(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
15 January 2015 (15.01.2015)

WIPO | PCT

(10) International Publication Number
WO 2015/006313 A3

(51) International Patent Classification:
B64D 11/06 (2006.01)

(21) International Application Number:
PCT/US2014/045727

(22) International Filing Date:
8 July 2014 (08.07.2014)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

61/957,635	8 July 2013 (08.07.2013)	US
61/959,598	28 August 2013 (28.08.2013)	US
61/961,092	4 October 2013 (04.10.2013)	US
61/961,367	12 October 2013 (12.10.2013)	US

(63) Related by continuation (CON) or continuation-in-part (CIP) to earlier applications:

US	13/507,149 (CIP)
Filed on	19 June 2012 (19.06.2012)
US	11/730,161 (CIP)
Filed on	29 March 2007 (29.03.2007)
US	14/461,395 (CIP)
Filed on	15 August 2014 (15.08.2014)
US	14/210,413 (CIP)
Filed on	13 March 2014 (13.03.2014)
US	13/138,183 (CIP)
Filed on	18 July 2011 (18.07.2011)
US	13/820,510 (CIP)
Filed on	2 March 2013 (02.03.2013)
US	US2013/000024 (CIP)
Filed on	30 June 2014 (30.06.2014)
US	US2013/000024 (CIP)
Filed on	31 January 2013 (31.01.2013)

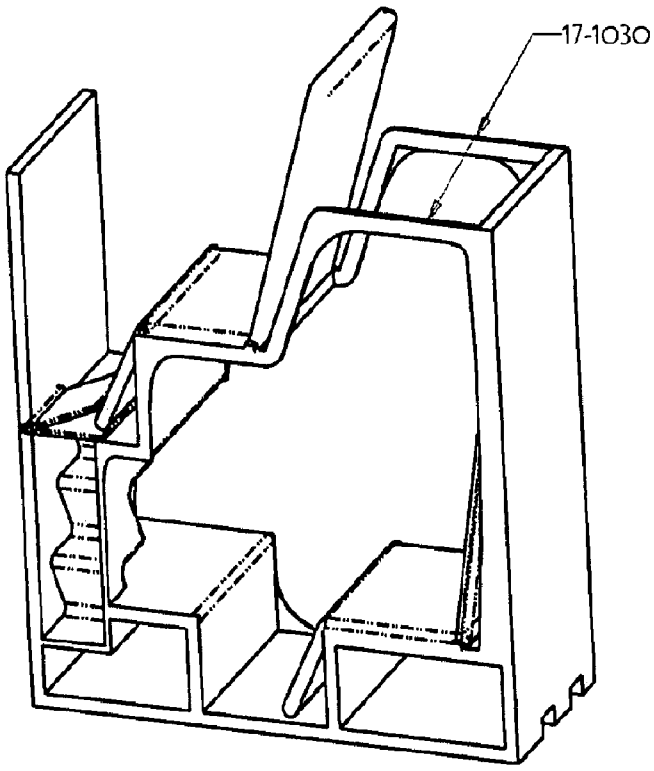
(72) Inventor; and
(71) Applicant : **RAJASINGHAM, Arjuna, Indraeswaran** [US/US]; 6024 Bradley Boulevard, Bethesda, MD 20817 (US).

(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, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,

[Continued on next page]

(54) Title: VEHICLE OCCUPANT SUPPORT

Fig 1-17



(57) Abstract: An aircraft occupant support substantially faces a longitudinal axis the aircraft and has upper and lower staggered tiers, thereby elevating some of said occupants and accordingly raising the central mass of the structure. The structure has at least one unit with an upper occupant support in the upper tier and a lower occupant support in the lower tier, wherein each of the occupant supports has at least a sitting position and a flat bed position, and wherein the flat bed positions of the upper and lower occupant supports are substantially vertically stacked. The structure is enabled to withstand crash loading conditions with load limiting latch arrangements at the floor of the aircraft.

WO 2015/006313 A3

HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, 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, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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

Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) Date of publication of the international search report:
19 March 2015

INTERNATIONAL SEARCH REPORT

International application No.: PCT/US14/45727 16.01.2015

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B64D 11/06 (2014.01)

CPC - B64D 11/0602

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)
IPC: B64D 11/06 (2014.01)
CPC: B64D 11/0602

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
IPC: B60N 2/01, B60N 2/34 (2014.01); USPC: 244/118.5, 244/118.6
CPC: B64D 11/0601, B64D 11/0604, B64D 11/0619, B64D 11/0641, B60N 2/01, B60N 2/34 (search term limited; see below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PatBase (All); Google (Web, Patents, Scholar)
Search terms: airplane, aircraft, seating, tier*, upper, top, lower, bottom, bed*, sleep*, stack*, doubledeck*, double deck*, piggyback*, piggy back*, load limit*, latch*, passenger

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y --- A	US 6,056,239 A (CANTU et al) 02 May 2000 (02.05.2000), entire document, especially Fig 2, Fig 4, Fig 5A-7B, Fig 11, col 8, ln 11-19 and 30-37	1-4, 7-9 and 12-18 --- 5, 6, 10 and 11
Y	US 7,393,167 B2 (DOWTY et al) 01 July 2008 (01.07.2008), entire document, especially Abstract, Fig 6-7, col 4, ln 4-67	1-4, 7-9 and 12-18
Y	US 2009/0243358 A1 (HENSHAW) 01 October 2009 (01.10.2009), entire document, especially Fig 6B and para [0049] and [0053]	13 and 14
Y --- A	DE 20 2008014239 U1 (KUSMAUL) 26 February 2009 (26.02.2009), entire document, especially Fig and para [0003]	8 and 9 --- 5, 6, 10 and 11
A	US 2002/0033432 A1 (MIKOSZA) 21 March 2002 (21.03.2002), entire document, especially Abstract, Fig 2, Fig 4	5, 6, 10 and 11
A	US 2009/0066121 A1 (JACOB) 12 March 2009 (12.03.2009), entire document, especially Abstract, Fig 1A-12	5, 6, 10 and 11
A	US 4,589,612 A (HALIM) 20 May 1986 (20.05.1986), entire document, especially Abstract, Fig 1A-3	5, 6, 10 and 11

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
02 January 2015 (02.01.2015)	16 JAN 2015
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:
This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

Group I: Claims 1-18 drawn to a structure for support of occupants facing the axis of motion of an aircraft having two tiers, with one occupant support in the upper tier and one occupant support in the lower tier, each occupant support having a sitting and flat bed position, wherein the flat bed positions are vertically stacked, and supports at the floor of the aircraft with load limiting latch arrangements.

Group II: Claims 19-31 drawn to a latch for securing a structure to support tracks at the floor of an aircraft comprising one or both of: vertical load limiting; and horizontal load limiting along the axis of motion of said aircraft.

-*-Continued in Supplemental Box-*-

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-18

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

-*-Box III - Observations where unity of invention is lacking-*-

Group III: Claims 32-34 drawn to a plurality of structures comprising occupant supports along the axis of an aircraft with attachments there between, and wherein said plurality of structures are attached to seat tracks at the floor of the aircraft at common support points between pairs of said structures, and wherein vertical load limiters of latches for support of said structures are housed vertically above the seat tracks in spaces between storage spaces in the supported structures.

Group IV: Claims 35-49 snd 52-53 drawn to a child restraint system in a vehicle of with an open architecture enabled to provide side-impact and front impact protection.

Group V: Claim 50 drawn to a child restraint system in a vehicle with a single pair of latch arrangements enabled to attach the child restraint system both for rear facing and front facing orientations by having to degrees of rotation freedom and a pivot near the center of the base of said child restraint system, and further comprising a bumper which may protrude from the front edge for a facing orientation, or protrude from the rear edge for a front facing orientation.

Group VI: Claim 51 drawn to a child restraint system in a vehicle with a continuously variable inclination angle for the rare facing orientation enabled by the motion of cross arms pivotally attached to the seat base and attached at the other end to nuts on a threaded rod attached to the seat, and wherein the seat base is pivotally attached to the seat base thereby enabling the rotation of the threaded rod to incline continuously the seat relative to the seat bottom.

Note: No claims are generic to all groups

The inventions listed as group I through VI do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT rule 13.2, they lack the same or corresponding special technical features for the following reasons:

Group I requires the special techanical feature of occupant supports stacked in two tiers, with each occupant support having a sitting and flat bed position, wherein the flat bed positions are vertically stacked, not required by groups II through VI.

Group II requires the special techanical feature of a latch for securing a structure to support tracks at the floor of an aircraft comprising one or both of: vertical load limiting; and horizontal load limiting along the axis of motion of said aircraft, not required by groups I and III-VI.

Group III requries the special technical feature of a plurality of structures attached to seat tracks at the floor of the aircraft at common support points between pairs of said structures, and wherein vertical load limiters of latches for support of said structures are housed vertically above the seat tracks in spaces between storage spaces in the supported structures, not required by groups I-II and IV-VI.

Group IV requires the special technical feature of a child restraint system in a vehicle of with an open architecture enabled to provide side-impact and front impact protection, not required by groups I-III and V-VI.

Group V requires the special technical feature of a single pair of latch arrangements enabled to attach a child restraint system both for rear facing and front facing orientations by having to degrees of rotation freedom and a pivot near the center of the base of said child restraint system, not required by groups I-IV and VI.

Group VI requires the special technical feature of a child restraint system in a vehicle with a continuously variable inclination angle for the rare facing orientation enabled by the motion of cross arms pivotally attached to the seat base and attached at the other end to nuts on a threaded rod attached to the seat, not required by groups I through V.

No features are shared by groups I through VI that would otherwise unify the groups.

The only feature shared by groups I through III that would otherwise unify the groups, is a load limiting latch structure for attaching to the floor of an aircraft. However this technical feature does not represent a contribution over prior art, because the shared technical feature is anticipated by US 7,393,167 B2 to Dowty et al (hereinafter 'Dowty').

Dowty teaches a load limiting latch structure (Abstract, shear pin 82 and plunger 62 with stud 50 engaging floor track 38, Fig 6-7, col 4, ln 4-67) for attaching aircraft seats to tracks in the floor of an aircraft.

As the common technical feature was known in the art at the time of the invention, this cannot be considered a common technical feature that would otherwise unify the groups.

The only features shared by groups I and III that would otherwise unify the groups, is an occupant support and a load limiting latch structure for attaching to the floor of an aircraft. However these technical features do not represent a contribution over prior art, because the shared technical features are anticipated by US 7,393,167 B2 to Dowty et al (hereinafter 'Dowty').

Dowty teaches an occupant support (passenger seat set 10, Fig 1-2) and a load limiting latch structure (Abstract, shear pin 82 and plunger 62 with stud 50 engaging floor track 38, Fig 6-7, col 4, ln 4-67) for attaching aircraft seats to tracks in the floor of an aircraft.

As the common technical features were known in the art at the time of the invention, these cannot be considered as common technical features that would otherwise unify the groups.

The only teachical feature shared by groups IV through VI that would othewise unify the groups is a child restraint system. However this technical feature does not represent a contribution over prior art, because the shared technical feature is anticipated by US 8,136,881 B2 to Vertegaal (hereinafter 'Vertegaal').

Vertegaal teaches a child vehicle restraint system (Abstract, Fig 1).

-*-Continued in next Supplemental Box-*-

-*-Supplemental Box III - Observations where unity of invention is lacking-*-

As the common technical feature was known in the art at the time of the invention, this cannot be considered a common technical feature that would otherwise unify the groups.

Therefore, Groups I through VI lack unity under PCT Rule 13.