

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
7 August 2003 (07.08.2003)

PCT

(10) International Publication Number
WO 03/064203 A1

(51) International Patent Classification⁷: **B60N 2/07**

(21) International Application Number: PCT/US03/02642

(22) International Filing Date: 28 January 2003 (28.01.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/352,379 28 January 2002 (28.01.2002) US

(71) Applicant (for all designated States except US): **INTIER
AUTOMOTIVE, INC.** [US/US]; 39600 Lewis Drive,
Novi, MI 48377 (US).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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

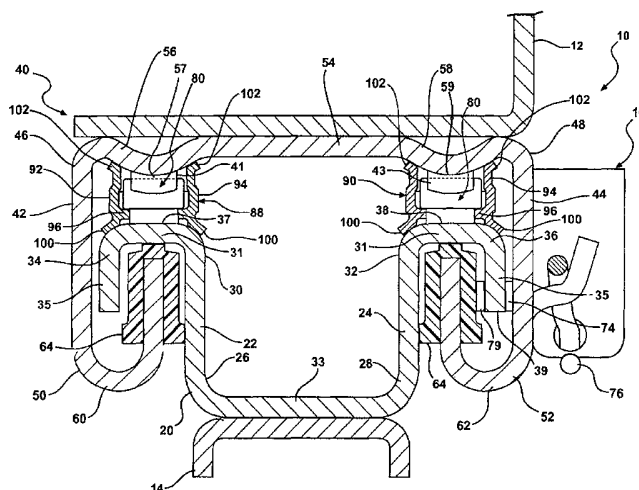
(72) Inventor; and

(75) Inventor/Applicant (for US only): **SEVERINI, Joseph, A.** [CA/CA]; 1 Valentini Avenue, Holland Landing, Ontario L9N 1H9 (CA).

(74) Agents: **ASHER, Robin, W.**, et al.; Clark Hill PLC, Suite 3500, 500 Woodward Avenue, Detroit, MI 48226-3435 (US).

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: AUTOMOTIVE SEAT TRACK HAVING VERTICALLY ADJUSTABLE BEARINGS



(57) **Abstract:** A seat track assembly (10) is adapted to mount a seat to a floor of an automotive vehicle and provide selective forward and rearward adjustment of the seat relative to the floor among a plurality of seating positions. The seat track assembly includes an inner track (20) fixedly secured to the floor of the vehicle. The inner track (20) has a flattened bearing surface (37, 38) extending longitudinally along the inner track. An outer track (40) is fixedly secured to the seat and slidably coupled to the inner track (20) to allow selective sliding adjustment of the seat relative to the floor of the vehicle. The outer track (40) includes an arcuate bearing surface (57, 59) extending longitudinally along the outer track (40) and opposing the flattened bearing surface (37, 38). A plurality of cylindrical bearings (80) are positioned between the flattened bearing surface (37, 38) of the inner track (20) and the arcuate bearing surface (57, 59) of the outer track (40) to accommodate torsional loading and movement of the outer track with respect to the inner track while facilitating the selective sliding adjustment of the seat relative to the floor.



WO 03/064203 A1

AUTOMOTIVE SEAT TRACK HAVING VERTICALLY ADJUSTABLE BEARINGS

BACKGROUND OF THE INVENTION

5

1. Field of the Invention

The invention relates to a seat track assembly for interconnecting a seat to a floor of an automotive vehicle and, more particularly, to flat and arcuate bearing surfaces within the seat track assembly allowing torsional loading and movement of a mobile outer track relative to a fixed inner track.

2. Description of the Related Art

Automotive vehicles include seats for supporting occupants within the vehicle. Seats typically include a seat track assembly interconnecting the seat to a floor of the vehicle to allow selective locking and adjustment of the seat along the floor of the vehicle among a plurality of seating positions. A seat track assembly includes a fixed track fixedly secured to the floor of the vehicle and a mobile track slidably coupled to the fixed track and fixedly secured to the bottom of the seat.

It is known to provide a plurality of bearings between the fixed and mobile tracks to reduce friction and facilitate movement of the mobile track relative to the fixed track. An example of a seat track assembly using such a plurality of bearings is disclosed in the United States Patent 5,741,000, which issued to Goodbred on April 21, 1998.

It remains desirable to provide a seat track assembly having a plurality of bearings that allows torsional loading and movement of the mobile track relative to the fixed track while, at the same time, facilitating sliding movement of the mobile track relative to the fixed track.

SUMMARY OF THE INVENTION

According to one aspect of the invention, a seat track assembly is adapted to mount a seat to a floor of an automotive vehicle and provide selective forward and rearward adjustment of the seat relative to the floor among a plurality of seating positions. The seat track assembly includes an inner track fixedly secured to the floor of the vehicle. The inner track has a flattened bearing surface extending longitudinally along the inner track. An outer track is fixedly secured to the seat and slidably coupled to the inner track to allow selective sliding adjustment of the seat relative to the floor of the vehicle. The outer track includes an arcuate bearing surface extending longitudinally along the outer track and opposing the

flattened bearing surface. A plurality of cylindrical bearings are positioned between the flattened bearing surface of the inner track and the arcuate bearing surface of the outer track to accommodate torsional loading and movement of the outer track with respect to the inner track while facilitating the selective sliding adjustment of the seat relative to the floor.

5

BRIEF DESCRIPTION OF THE DRAWINGS

Advantages of the invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

10 Figure 1 is a section view of a seat track assembly incorporating one embodiment of the invention therein; and

Figure 2 is a fragmentary side view of the seat track assembly.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

15 Referring to Figure 1, a seat track assembly of the invention is generally shown at 10. A pair of seat track assemblies 10 (one shown) slidably interconnects a vehicle seat 12 to a floor of an automotive vehicle. The seat track assembly 10 allows selective forward and rearward adjustment of the seat 12 among a plurality of seating positions along the floor of the vehicle. The seat track assembly 10 includes a latch mechanism 16 for selectively locking the
20 seat 12 in any one of the plurality of seating positions. An example of a latch mechanism 16 is disclosed in PCT Application US01/44685, which is hereby expressly incorporated herein by reference in its entirety.

 The seat track assembly 10 includes a fixed or inner track 20. A riser 14 interconnects the inner track 20 to the floor of the vehicle. The inner track 20 has a generally U-shaped
25 cross-section defined by generally parallel upright sides 22, 24 each having first 26, 28 and distal second 30, 32 ends. A base 33 extends laterally between the first ends 26, 28 of the sides 22, 24. An outer edge 31 extends laterally outwardly from each of the sides 22, 24. A generally flat bearing surface 37, 38 is formed in the outer edge 31 and extends longitudinally with respect to the inner track 20. An outer wall 35 extends generally perpendicularly from
30 each of the outer edges 31 to define a flange 34, 36. A plurality of teeth 39 is formed along at least one of the outer walls 35. The plurality of teeth 39 is disposed longitudinally with respect to the inner track 20 for cooperating with the latch mechanism 16 to define the plurality of seating positions. Each bearing surface 37, 38 extends longitudinally between spaced apart tabs 41, 43.

A mobile or outer track 40 is fixedly secured to the seat and slidably coupled to the inner track 20. The outer track 40 includes generally upright sides 42, 44 each extending between a first end 46, 48 and a distal second end 50, 52. A base 54 extends laterally between the first ends 46, 48 of the sides 42, 44 of the outer track 40 to define a U-shaped cross section. Concavities 56, 58 are formed in the base 54 of the outer track 40 corresponding to the flat bearing surfaces 37, 38 of the inner track 20. Each concavity 56, 58 protrudes toward the inner track 20 to define an arcuate bearing surface 57, 59 opposing the corresponding flat bearing surfaces 37, 38. Each arcuate bearing surface 57, 59 extends longitudinally with respect to the outer track 40. Each second end 50, 52 of the upright sides 42, 44 of the outer track 40 includes a hook 60, 62 engaged with the flanges 34, 36 of the inner track 20 to prevent vertical separation of the outer track 40 from the inner track 20. A plurality of spacers 64 extends over each of the hooks 60, 62 between the inner 20 and outer 40 tracks to reduce rattle between the inner 20 and outer 40 tracks.

Referring to Figure 2, the latch mechanism 16 is operatively coupled to the outer track 40. The latch mechanism 16 includes a latch plate 74 having a plurality of apertures 79 for lockingly engaging the plurality of teeth 39. While engaged with the plurality of teeth 39, the latch plate 74 prevents sliding movement of the outer track 40 relative to the inner track 20. The latch plate 74 is movably supported on the outer track 40 for movement between a locked condition, wherein the plurality of apertures 79 is engaged with the plurality of teeth 39, and an unlocked condition, wherein the plurality of apertures 79 is disengaged with the plurality of teeth 39 to allow sliding movement of the outer track 40 relative to the inner track 20. A biasing member or spring 76 is energized between the outer track 40 and the latch plate 74 for biasing the latch plate 74 toward the locked condition. A release lever 78 is operatively coupled to the latch plate 74 for facilitating movement of the latch plate 74 between the locked and unlocked conditions.

A plurality of cylindrical bearings 80 are positioned between the flat 37, 38 and arcuate 57, 59 bearing surfaces to reduce friction between the inner 20 and outer 40 tracks. Each of the plurality of cylindrical bearings 80 is disposed laterally with respect to the flat 37, 38 and arcuate 57, 59 bearing surfaces. Engagement between each of the plurality of bearings 80 and the flat bearing surfaces 37, 38 is defined by a line of contact extending laterally with respect to the longitudinal extent of the inner 20 and outer 40 tracks. Engagement between each of the plurality of bearings 80 and the arcuate bearing surface 57, 59 is defined by a point of contact. The line and point of contact between each of the plurality of bearings 80 and the flat 37, 38 and arcuate 57, 59 bearing surfaces, respectively, allows for torsional loading or

movement of the outer track 40 with respect to the inner track 20 while still permitting and facilitating sliding movement of the outer track 40 relative to the inner track 20.

A bearing guide 88, 90 extends between each outer edge 31 of the inner track 20 and each concavity 56, 58 of the outer track 40. Each bearing guide 88, 90 includes spaced apart sides 92, 94 and a cross member 96 extending laterally between the sides 92, 94 to define a generally H-shaped cross section. Each of the plurality of bearings 80 are rotatably coupled to the sides 92, 94 of the respective bearing guide 88. Each of the sides 92, 94 includes opposite bent ends 100 and 102 adapted to engage the outer edge 31 and the concavities 56, 58 to laterally retain the plurality of bearings 80 between the flat 37, 38 and arcuate 57, 59 bearing surfaces.

In use, the latch plate 74 is moved to the unlocked condition to allow sliding movement of the outer track 40 relative to the inner track 20, and in turn, the seat relative to the floor of the vehicle among the plurality of seating positions. The plurality of bearings 80 roll between the flat 37, 38 and arcuate 57, 59 bearing surfaces to reduce friction between the outer 40 and inner 20 tracks. At the same time, the point of contact between the arcuate bearing surface 57, 59 and the plurality of bearings 80 allows the outer track 40 to roll laterally about the point of contact when the outer track 40 is torsionally loaded or moved with respect to the inner track 20 due to forces associated with, for example, the shifting weight of the occupant or the seat during lateral accelerations of the vehicle or during installation of the lower track 20 to the floor of the vehicle when the dimensions of the floor fall outside anticipated design tolerances. Additionally, the lateral line of contact between the plurality of bearings and the flat bearing surface 37, 38 laterally stabilizes the plurality of bearings 80 with respect to flat bearing surface 37, 38. When the seat is adjusted to the desired one of the plurality of seating positions, the latch plate 74 is allowed to return to the locked condition under the bias of the spring 76.

The invention has been described in an illustrative manner, and it is to be understood that the terminology, which has been used, is intended to be in the nature of words of description rather than of limitation.

Many modification and variations of the present invention are possible in light of the above teachings. It is, therefore, to be understood that within the scope of the appended claims, the invention may be practiced other than as specifically described.

What is claimed is:

1. A seat track assembly adapted to mount a seat to a floor of an automotive vehicle and provide selective forward and rearward adjustment of the seat relative to the floor among a plurality of seating positions, said seat track assembly comprising:

5 an inner track fixedly secured to the floor of the vehicle and having a flattened bearing surface extending longitudinally along said inner track;

an outer track fixedly secured to the seat and slidably coupled to said inner track to allow selective sliding adjustment of the seat relative to the floor of the vehicle, said outer track including an arcuate bearing surface extending longitudinally along said outer track and
10 opposing said flattened bearing surface; and

a plurality of cylindrical bearings positioned between said flattened bearing surface of said inner track and said arcuate bearing surface of said outer track to accommodate torsional loading and movement of said outer track with respect to said inner track while facilitating said selective sliding adjustment of the seat relative to the floor.

15

2. A seat track assembly as set forth in claim 1 wherein said inner track includes two upright sides and a cross member extending laterally therebetween to define a U-shaped channel, said sides each having a distal end opposite said cross member.

20 3. A seat track assembly as set forth in claim 2 wherein said inner track includes an outer edge extending laterally outwardly from each of said distal ends of each of said sides.

4. A seat track assembly as set forth in claim 3 wherein said flattened bearing surface is formed in said outer edge and extends longitudinally with respect to said inner track.

25

5. A seat track assembly as set forth in claim 4 wherein said inner track includes an outer wall extending perpendicularly from each of said outer edges to define a flange.

6. A seat track assembly as set forth in claim 5 wherein said inner track includes a
30 plurality of teeth formed along said outer wall, each of said plurality of teeth disposed longitudinally with respect to said inner track to define each of the plurality of seating positions.

7. A seat track assembly as set forth in claim 6 wherein said outer track includes two upright sides and a base extending laterally between said sides to define a U-shaped cross section, said sides of said outer track each including a distal end.

8. A seat track assembly as set forth in claim 7 wherein said base of said outer track includes a concavity formed therein, said concavity protruding toward said inner track to define said arcuate bearing surface opposing said flattened bearing surface.

9. A seat track assembly as set forth in claim 8 wherein said outer track includes a hook formed on each of distal ends of said sides of said outer track, said hook engaged with said flange of said inner track to prevent vertical separation of said outer track from said inner track.

10. A seat track assembly as set forth in claim 9 including a spacer extending over said hook between said outer track and said inner track for reducing rattle between said outer track and said inner track.

11. A seat track assembly as set forth in claim 10 including a bearing guide for retaining said plurality of bearings between said arcuate and flattened bearing surfaces.

12. A seat track assembly as set forth in claim 11 including a latch mechanism operatively coupled to said outer track and lockingly engagable with said plurality of teeth of said inner track to selectively lock the seat in one of the plurality of seating positions.

13. A seat track assembly as set forth in claim 12 wherein said latch mechanism includes a latch plate having a plurality of apertures for lockingly engaging said plurality of teeth to prevent sliding movement of said outer track relative to said inner track, said latch plate movably supported on said outer track for movement between a locked position, wherein said plurality of apertures are engaged with said plurality of teeth, and an unlocked position, wherein said plurality of apertures are disengaged with said plurality of teeth to allow sliding movement of said outer track relative to said lower track.

14. A seat track assembly as set forth in claim 13 including a spring energized between said outer track and said latch plate for biasing said latch plate toward said locked position.

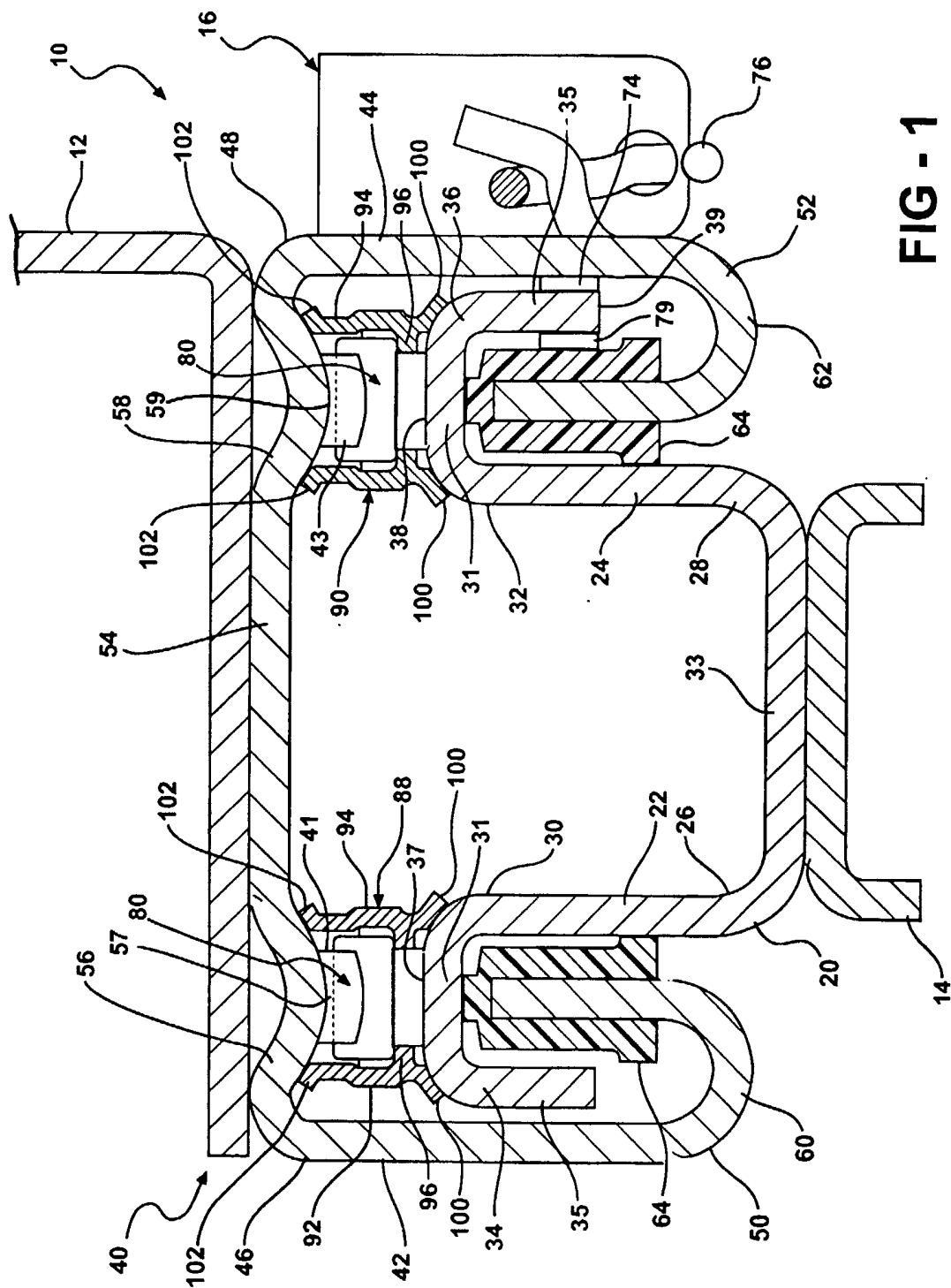
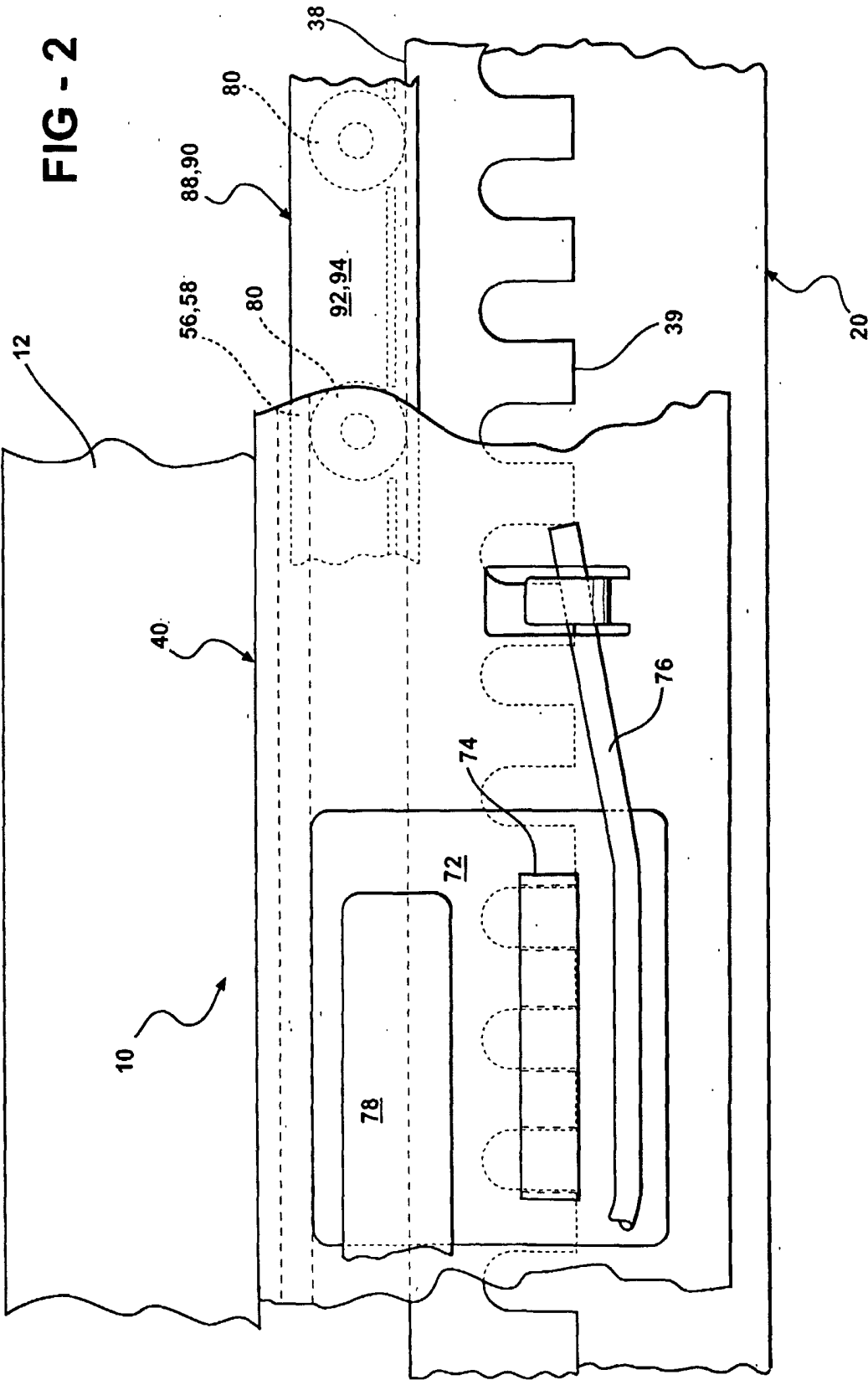


FIG - 1



INTERNATIONAL SEARCH REPORT

Intern: plication No

PCT/US 03/02642

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B60N2/07

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 7 B60N

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.
A	EP 0 394 623 A (BROSE FAHRZEUGTEILE) 31 October 1990 (1990-10-31) column 7, line 37 -column 8, line 5 figures 5,6 ----	1
A	DE 41 33 509 A (KEIPER RECARO GMBH CO) 15 April 1993 (1993-04-15) figures 3-5 ----	1
A	US 5 741 000 A (GOODBRED NEIL G) 21 April 1998 (1998-04-21) cited in the application figure 5 ----	1
A	EP 0 568 900 A (TEVES GMBH CO OHG ALFRED) 10 November 1993 (1993-11-10) figures 1-3 ----- -/--	1



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

° 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 document 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

11 June 2003

Date of mailing of the international search report

18/06/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Cauderlier, F

INTERNATIONAL SEARCH REPORT

Intern

n No

PCT/US 03/02042

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2 107 179 A (HAMMERSTEIN GMBH C ROB) 27 April 1983 (1983-04-27) figures 5,6 column 3, line 83 - line 114 ---	1
A	US 3 926 397 A (HUNWICKS ALEC ALFRED) 16 December 1975 (1975-12-16) abstract; figures 2-5 ---	1
A	EP 0 947 381 A (GALLO SERGIO) 6 October 1999 (1999-10-06) abstract; figure 2 ---	1
A	US 5 454 541 A (ITO SADA0) 3 October 1995 (1995-10-03) figure 5 ---	1
A	US 4 809 939 A (UEDA HIROSHI ET AL) 7 March 1989 (1989-03-07) figures 4-7 ---	1
A	DE 91 12 600 U (KEIPER RECARO GMBH) 5 December 1991 (1991-12-05) figures ---	1
A	DE 37 24 758 A (YMOS AG IND PRODUKTE) 2 February 1989 (1989-02-02) figures 2-4 ---	1
A	US 2 336 433 A (WOINA BENJAMIN A) 7 December 1943 (1943-12-07) figures 18-26 -----	1

INTERNATIONAL SEARCH REPORT

 Intern: Application No
 PCT/US 83/02642

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0394623	A	31-10-1990	DE 3914046 A1	31-10-1990
			DE 59002249 D1	16-09-1993
			EP 0394623 A2	31-10-1990
			EP 0394892 A2	31-10-1990
DE 4133509	A	15-04-1993	DE 4133509 A1	15-04-1993
US 5741000	A	21-04-1998	AT 188174 T	15-01-2000
			AU 7329396 A	01-04-1997
			CA 2231884 A1	20-03-1997
			DE 69605929 D1	03-02-2000
			DE 69605929 T2	20-07-2000
			EP 0846066 A1	10-06-1998
			ES 2142624 T3	16-04-2000
			WO 9710116 A1	20-03-1997
			JP 11512365 T	26-10-1999
EP 0568900	A	10-11-1993	DE 4214684 A1	04-11-1993
			EP 0568900 A1	10-11-1993
GB 2107179	A	27-04-1983	DE 3238028 A1	19-05-1983
			FR 2514702 A1	22-04-1983
			SE 448157 B	26-01-1987
			SE 8205925 A	19-10-1982
US 3926397	A	16-12-1975	GB 1483179 A	17-08-1977
			AU 499109 B2	05-04-1979
			AU 7212274 A	12-02-1976
			DE 2437499 A1	06-03-1975
			IT 1017935 B	10-08-1977
			JP 50071022 A	12-06-1975
			SE 409310 B	13-08-1979
			SE 7409916 A	14-02-1975
EP 0947381	A	06-10-1999	IT T0980278 A1	30-09-1999
			EP 0947381 A2	06-10-1999
US 5454541	A	03-10-1995	JP 3114326 B2	04-12-2000
			JP 5221255 A	31-08-1993
			DE 4304107 A1	09-09-1993
US 4809939	A	07-03-1989	JP 1678771 C	13-07-1992
			JP 3044931 B	09-07-1991
			JP 63116945 A	21-05-1988
DE 9112600	U	05-12-1991	DE 9112600 U1	05-12-1991
DE 3724758	A	02-02-1989	DE 3724758 A1	02-02-1989
US 2336433	A	07-12-1943	NONE	