

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
22 November 2007 (22.11.2007)

PCT

(10) International Publication Number
WO 2007/133823 A1

(51) International Patent Classification:
A47C 7/02 (2006.01)

(21) International Application Number:
PCT/US2007/061278

(22) International Filing Date: 30 January 2007 (30.01.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/766,588 30 January 2006 (30.01.2006) US

(71) Applicant (for all designated States except US): **BE AEROSPACE, INC.** [US/US]; 1400 Corporate Center Way, Wellington, FL 33414 (US).

AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, 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, LV, 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, SV, SY, 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, 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, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **DOWTY, Mark, Brian** [US/US]; 8424 Monticello Ridge Drive, Rural Hall, NC 27045 (US).

(74) Agent: **ADAMS EVANS P.A.**; 301 South Tryon Street, 2180 Two Wachovia Center, Charlotte, NC 28282 (US).

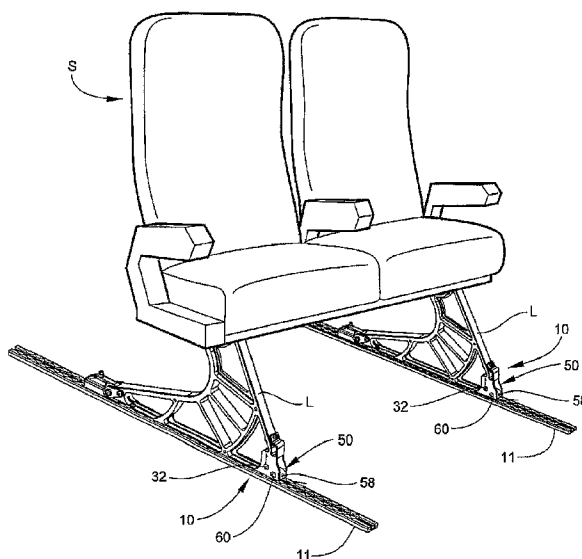
(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: ANTI-RATTLE TRACK FASTENER



(57) Abstract: An anti-rattle track fastener assembly for attaching a fixture to a vehicle that has a track formed therein. The track includes upper walls that form a longitudinally- extending slot. Spaced-apart segments extend from the upper walls into the slot to provide undercut areas in the slot positioned under the segments. Spaced-apart openings are positioned between the segments. The fastener assembly includes a stud that extends from the fixture and is dimensioned to be received within the slot for engaging the spaced-apart segments. The fastener also includes an eccentrically-mounted cam movable between a first position and a second position. When the cam is in the first position, the stud can engage the spaced-apart segments with clearance, and when the cam is in the second position, the stud can tightly engage the spaced- apart segments.

WO 2007/133823 A1

ANTI-RATTLE TRACK FASTENER

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a formal utility of U.S. Provisional Patent Application No. 60/766,588 filed on January 30, 2006.

BACKGROUND OF THE INVENTION

[0002] This invention relates to a track fastener assembly of the type used to anchor seats or cargo to tracks fitted to the floor of a vehicle. The particular embodiment disclosed herein is of a track fastener assembly for securing an aircraft passenger seating unit to the floor of an aircraft. Therefore, the vehicle referred to throughout this application is an aircraft. It is understood that the invention relates as well to other types of vehicles such as trains, buses, or the like.

[0003] Many aircraft require the capability to be differently configured to meet varying cargo and/or passenger-carrying requirements such as the removal or addition of passenger seats and/or cargo. In addition, aircraft also must have the capability to easily and quickly relocate or reposition seats and/or cargo. It is often necessary in aircraft to change the spacing between seats to increase or decrease the passenger density throughout a portion of or the entire aircraft. For example, it may be necessary to change the passenger density of a particular aircraft from its normal first class and coach density to an all-coach configuration such as might be necessary with charter operations. In addition, some aircraft, particularly those operating on late-night schedules, carry both passengers and cargo, the cargo being carried in one or more compartments normally used to carry passengers. Also driving this design is the need of aircraft manufacturers to speed their initial installation time, which is a major consideration on large aircraft with many seats.

[0004] To provide this capability, aircraft manufacturers install locking tracks that run fore and aft along the deck of the major compartments of the aircraft. These locking

tracks have a slot that runs the entire length of the track along its top side. Enlarged cut-out openings are spaced at regular intervals along the length of the track to receive track fasteners to permit the track fasteners to be positioned along and locked into the track in order to secure passenger seats and/or cargo pallets that are themselves secured to the track fastener. These track fasteners are adjustable within the track, thereby permitting the seats and/or cargo to be repositioned or removed.

[0005] The locking tracks and track fasteners are both fabricated from metal materials. Even when tightly locked into place, adjacent metal parts can rattle, causing annoying disturbances within an aircraft cabin environment. In an effort to reduce rattling there may be a tendency to over-tighten the track fastener screws. This can potentially lead to damaged screws, stripped threads and jamming of the fastener that makes later removal difficult. Prior art anti-rattle devices include star-shaped washers that are threaded down onto the front stud shaft of the track fastener to lift the seat slightly off of the track and snug-up the front stud onto the bottom of the track surface. These washers are difficult and time-consuming to install, and require special tools.

[0006] The present invention quickly and efficiently locks the track fastener into its proper position, prevents rattling and vibration that causes irritating noise and may loosen the track fitting.

SUMMARY OF THE INVENTION

[0007] Therefore, it is an object of the invention to provide an anti-rattle track fastener assembly for a vehicle such as an aircraft, train, bus or the like.

[0008] It is an object of the invention to provide an anti-rattle track fastener assembly that is quickly and easily locked and unlocked when necessary to reposition the fastener.

[0009] It is another object of the invention to provide an anti-rattle track fastener assembly that is capable of being engaged to a locking track quickly, safely and

securely.

[0010] It is another object of the invention to provide an anti-rattle track fastener assembly that does not require special tools.

[0011] It is another object of the invention to provide an anti-rattle track fastener assembly that does not interfere with or require attachment to the stud shaft of the track fastener.

[0012] According to one embodiment of the present invention, there is provided an anti-rattle track fastener assembly for attaching a fixture to a vehicle that has a track formed therein. The track includes upper walls that form a longitudinally-extending slot. Spaced-apart segments extend from the upper walls into the slot to provide undercut areas in the slot positioned under the segments. Spaced-apart openings are positioned between the segments. The fastener assembly includes a stud that extends from the fixture and is dimensioned to be received within the slot for engaging the spaced-apart segments. The fastener also includes a cam that has a transversely-extending, eccentrically-positioned hole therethrough for mounting the cam to the fixture and is movable between a first position and a second position. When the cam is in the first position, the stud is engageable to the spaced-apart segments with clearance, and when the cam is in the second position, the stud is tightly engageable to the spaced-apart segments against movement of the fixture.

[0013] According to another embodiment of the invention, the cam also has a radially extending camming hole formed therein for receiving a tool for moving the cam between the first position and the second position.

[0014] According to yet another embodiment of the invention, the stud has a foot for engaging the spaced-apart segments formed on an end thereof.

[0015] According to yet another embodiment of the invention, the cam has a curved surface.

[0016] According to yet another embodiment of the invention, the cam has a flat

surface portion.

[0017] According to yet another embodiment of the invention, the fastener assembly includes a foot formed on the stud for being received within the slot and the flat surface portion is dimensioned to engage the track when the cam is in the first position and the foot is received within the slot.

[0018] According to yet another embodiment of the invention, the cam is dimensioned such that the flat surface portion is positioned away from the track when the cam is in the second position and the foot is received within the slot.

[0019] According to yet another embodiment of the invention, the stud is dimensioned to be received within a sleeve.

[0020] According to yet another embodiment of the invention, the sleeve is dimensioned to be attached to the fixture.

[0021] According to yet another embodiment of the invention, the fixture is a seat for passengers within an airplane.

[0022] According to another aspect of the present invention, a method relating to an anti-rattle track fastener assembly for attaching a fixture to a vehicle is disclosed, including the step of providing a track having upper walls that form a longitudinally-extending slot and having spaced-apart segments that extend from the upper walls into the slot. The spaced-apart segments provide undercut areas in the slot positioned under the segments and spaced-apart openings positioned between the segments. The fixture includes a stud that extends from the fixture and is dimensioned to be received within the slot for engaging the spaced-apart segments. The fixture also includes a cam having a transversely-extending, eccentrically-positioned hole therethrough for mounting the cam to the fixture. The cam is movable between a first position wherein the stud can engage the spaced-apart segments with clearance and a second position wherein the stud can tightly engage the spaced-apart segments. The fixture is positioned adjacent the track such that the stud extends into the slot and the

cam is in the first position. The cam is then moved from the first position to the second position thereby wedging the cam into engagement with the upper walls of the track such that the stud is tightly engaged with the segments.

[0023] According to yet another embodiment of the invention the step of positioning the fixture adjacent the track such that the stud extends into the slot, includes the step of extending the stud through openings that are positioned between the segments.

[0024] According to yet another embodiment of the invention, the step of inserting a tool into a radially positioned hole that extends from the surface of the cam into the cam, wherein the tool is for performing the step of moving the cam from the first position to the second position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] Some of the objects of the invention have been set forth above. Other objects and advantages of the invention will appear as the description of the invention proceeds when taken in conjunction with the following drawings, in which:

[0026] Figure 1 is a perspective view of an aircraft passenger seat and locking track incorporating an anti-rattle track fastener;

[0027] Figure 2 is an enlarged fragmentary view of the leg of the seat and the anti-rattle track fastener;

[0028] Figure 3 is an exploded view of the track fastener;

[0029] Figure 4 is a cross-sectional view of the anti-rattle track fastener and an adjacent length of the locking track, showing the anti-rattle feature of the track fastener in an unlocked position; and

[0030] Figure 5 is a cross-sectional view of the anti-rattle track fastener and an

adjacent length of the locking track, showing the anti-rattle feature of the track fastener in a locked, anti-rattle position.

TECHNICAL FIELD AND BACKGROUND OF THE INVENTION

[0031] Referring now specifically to the drawings wherein identical reference numerals denote the same elements within and among the various views, a typical seating arrangement using the track fastener assembly according to the present invention is illustrated in FIG. 1. A seating unit "S" is positioned on a locking track 11 and locked thereto by means of track fastener assemblies 10 mounted on the front end of the seat legs "L."

[0032] Referring now to Figure 2, locking track 11 has a longitudinally-extending slot 12 therein that extends along the entire length of the locking track 11. Upper walls 13 of the locking track 11 define the slot 12 and have regularly spaced-apart enlarged openings 14 along the length thereof, separated by relatively narrower track slot segments 15 that form the portions of the structure that actually perform the locking function. In Figure 2 it is evident that the narrow track slot segments 15 extend into the slot 12 to provide undercut areas in the slot 12 beneath the slot segments 15. In contrast, the enlarged openings 14 have little or no undercut areas in the slot 12. The locking track 11 is attached to the floor of the aircraft, for example by machine screws that pass through screw holes, not shown, in the bottom of locking track 11.

[0033] Referring now to Figure 3, the anti-rattle track fastener assembly 10 includes a track stud 20 having a stud shaft 22 and an enlarged locking foot 24. The stud 20 is mounted in a sleeve 26 that is positioned between sidewalls 10A and 10B of the track fastener 10. The stud 20 may be formed integrally with the sleeve 26, threaded or welded onto it, or the track stud may be screwed directly into the seat leg "L" by forming mating screw threads in the leg "L". Two diametrically-aligned screw holes 28 and 30 accept a screw 32 that is extended through screw holes 34 and 36 in the sidewalls 10A, 10B. The screw holes 28 and 30 are aligned with the screw holes

34, 36 by means of a guide pin 38 that fits into a small guide hole 40. The screw 32 is secured by a nut 42.

[0034] A cam 50 is positioned between the sidewalls 10A, 10B adjacent the stud 20. The cam 50 may be fabricated from any suitable material, such as plastics, resins or metals. One preferred embodiment if the cam 50 is fabricated from an unfilled or PTFE-filled acetal copolymer resin sold under the registered trademark Delrin®.

[0035] The cam 50 includes a transversely-extending, eccentrically-positioned screw hole 52, a flat surface portion 54, a curved surface portion 56 and a radially-extending camming hole 58. The cam 50 is mounted to the sidewalls 10A, 10B by a screw 60 positioned in a sleeve 62 and positioned in cam mounting holes 64, 66. The screw 60 is secured with a nut 68.

[0036] Referring now to Figure 4, the track fastener 10 is shown in the mounted position, with the foot 24 of the stud 20 positioned in the slot 12 and displaced from the opening 14 so that the stud 20 is retained the area of one of the relatively narrower track slot segments 15. Note at this point that there is a clearance between the top of the foot 24 and the upper walls 13 of the track 11. The cam 50 is positioned with the flat surface area 54 resting on the upper walls 13 of the track 11. The flat surface area 54 also acts to resist inadvertent disengagement of the cam 50 and disengagement without the use of a tool.

[0037] As is shown in Figure 5, to engage the anti-rattling function of the track fastener 10, any suitably sized object, such as the shank 62 of a screwdriver, is inserted into the camming hole 58 and used as a lever to rotate the cam 50. The cam 50 is rotated so that the flat surface area 54 is rotated away from engagement with the upper walls 13 of the track 11. In this manner the curved surface portion 56 is wedged into engagement with the upper walls 13 of the track 11. The eccentric position of the screw hole 52 and the curved surface portion 56 causes the stud 20 to be raised upwardly as the cam 50 is rotated, wedging the foot 24 of the stud 20 into a tight engagement with the upper walls 13 of the track 11. This can be accomplished very quickly during

installation of the seat "S" without any special tools. For example, the camming hole 58 can be sized to accept the shank 62 of the screwdriver used to tighten the screws 32 and 60. The acetal copolymer resin of the cam 50 has a slight degree of compressibility that allows a secure engagement between the cam 50 and the track 11, while the low CF of the acetal copolymer resin allows the cam 50 to be relatively easily rotated between the positions shown in Figures 4 and 5.

[0038] As is apparent from the foregoing, the novel feature of the invention is the use of a cam to wedge the foot 24 of the stud 20 into a tight, non-rattling engagement with the track 11. Thus, many variations in the structure of the track, track stud and associated hardware are possible. For example, the cam may be fore or aft of the track stud and may or may not have a flat side. Eccentric mounting of the cam may provide adequate force on the track, and other means may be used to prevent inadvertent movement of the cam out of the anti-rattle position.

[0039] An improved aircraft passenger seat anti-rattling track fastener is described above. Various details of the invention may be changed without departing from the scope of the invention. Furthermore, the foregoing description of the preferred embodiment of the invention and best mode for practicing the invention are provided for the purpose of illustration only and not for the purpose of limitation, the invention being defined by the claims.

I claim:

1. An anti-rattle track fastener assembly for attaching a fixture to a vehicle having a track formed therein, the track having upper walls that form a longitudinally-extending slot and having spaced-apart segments that extend from the upper walls into the slot to provide undercut areas in the slot positioned under the segments and spaced-apart openings positioned between the segments, the fastener assembly comprising:

a stud that extends from the fixture and is dimensioned to be received within the slot for engaging the spaced-apart segments; and

a transversely-extending, eccentrically-positioned cam mounted on the fixture, and movable between a first position and a second position, wherein the stud is engageable to the spaced-apart segments with clearance when the cam is in the first position, and is tightly engageable to the spaced-apart segments against movement of the fixture when the cam is in the second position.

2. An anti-rattle track fastener assembly according to claim 1, wherein the cam also has a radially extending camming hole formed therein for receiving a tool for moving the cam between the first position and the second position.

3. An anti-rattle track fastener assembly according to claim 1, wherein the stud has a foot for engaging the spaced-apart segments formed on an end thereof.

4. An anti-rattle track fastener assembly according to claim 1, wherein the cam has a curved exterior camming surface.

5. An anti-rattle track fastener assembly according to claim 4, wherein the cam has a flat surface portion for locking the cam into a cammed position.

6. An anti-rattle track fastener assembly according to claim 5, further comprising a foot formed on the stud for being received within the slot, wherein the cam is dimensioned such that the flat surface portion is engaged with the track when the cam is in the first position and the foot is received within the slot.

7. An anti-rattle track fastener assembly according to claim 5, wherein the cam is dimensioned such that the flat surface portion is positioned away from the track and the curved surface is engaged with the track when the cam is in the second position and the foot is received within the slot.

8. An anti-rattle track fastener assembly according to claim 1, wherein the stud is dimensioned to be received within a sleeve.

9. An anti-rattle track fastener assembly according to claim 8, wherein the sleeve is dimensioned to be attached to the fixture.

10. An anti-rattle track fastener assembly according to claim 1, wherein the fixture is carried by an aircraft passenger seat.

11. A method of using an anti-rattle track fastener assembly for attaching a fixture to a vehicle, the method comprising the steps of:

(a) providing a track having upper walls that form a longitudinally-extending slot and having spaced-apart segments that extend from the upper walls into the slot to provide undercut areas in the slot positioned under the segments and spaced-apart openings positioned between the segments; a stud that extends from the fixture and is dimensioned to be received within the slot for engaging the spaced-apart segments; and a cam having a transversely-extending, eccentrically-positioned hole therethrough for mounting the cam to the fixture, the cam being movable between a first position and a second position, wherein the stud can engage the spaced-apart segments with clearance when the cam is in the first position and tightly engage the spaced-apart segments when the cam is in the second position;

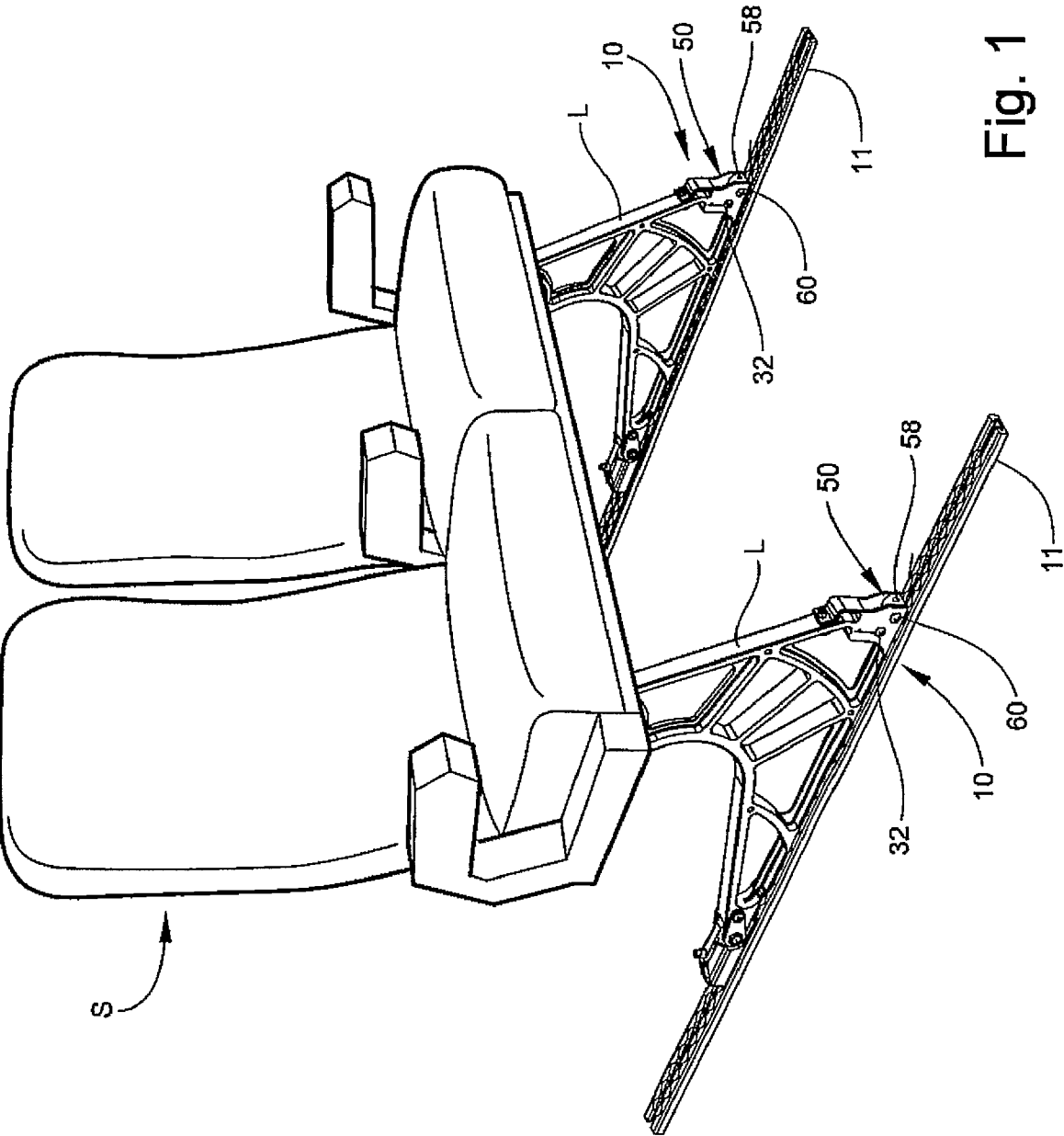
(b) positioning the fixture adjacent the track such that the stud extends into the slot;

(c) moving the cam from the first position to the second position thereby

wedging the cam into engagement with the upper walls of the track and tightly engaging the stud with the segments.

12. A method of using an anti-rattle track fastener assembly according to claim 10, wherein the step of positioning the fixture adjacent the track such that the stud extends into the slot, includes the step of extending the stud through openings that are positioned between the segments.

13. A method of using an anti-rattle track fastener assembly according to claim 10, including the step of inserting a tool into a radially positioned hole that extends from the surface of the cam into the cam, wherein the tool is for performing the step of moving the cam from the first position to the second position.



2/5

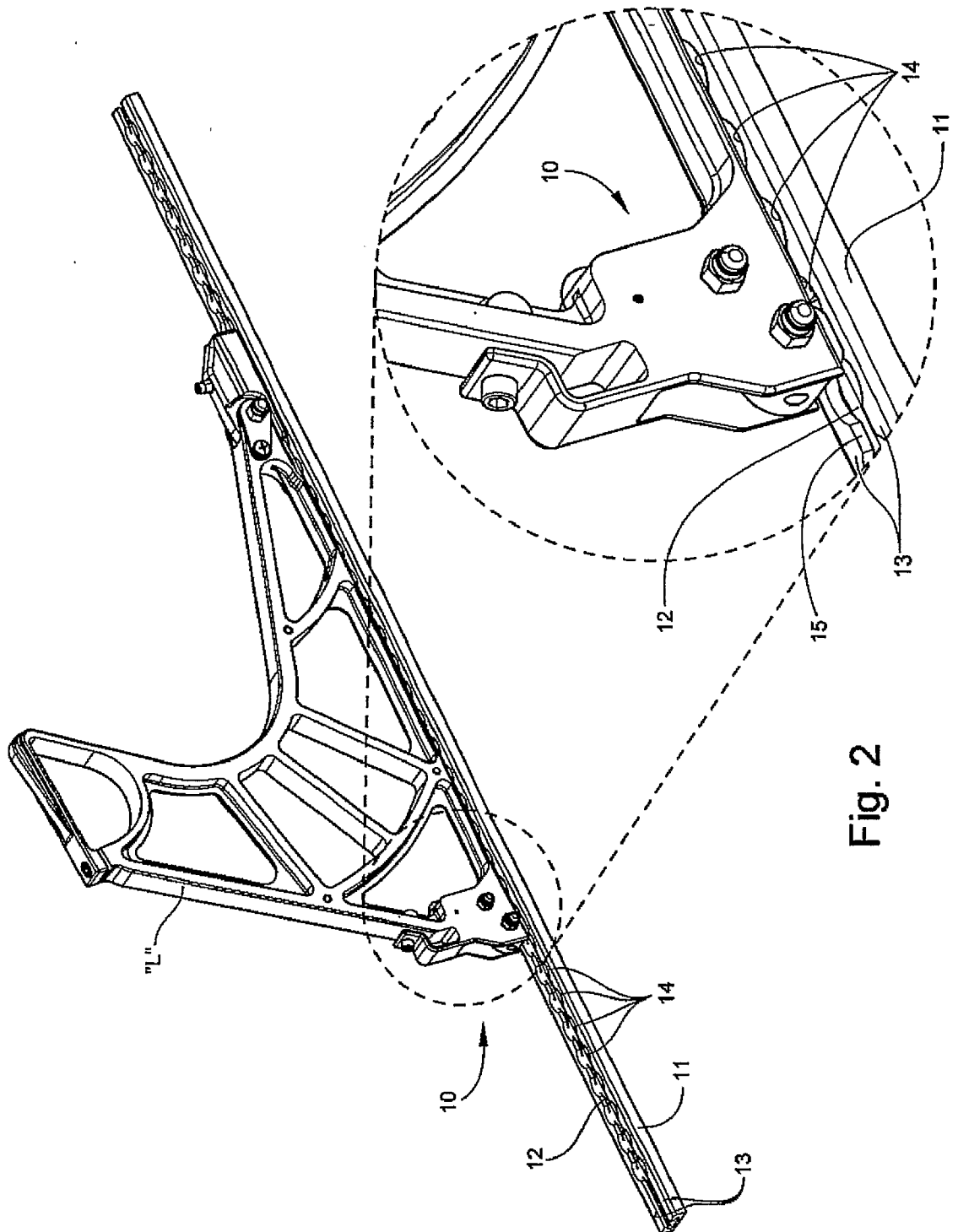
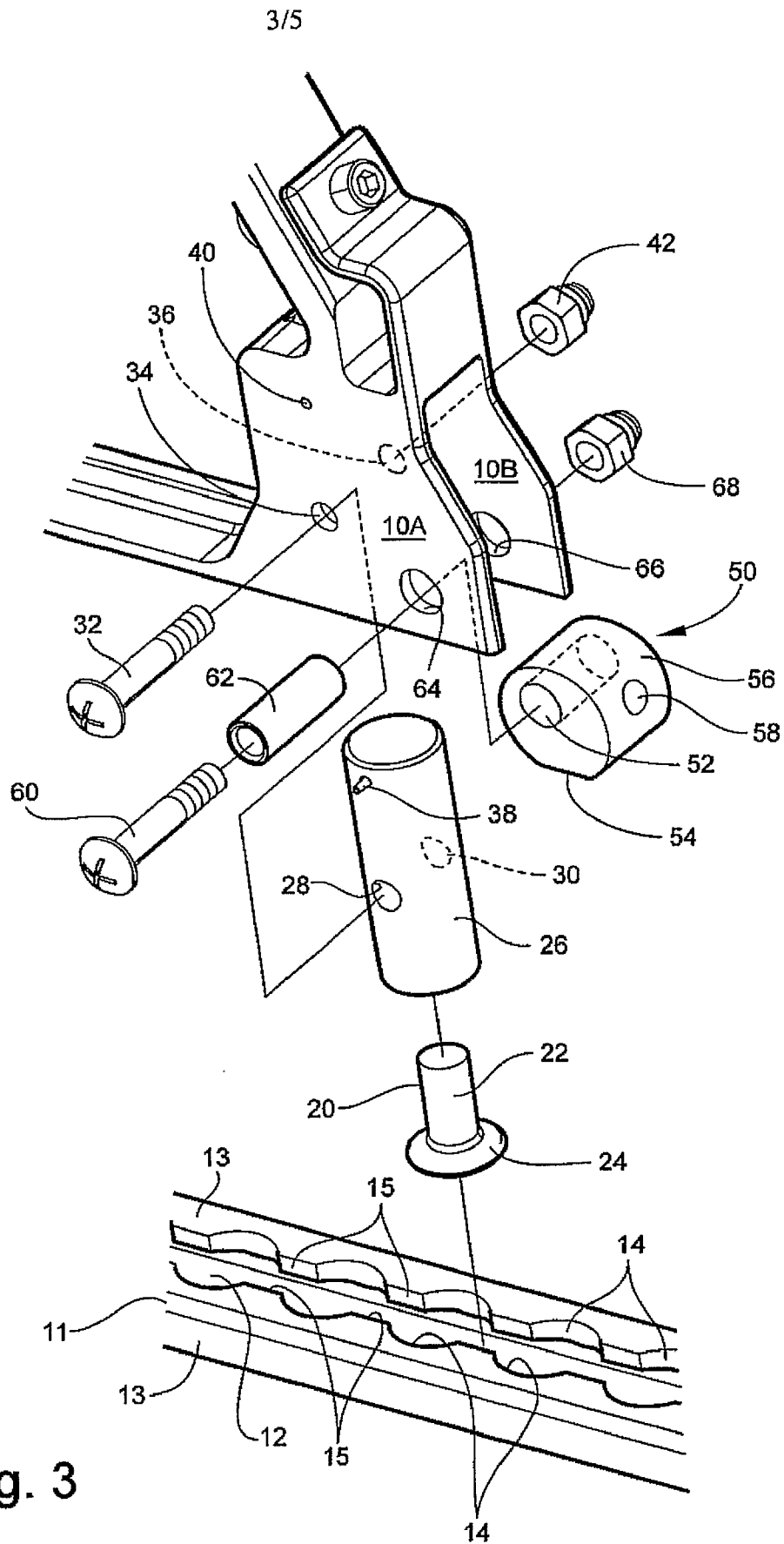


Fig. 2



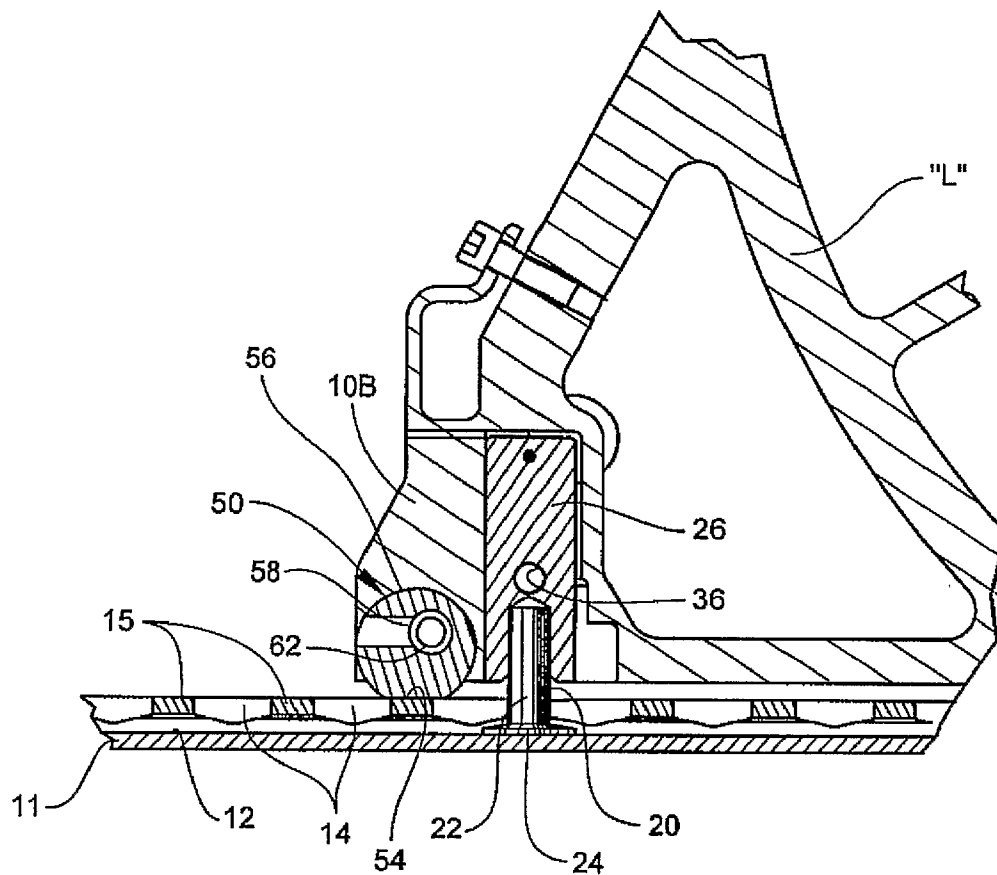


Fig. 4

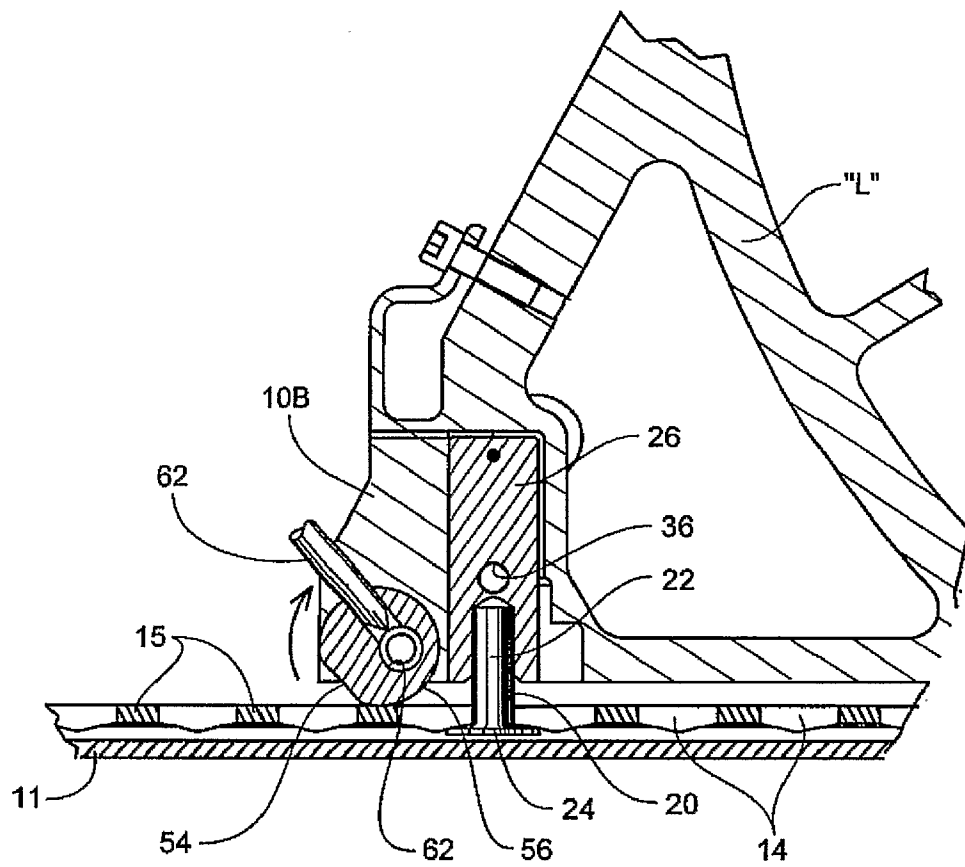


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 07/61278

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A47C 7/02 (2007.01)

USPC - 297/452.1

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(8): A47C 7/02 (2007.01)

USPC: 297/452.1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 297/232,311

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

pubWEST, Search Terms Used: track, channel, lock, seat, cam, anti-rattle

Google Patents, Search Terms Used: cam, lock, anti-rattle

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,213,593 A (WEIK) 22 July 1980 (22.07.1980). entire document, especially Fig. 1-3, col 1, 5-9; col 1, ln 65-68, col 2, ln 1-5; col 2, ln 6-18;	1 and 3-12
-		
Y		2 and 13
Y	US 2,779,092 A (GORDON) 29 Jan. 1957 (29.01.1957). Fig. 3	2 and 13

☐ 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

25 August 2007 (25.08.2007)

Date of mailing of the international search report

03 OCT 2007

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