

(19) World Intellectual Property Organization
International Bureau(43) International Publication Date
25 June 2009 (25.06.2009)

PCT

(10) International Publication Number
WO 2009/077717 A2(51) International Patent Classification:
B64D 11/06 (2006.01)

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(21) International Application Number:
PCT/GB2008/004058

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(22) International Filing Date:
10 December 2008 (10.12.2008)

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(25) Filing Language: English

Published:

(26) Publication Language: English

— without international search report and to be republished upon receipt of that report

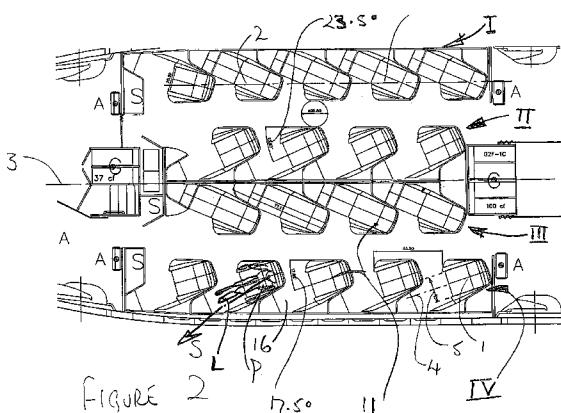
(30) Priority Data:
0724397.5 14 December 2007 (14.12.2007) GB

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(54) Title: AIRCRAFT SEAT



(57) **Abstract:** Aircraft seats convertible between sitting and bed mode are arranged in columns in an aircraft cabin. The seats are swivelable about axes 1 and arranged with their axes in column axes 2. Normally these will be parallel to the central axis of the aircraft 3. The seats each have a direction 4 extending from the middle of the seat back through the middle of the seat cushion 22, intersecting the seat's swivel axis. Extending equally on either side of the seat direction is defined a seat projection 5 forwards of the seat cushion and having the same width as the seat cushion. The swivel is set up to allow the seat to be turned through 6° from 17.5° to the longitudinal axis of the column (and the aircraft to be equipped with the seats) to 23.5°. At 17.5°, as in column IV, the seats partially face the seats in front in the column. This is the maximum angle at which the regulatory authorities will allow a lap belt only to be worn by a passenger for TTL. Passengers P in these seats are able to see S out of the side windows of the aircraft, without having to crane sideways and are able to stretch their legs L into the space 6 adjacent the seat in front. When the seats are swivelled outwards to 23.5°, they face the space 6 along side the seat in front and can be converted to bed mode.

WO 2009/077717 A2

AIRCRAFT SEAT

The present invention relates to an aircraft seat.

5 Business and first class seats in aircraft usually convert from a sitting mode to a bed mode. Such seats are referred to in this specification as convertible seats. In the sitting mode, seats can be at a tighter pitch, i.e. spacing longitudinally of the aircraft, than they can be in bed mode, for the obvious reason that in bed mode the seat is longer.

10

It is known to arrange seats in a herring bone pattern, whereby the foot end of the seat in bed mode overlaps with the head end of the seat in front.

15 It is more usual in a herring bone LOPA (Lay Out of Passenger Accommodation) for the seats to be arranged head-out / feet-in, but head-in / feet-out LOPAs are known.

American Airline British Patent No 2,362,095 describes:

20 An airplane, system and passenger cabin comprising columns and rows (fig 1B) of recliners 220a-e in the form of compartments 106c-d is disclosed. Each recliner 220a-e comprises a rotatable and releasably lockable chair 232a-e with a detached ottoman/footrest 234a-e (which may also be used as a seat), towards which the chair faces after rotation from a first angular position (generally facing the front of the plane), through an angle of greater than 10 degrees, to a second angular position 25 (facing a second stowable table 228). Chair rotation to a third angular position (perpendicular to the first) allows the chair to face a first table 226a-e, window 236 or removable divider/partition (fig 1B, 122 & 146, from which a recliner support may also be formed). When fully reclined (fig 3B), the armrests (314) and upper surface of the seat (312) are generally flush. Chair 232a-e (and fig 3A) also comprises an 30 indicator (323 and fig 3D) which indicates when the chair is locked in to the first angular or any other desired position.

Figure 1 accompanying this specification is illustrative of the possible swivel positions so the American Airlines patent, which can be summarised as:

- Facing directly forwards for taxi, taking off and landing,

- Facing directly outboard for dining and
- Facing obliquely forwards for reclining and sleeping.

This American Airlines LOPA is not particularly efficient in terms of passenger accommodation, reflecting its first class usage.

5

The object of the present invention is to provide an improved LOPA utilising two swivel positions.

According to the invention there is provided a column of aircraft seats, the 10 seats being of the type which are both swivellable and are convertible between a sitting mode and a bed mode, each seat being swivellable between facing in one direction and facing in only one other direction:

- the one direction, for the second or a subsequent seat in the column, being a sitting mode direction oblique to an axis of the column with the seat least 15 partially facing a seat in front with the seat facing at an angle with respect to an aircraft central axis such that lap belt restraint for taxi, take off and landing is permitted and
- the other direction being a more oblique bed mode direction, with the seat facing to one side of the seat in front, whereby the seat can be extended to its 20 bed mode with the foot of the bed beside the seat in front.

Preferably, the seats being of the type which have a back rest and a seat cushion and which are convertible between a sitting mode and a bed mode, wherein:

- each seat has:
 - a seat direction in which it faces and which is defined by an axis extending from the middle of the seat back through the middle of the seat cushion and
 - a seat projection which is defined by a width extending by half the width of the seat cushion on both sides of the seat axis;
- 30 • each seat is mounted on a swivel for changing the seat's direction in the column;
- each swivel has a swivel axis;
- the swivel axes of the seats define a column axis; and

- the column axis makes an angle with an aircraft central axis and

wherein:

- the swivel is limited to provide two use directions of each seat:

- an oblique sitting mode direction, in which for the second or a subsequent seat in the column:

- the seat at least partially faces a seat in front in the column;

- the seat's projection overlaps the seat in front and

- the seat's axis makes an angle with the aircraft central axis such that lap belt restraint for taxi, take off and landing is permitted and

- a more oblique bed mode direction, in which the seat faces to one side of the seat in front, without its projection overlapping the seat in front and with its axis making a greater angle with the aircraft central axis, whereby the seat can be extended to its bed mode with the foot of the bed beside the seat in front.

15

In a parallel walled aircraft cabin, the column axis is parallel to the aircraft central axis.

20 The normal maximum angle of obliqueness for normal lap belt restraint during taxi, take off and landing (TTL) is substantially 17.5°. The one direction can be more closely aligned with the column axis than the maximum allowed angle of obliqueness.

25 The advantage of the oblique TTL position is that the passenger using the seat has plenty of leg room to the one side of the seat in front without being cramped by the seat in front to an extent unacceptable for business class travel. Further an oblique TTL position allows a much more comfortable viewing of the take off and landing through the aircraft cabin windows.

30 In the preferred embodiment the seat includes a telescopic mechanism for extending the seat forwards into the bed mode, the final part of the telescopic extension engaging a leg rest with a fixed support remote from the seat.

To help understanding of the invention, a specific embodiment thereof will now be described by way of example and with reference to the accompanying drawings, in which:

Figure 1 is a reproduction of a typical view from the above mentioned
5 American Airlines patent;

Figure 2 is a LOPA of a column of aircraft seats in accordance with the present invention;

Figure 3 is a diagrammatic side view of a seat for use in the invention, the seat being in sitting mode and

10 Figure 4 is a similar view of the seat in bed mode.

Referring to Figures 2 to 4 of the accompanying drawings, Figure 2 shows four columns I, II, III, IV of seats 1, which are in bed mode in columns I & III, sitting mode for dining in column II and sitting mode for taxi, take-off and landing in column
15 IV.

As described in more detail below, the seats are swivellable about axes 1 and arranged with their axes in column axes 2. Normally these will be parallel to the central axis of the aircraft 3. The seats each have a direction 4 extending from the
20 middle of the seat back through the middle of the seat cushion 22, intersecting the seat's swivel axis. Extending equally on either side of the seat direction is defined a seat projection 5 forwards of the seat cushion and having the same width as the seat cushion.

25 The seats have a pallet 12 on which is mounted a lockable swivel 13, such as shown in US Patent No 5,568,960. The swivel supports a seat chassis 14 including a telescopic slide 15. This can be as in patent application No 0706775.4. Full details of this will be open to public inspection by the time that this application is published. The swivel is set up to allow the seat to be turned through 6° from 17.5° to the
30 longitudinal axis of the column (and the aircraft to be equipped with the seats) to 23.5°.

At 17.5° , as in column IV, the seats partially face the seats in front in the column. This is the maximum angle at which the regulatory authorities will allow a lap belt only to be worn by a passenger for TTL. Passengers P in these seats are able to see S out of the side windows of the aircraft, without having to crane sideways and 5 are able to stretch their legs L into the space 6 adjacent the seat in front.

When the seats are swivelled outwards to 23.5° , they face the space 6 along side the seat in front and can be converted to bed mode.

10 Turning to Figures 3 & 4, whilst the full details of the seat's recline mechanism is not shown, the seat includes a backrest 21, a seat cushion or pan 22, a leg rest 24 and a doubled back leg rest extension 25. When the seat is converted to bed mode, with the backrest, the seat cushion, the leg rest 24 and the doubled back extension all aligned, the last part of the conversion is a small advance in the direction 15 A of the extended seat on the slide 15 so that the distal end of the extended leg rest is supported on a support 26 at the distal end of the bed.

CLAIMS:

1. A column of aircraft seats, the seats being of the type which are both swivellable and are convertible between a sitting mode and a bed mode, each seat being swivellable between facing in one direction and facing in only one other direction:

5 • the one direction, for the second or a subsequent seat in the column, being a sitting mode direction oblique to an axis of the column with the seat least partially facing a seat in front with the seat facing at an angle with respect to an aircraft central axis such that lap belt restraint for taxi, take off and landing is permitted and

10 • the other direction being a more oblique bed mode direction, with the seat facing to one side of the seat in front, whereby the seat can be extended to its bed mode with the foot of the bed beside the seat in front.

2. A column of aircraft seats, the seats being of the type which have a back rest and a seat cushion and which are convertible between a sitting mode and a bed mode,

15 wherein:

 • each seat has:

20 • a seat direction in which it faces and which is defined by an axis extending from the middle of the seat back through the middle of the seat cushion and

 • a seat projection which is defined by a width extending by half the width of the seat cushion on both sides of the seat axis;

 • each seat is mounted on a swivel for changing the seat's direction in the column;

 • each swivel has a swivel axis;

25 • the swivel axes of the seats define a column axis; and

 • the column axis makes an angle with an aircraft central axis and

wherein:

 • the swivel is limited to provide two use directions of each seat:

30 • an oblique sitting mode direction, in which for the second or a subsequent seat in the column:

 • the seat at least partially faces a seat in front in the column;

 • the seat's projection overlaps the seat in front and

- the seat's axis makes an angle with the aircraft central axis such that lap belt restraint for taxi, take off and landing is permitted and
- a more oblique bed mode direction, in which the seat faces to one side of the seat in front, without its projection overlapping the seat in front and with its axis making a greater angle with the aircraft central axis, whereby the seat can be extended to its bed mode with the foot of the bed beside the seat in front.

5 3. A column of aircraft seats as claimed in claim 1 or claim 2, wherein the column axis is parallel to the aircraft central axis.

10 4. A column of aircraft seats as claimed in claim 1, claim 2 or claim 3, wherein the oblique sitting mode direction is substantially 17.5° . to the aircraft central axis.

5 5. A column of aircraft seats as claimed in any preceding claim, wherein the angular extent of swivelling between the one and other directions is substantially 6° .

15 6. A column of aircraft seats as claimed in any preceding claim, wherein each seat includes a telescopic mechanism for extending the seat forwards into the bed mode, the final part of the telescopic extension engaging a leg rest with a fixed support remote from the seat.

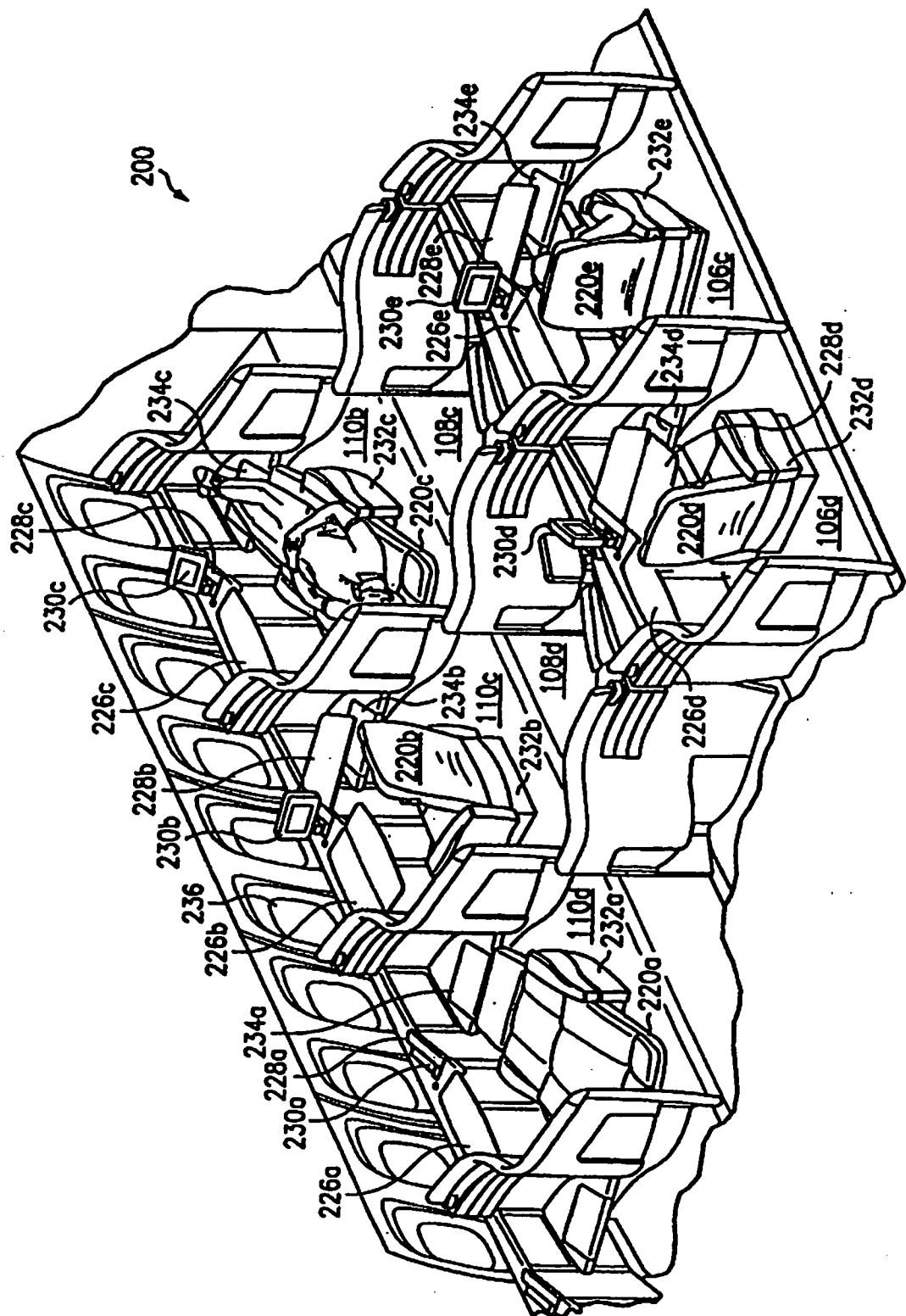


FIGURE 1

- PRIOR ART

