 Figure 6 is a section schematic of the mechanism in the semi-reclined position; and

Figure 7 is a section schematic of the mechanism in the fully reclined position.

Figures 1 and 2 show views of a seat embodying the invention. Figure 5 to 6 depicts the seat base (10), the backrest (11) and the lower back support (12) in an upright, semi-reclined and retracted state respectively. The retracted state is achieved by incorporating a resilient return device about pivot point P, such that the device applies a torsional force. This may be aided by or replaced by a linear return device. The backrest (11) and lower back support (12) comprise a flexible or semi rigid sheet, panel or other diaphragm material arranged to flex

and support the occupants' weight. When not in use, the seat base and lower back support are retracted to increase space between rows of seats. The seat base (10), backrest (11) and lower back support (12) are padded and upholstered respectively. The seat base (10) consists of semi-rigid material such as thin sheet metal or plastic such that it supports with some flexure the occupant's weight. This thin sheet metal or plastic is linked and pivoted through the plurality of links allowing the seat base (10) and lower back support (12) to take two independent orientations when in use and retracted [relative to the backrest (11)].

Figure 3 shows a seat mechanism in an upright retracted state in which the seat base (10) and lower back support (12) adopt a first orientation relative to the backrest (11). A resilient return device (25) may be incorporated about pivot or shaft (61 or 62) forcing the retracted state if required. The seat base (10) and lower back support (12) may independently be biased in position relative to guide slots (16 and 17) located in the seat base structure (15) using a resilient return device. Such a device may be connected directly to the 'driving' shaft which may be either the forward (61) or aft (62) shafts as required - providing a torsional return force. A linear device may also independently be incorporated. The shafts (61 and 62) are connected pivotally to the seat base structure (14) and translate along the paths depicted by suitable guides such as those shown (16 and 17). A bearing material (63) or slide can be attached to the ends of each shaft to ensure lowered resistance if required.

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Figure 4 shows a view of the seat pan mechanism. The state of the mechanism position is infinitely variable being controlled by a clutching mechanism such as a spring gripping a shaft or similar non-ratcheting lock (24) attached to either or both shafts (61 and 62) and to the seat pan structure (14). Any position between the two predefined states of upright and reclined can be reached by travelling along a linear or non linear path followed by rollers, bearings, slides or similar guides for which the path has been predetermined for example shown by the grooves (16 and 17 respectively). The torsional force applied by the lock (24) is transmitted through gears (35) attached to one end, both ends and indeed one or both of the shafts (61 and 62). This force is translated to the seat base structure through a rack (34) or combination of such which is/ are rigidly connected to the seat base structure (15). In order to recline the seat base (10) and lower back support (12), the locking mechanism (24) is clutched or unlocked by using a levered mechanism or button interface (21 - depicted in figure 3) connected by mechanical cable, links or electronic controls to the locking mechanism (24). A similar or indeed the same system can be used if required to control the

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movement of the seat base (10) between reclined and upright state. Dependant upon requirements, the spring clutch or locking mechanism (24) can be designed such that it will only lock in a single direction such that the seat base (10) and lower back support (12) can translate along the predefined path by exerting light force in a single direction, whether  
5 exerted by the occupant or by a biased resilient return device (25) – without interacting further with the control interface (21). Such a resilient return device could be incorporated on the shaft (61 and 62) joining the pinion gears (35) and allowing a torsional return force to be applied. A similar force could be applied using a linear device connected to the support structure (14) and seat base frame (15). Damped translation from upright to recline state and  
10 vice versa can be achieved by incorporating a rotary damper rigidly held to the support structure (14) and rotating along the rack (34) or indeed a supplementary rack system. Similar damping can be achieved using a linear device connected to the support structure (14) and seat base frame (15).

15 Figure 5 shows the seat in an upright– with the seat base (10) and lower back support (12) in the in-use state.

Figure 6 shows the seat mechanism in an in use and partially reclined position in that the shafts (61 and 62) are in an intermediate position of travel along the guides (16 and 17).

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Figure 7 shows the seat mechanism in an in use and fully reclined position in that the shafts (61 and 62) are at a predefined end position of travel along the guides (16 and 17).

## Claims

1. A reclining seat comprising a seat base and a backrest, wherein the seat base is mounted on a support structure moveable along at least one guide path whereby the seat  
5 base is moveable between upright and reclined positions and between a use state and a retracted state, control means being provided for controlling movement of the seat base along said at least one guide path between said upright and reclined seating positions.
2. A seat as claimed in claim 1, wherein said control means provides infinite  
10 adjustment of the seat base along said at least one guide path between said upright and reclined seating positions.
3. A seat as claimed in claim 2, wherein said control means comprises at least one rotary member rotatably mounted on the support structure and arranged to roll along said at  
15 least one guide path, locking means being provided for selectively preventing rotation of said rotary member in at least one direction and actuation means permitting manual release of the locking means to permit rotation of the rotary member and thus adjustment of the seat base.
- 20 4. A seat as claimed in claim 3, wherein said locking means comprises a clutch mechanism for selectively locking the at least one rotary member against rotation.
5. A seat as claimed in claim 3, wherein said at least one rotary member is mounted upon a shaft, said shaft being rotatably mounted upon said support structure, said locking  
25 means acting upon said shaft to selectively prevent rotation of the shaft in said at least one direction.
6. A seat as claimed in claim 5, wherein said locking means comprises an elongate member wrapped around said shaft and having one end fixed to said support structure to  
30 permit the shaft to rotate in a first direction when the at least one rotary member moves along said at least one guide means in a direction corresponding to the translation of the seat base towards its upright position, application of a torque on the shaft in a second, opposite direction causing the elongate member to tighten around the shaft, thus preventing the shaft from rotating in said second direction to prevent translation of the seat base towards its



reclined position, said actuation means acting on the free end of the elongate member to release the grip of the elongate member on the shaft.

7. A seat as claimed in any of claims 5 or claim 6, wherein the at least one rotary  
5 member comprises a gear wheel, said at least one guide path comprising a rack whereby said gear wheel meshes with said rack.
8. A seat as claimed in any of claims 4 to 7, wherein said actuation means comprises a  
10 release button provided on a user accessible location operatively connected to said actuation means by a mechanical linkage, such as a cable or rod, or by an electrical connection, said actuation means comprises an electrical actuator, such as a solenoid.
9. A seat as claimed in any of claims 4 to 8, wherein a damping device is operably  
15 connected to the rotary member to dampen rotation of the rotary member and thus dampen movement of the seat base between its upright and reclined positions.
10. A seat as claimed in any preceding claim, wherein the control means is adapted to  
enable the seat base to be translated towards its upright position along said at least one guide  
20 path without requiring actuation of a user control interface associated with the control means, such as a lever or button or other actuation member, while preventing the seat base from being translated towards its reclined position without actuation of said user control interface.
11. A seat as claimed in any preceding claim, wherein the seat base and back rest are  
25 coupled together for movement with respect to a generally rigid outer shell, containing the seat base and back rest, from the upright state to the reclined state by forward sliding movement of the seat base and corresponding downward movement of the top edge of the back rest.
- 30 12. A seat as claimed in claim 11, wherein the back rest is rotatable about a substantially horizontal axis which is slidable along a first downwardly and forwardly extending guide path when the seat base moves from the upright state to the reclined state and wherein the seat base support structure is slideable along both the first guide path and a second downwardly and forwardly extending guide path when the seat moves from the upright state

to the reclined state, and wherein the second guide path makes a lesser angle to the horizontal than the first guide path whereby the forward sliding movement of the seat base is accompanied by a slight downward tilting of the rear of the seat base, said control means being associated with at least one of said first and second guide paths.

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13. A seat as claimed in claim 12, wherein the support structure comprises first and second link members each pivoted at one end to the underside of the seat base at respective locations spaced in the front-to-rear direction of the seat, the other ends of the link members being pivotable at respective locations a fixed distance apart and slidable along the first and  
10 second guide paths respectively.

14. A seat as claimed in any preceding claim, wherein the back rest comprises a flexible diaphragm.

15 15. A seat substantially as described herein with reference to the accompanying drawings.

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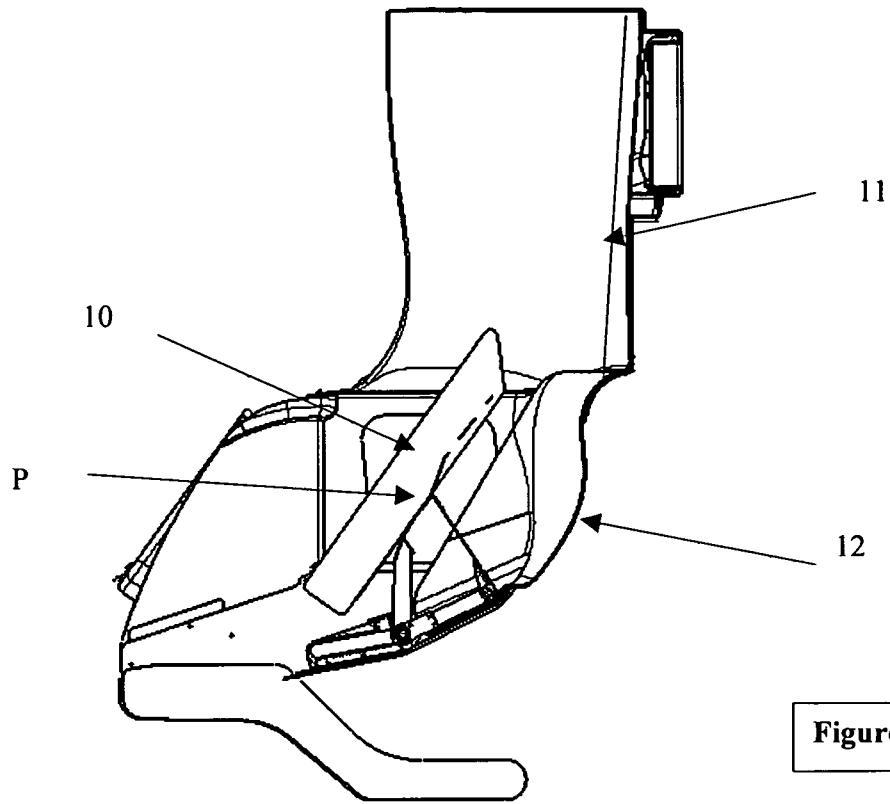


Figure 1

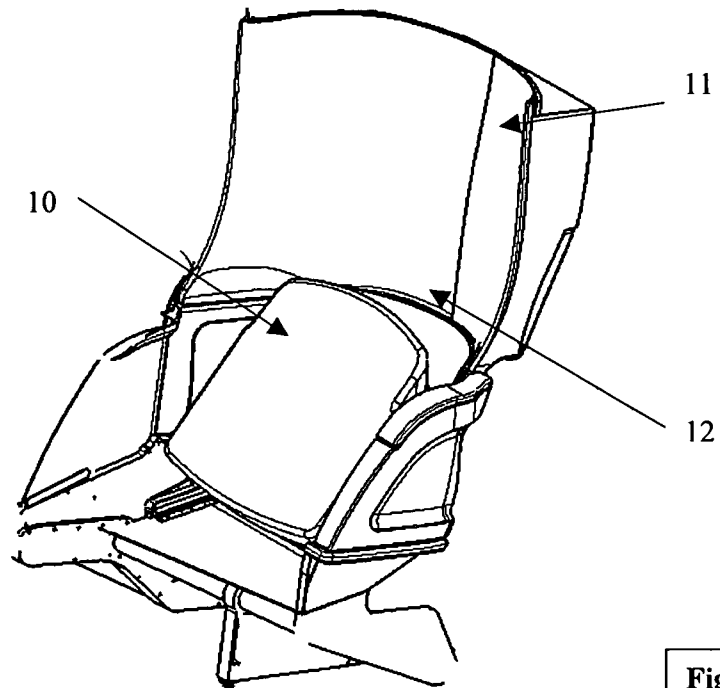


Figure 2

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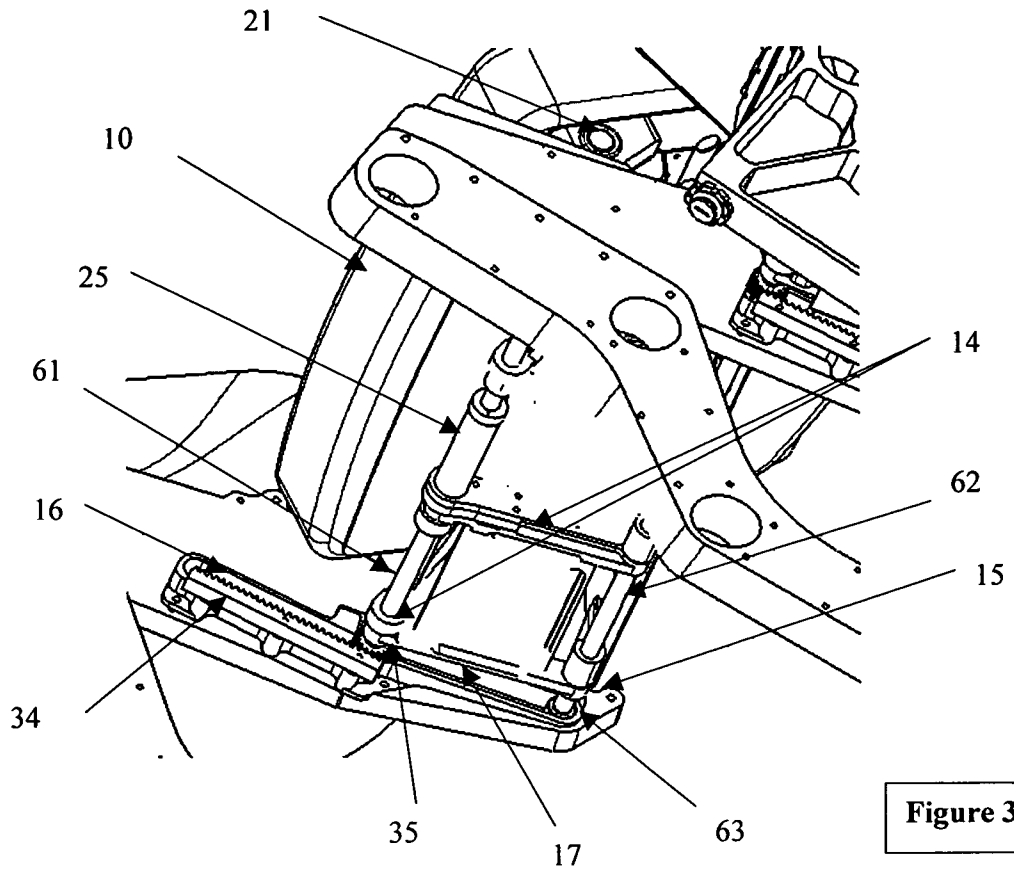


Figure 3

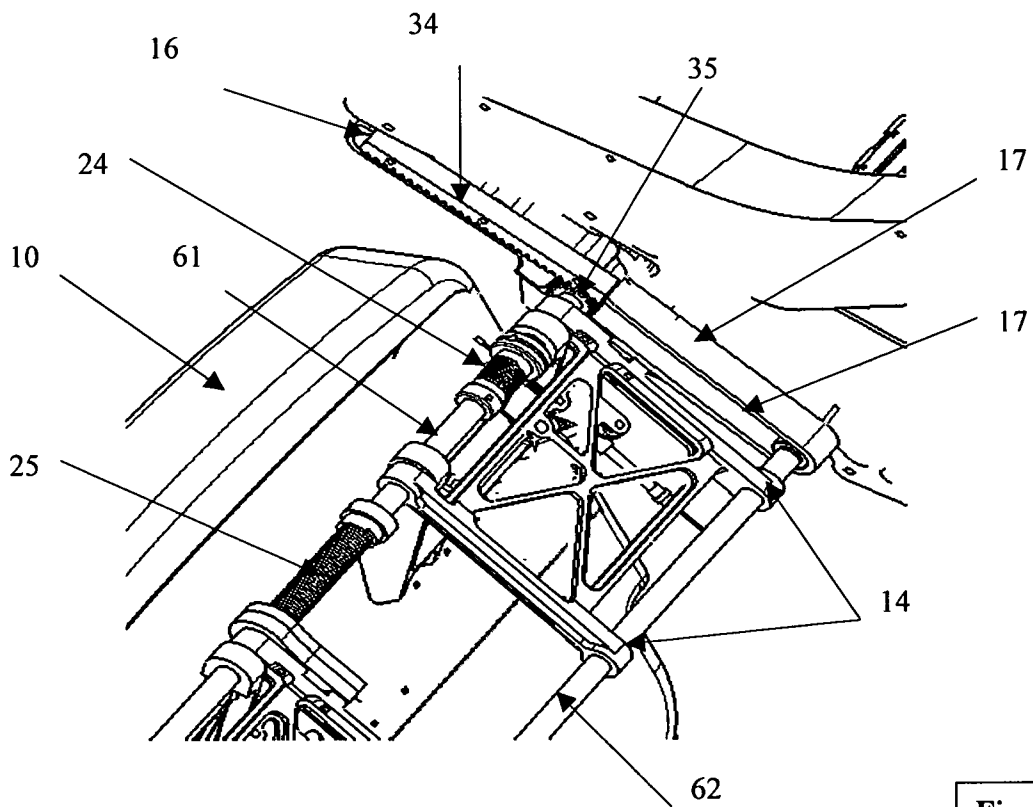


Figure 4

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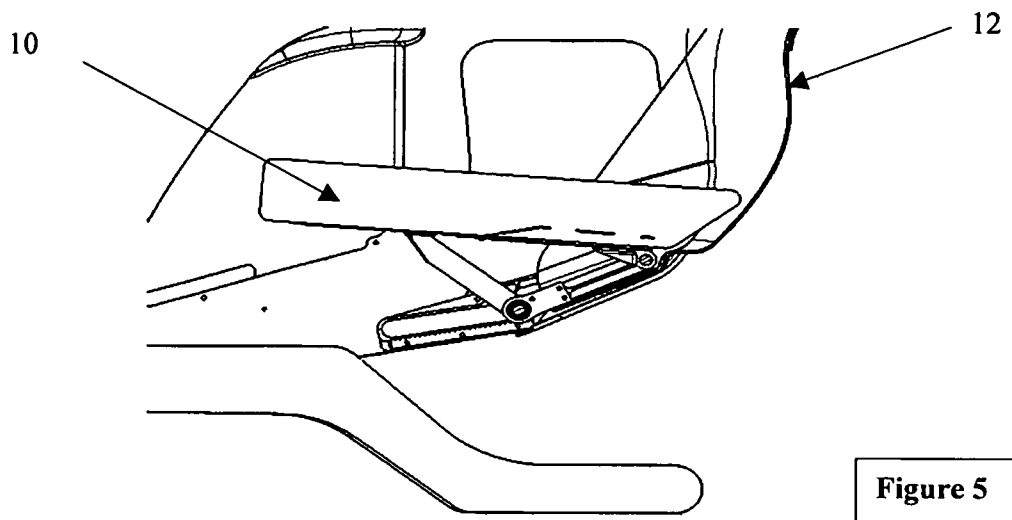


Figure 5

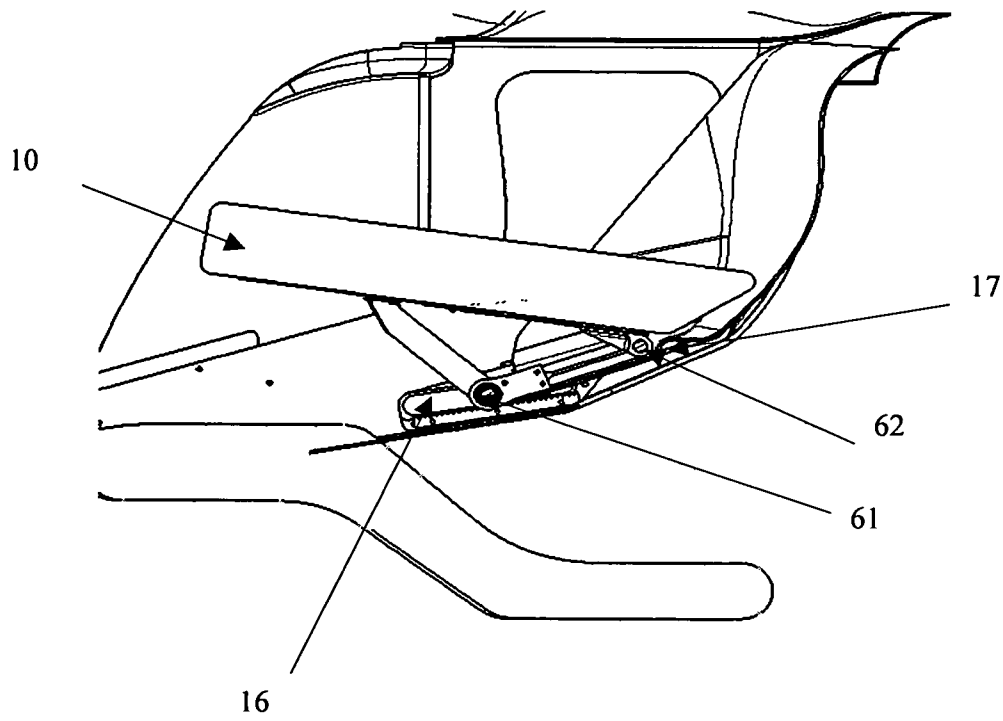


Figure 6

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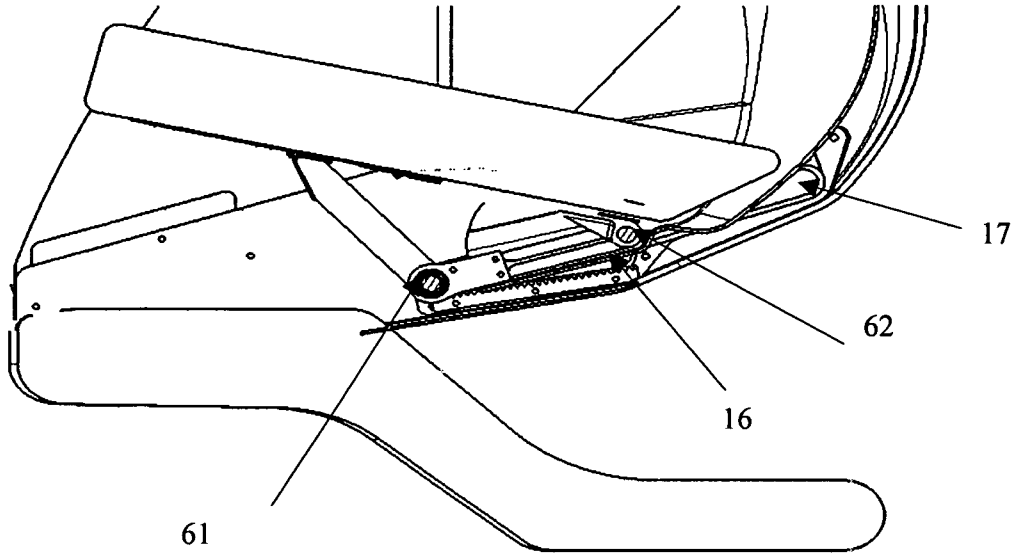


Figure 7

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2009/002227

## A. CLASSIFICATION OF SUBJECT MATTER

INV. B60N2/22 B60N2/16 B60N2/18 B64D11/06 B60N2/30

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B60N B64D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 1 060 383 A (AIR FRANCE) 1 March 1967 (1967-03-01) page 2, line 99 - page 3, line 2; figures 1-4b	1-5,7-9
X	DE 197 42 773 A1 (NICOL KLAUS PROF DR [DE]) 1 April 1999 (1999-04-01) column 7, line 62 - column 8, line 38; claims 11,40,43; figures 7-10	1-5,8
X	GB 2 429 908 B (THOMPSON JAMES [GB]) 9 January 2008 (2008-01-09) cited in the application page 5, line 3 - page 9, line 22; figures 5-7,17-19 page 11, line 21 - page 12, line 24	1,2, 11-14
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 Further documents are listed in the continuation of Box C. See patent family annex.

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Date of the actual completion of the international search

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22/06/2009

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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2009/002227

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 571 037 A (VIRGIN ATLANTIC AIRWAYS LTD [GB]) 7 September 2005 (2005-09-07) paragraphs [0180], [0187], [0190], [0193]; figures 3-5, 29A-30B -----	1, 2, 11
A	US 2003/085602 A1 (OGINO TAKASHI [JP] ET AL) 8 May 2003 (2003-05-08) paragraphs [0042], [0054] - [0057]; figures 2, 4-7 -----	10



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No  
PCT/EP2009/002227

Patent document cited in search report	A	Publication date	Patent family member(s)	Publication date
GB 1060383	A	01-03-1967	NONE	
<hr/>				
DE 19742773	A1	01-04-1999	WO 9916638 A1	08-04-1999
			EP 0941168 A1	15-09-1999
			ES 2184337 T3	01-04-2003
<hr/>				
GB 2429908	B	09-01-2008	WO 2005095210 A1	13-10-2005
			GB 2429908 A	14-03-2007
<hr/>				
EP 1571037	A	07-09-2005	EP 1495908 A1	12-01-2005
			EP 1602526 A2	07-12-2005
<hr/>				
US 2003085602	A1	08-05-2003	CN 1410293 A	16-04-2003
			DE 10247131 A1	15-05-2003
			JP 3964172 B2	22-08-2007
			JP 2003118436 A	23-04-2003
			KR 20030030916 A	18-04-2003
			TW 576357 Y	11-02-2004
<hr/>				