



(51) International Patent Classification:

B60J 5/06 (2006.01)

(21) International Application Number:

PCT/TR2018/050419

(22) International Filing Date:

08 August 2018 (08.08.2018)

(25) Filing Language:

Turkish

(26) Publication Language:

English

(30) Priority Data:

2018/06565 09 May 2018 (09.05.2018) TR

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(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, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP,

KR, KW, KZ, LA, LC, LK, LR, LS, 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, ST, 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).

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))
- in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE

(54) Title: A RAIL MECHANISM WHICH PROVIDES DOOR OPENING AND CLOSING

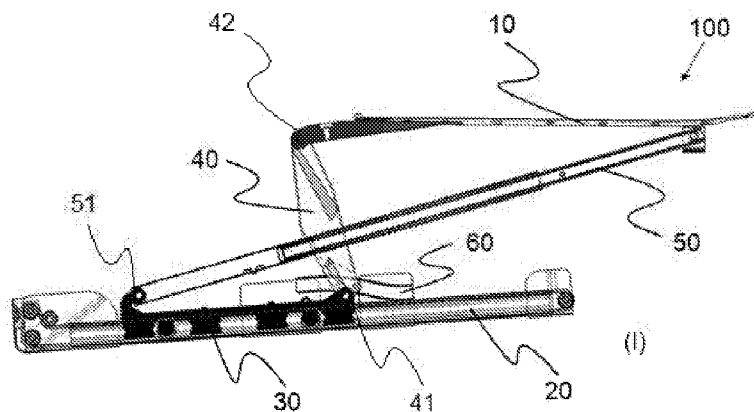


Figure 1

(57) Abstract: The present invention relates to a rail mechanism (100) in order to provide opening and closing of sliding doors (10) in vehicles. As an improvement, the subject matter rail mechanism (100) comprises a primary rail (20) fixed onto the vehicle body (11), at least one roller (30) positioned inside said primary rail (20) and which provides advancing of the door (10) between an open position (I) and a closed position (II), a first arm (40) whose one end is connected to the end part of said roller (30) in door (10) opening direction by means of a first hinge (41) and whose other end is connected to the edge of the door (10) in the door (10) closing direction and an extendable second arm (50) whose one end is connected to the end part of said roller (30) in the door (10) closing direction by means of a second hinge (51) and whose other end is connected to the edge of the door (10) in the door (10) opening direction.



## A RAIL MECHANISM WHICH PROVIDES DOOR OPENING AND CLOSING

### 5 TECHNICAL FIELD

The present invention relates to a rail mechanism in order to provide opening and closing of sliding doors in vehicles.

### 10 PRIOR ART

In vehicles, particularly in commercial vehicles, sliding doors are used for providing opening of sliding doors in narrow areas and for preventing limitation of the movement area in the environment when the door is opened. Sliding doors can be connected in a sliding manner onto the bottom, intermediate and upper rail provided on the vehicle body.

In the known state of the art, the lower rails and the upper rails, provided in sliding doors, have a curved structure, and great gap shall be left between the rail and the roller in order for the roller to advance inside the rail in a comfortable manner during the movement of the door. Because of this gap, problem may occur in the slider. Again since the carrier mechanism, where the door is connected to the body and which provides opening and closing of the door, is connected to the door in a single area, the balance of the door weight cannot be provided by the rail.

In literature, the application with number US2004216383A has title "A sliding door mechanism provision tool and method". In said application, in order to move a sliding door of a vehicle between an open position and a closed position, a drive unit is disclosed which provides lifting the hinge mechanism inside a guide rail which is inclined from one end and the ingredient of said structure in order to move the sliding door of a vehicle between an open position and a closed position.

In literature, in another example, the application with number US201108971 has title "A roll assembly for closing by means of sliding in vehicles". In said application, there is a roll assembly for a sliding vehicle door and an elbow fixed to the related sliding vehicle cover and a ball roll fixed to a part in a spaced manner from the related sliding vehicle cover. The ball roll is fixed at the position with respect to the related sliding vehicle cover during opening and

closing. In said application, a mechanism is disclosed which is connected to a rail structure in an inclined manner.

As a result, because of all of the abovementioned problems, an improvement is required in the related technical field.

### **BRIEF DESCRIPTION OF THE INVENTION**

The present invention relates to a rail mechanism, for eliminating the above mentioned disadvantages and for bringing new advantages to the related technical field.

An object of the present invention is to prevent problems like vibration of the roller and noise formation inside a rail during driving of the door by means of preventing gap formation between the rail and the roller thanks to movement of the roller system inside the flat rail for opening and closing the door.

Another object of the present invention is to provide balancing of the door weight by means of connection of the carrier mechanism, which provides opening and closing movement of the door and which provides connection of the door to the vehicle body, to the two edges of the door.

In order to realize all of the abovementioned objects and the objects which are to be deducted from the detailed description below, the present invention relates to a rail mechanism for providing opening and closing of sliding doors in vehicles. Accordingly, the subject matter rail mechanism comprises a primary rail fixed onto the vehicle body, at least one roller positioned inside said primary rail and which provides advancing of the door between an open position and a closed position, a first arm whose one end is connected to the end part of said roller in door opening direction by means of a first hinge and whose other end is connected to the edge of the door in the door closing direction and an extendable second arm whose one end is connected to the end part of said roller in the door closing direction by means of a second hinge and whose other end is connected to the edge of the door in the door opening direction. Thus, the door weight is kept balanced and the door is opened and closed.

In a possible embodiment of the present invention, said primary rail has a flat structure which extends in the direction of the width of the vehicle body. Thus, excessive gap formation

between the primary rail and the roller is prevented and the problems which may occur during sliding of the door are prevented.

5 In a possible embodiment of the present invention, said second arm has a telescopic structure.

10 In a possible embodiment of the present invention, said first arm comprises at least one intermediate hinge for providing separation into at least two parts in order for the door to extend in an opening position and in order for the door to be folded and shortened in a closing position.

15 In a possible embodiment of the present invention, in order to provide a predetermined movement of the door outwardly from the vehicle for opening the door, at least one secondary rail is provided which is connected to the primary rail and which guides the axial movement of the first arm in the part where said first arm is connected to the end of said roller.

20 In a possible embodiment of the present invention, at least one belt is provided which is connected to said first rail in order to prevent entry of dust and similar items into said primary rail. Thus, dust and similar items are prevented from entering into the primary rail.

25 In a possible embodiment of the present invention, in order to provide automatic opening and closing of the door, at least one first drive element is provided which moves at least one second drive element which provides movement to said belt and at least one motor is provided which moves said first drive element. Thus, the door is automatically opened and closed.

### **BRIEF DESCRIPTION OF THE FIGURES**

30 Figure 1 is a representative isometric view of the condition of the rail mechanism, providing opening and closing of the door, on the door where the door is partially open.

Figure 2 is a representative isometric view of the condition of the rail mechanism, providing opening and closing of the door, on the door where the door is completely open.

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Figure 3 is a representative isometric view of the condition of the rail mechanism, providing opening and closing of the door, on the door where the door is closed.

Figure 4 is a representative lateral cross sectional view of the primary rail in the rail mechanism which provides opening and closing of the door.

5 Figure 5a is a representative isometric view of the condition of the rail mechanism, providing opening and closing of the door, on the vehicle body where the door is closed.

Figure 5b is a representative zoomed isometric view of the condition of the rail mechanism, providing opening and closing of the door, on the vehicle body where the door is closed.

10 Figure 6a is a representative isometric view of the condition of the rail mechanism, providing opening and closing of the door, on the vehicle body where the door is partially open.

Figure 6b is a representative zoomed isometric view of the condition of the rail mechanism, providing opening and closing of the door, on the vehicle body where the door is partially  
15 open.

Figure 6c is a representative zoomed isometric view of the part where the first arm is connected to the primary rail and to the secondary rail in the rail mechanism providing opening and closing of the door.  
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Figure 7a is a representative isometric view of the rail mechanism, providing opening and closing of the door, on the vehicle body where the door is completely open.

Figure 7b is a representative zoomed isometric view of the rail mechanism, providing  
25 opening and closing of the door, on the vehicle body where the door is completely open.

Figure 8a is a representative isometric view of the form where motor is provided in order to provide automatic opening of the door, in the rail mechanism providing opening and closing of the door.  
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Figure 8b is a representative zoomed isometric view of the form where motor is provided in order to provide automatic opening of the door, in the rail mechanism providing opening and closing of the door.  
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**DETAILED DESCRIPTION OF THE INVENTION**

In this detailed description, the subject matter rail mechanism (100) is explained with references to examples without forming any restrictive effect only in order to make the subject more understandable.

In Figure 1, a representative isometric view of the condition of the rail mechanism (100), providing opening and closing of the door (10), on the door (10) where the door (10) is partially open is given. The present invention relates to a rail mechanism (100) for providing opening and closing of sliding doors (10) in vehicles. In said rail mechanism (100); there is a primary rail (20) fixed onto the vehicle body (11). The primary rail (20) extends in the direction of the width of the vehicle body (11). There is at least one roller (30), providing advancing of the door (10) between an open position (I) and a closed position (II), positioned in said primary rail (20). There is a first arm (40) connected to the end part of said roller (30) in door (10) opening direction by means of a first hinge (41) and which can realize rotational movement in the axis of said first hinge (41). The other end of said first arm (40) is connected to the edge of the door (10) which is in door (10) closing direction. There is a second arm (50) connected to the end part of said roller (30), which is in door (10) closing direction, by means of a second hinge (51). The other end of said second arm (50) is connected to the edge of the door (10) in the door (10) opening direction. Said second arm (50) has an extendable structure.

In Figure 2 and 3, the representative isometric views of the condition of the rail mechanism (100), providing opening and closing of the door (10), on the door (10) where the door (10) is completely open (I) and where the door (10) is in closed position (II) are given. In said rail mechanism (100), said primary rail (20) connected to the vehicle body (11) has a flat structure. Since said primary rail (20) has a flat structure, gap formation is prevented between said primary rail (20) and the roller (30) provided in said primary rail (20) and which provides advancing of the door (10) between an open position (I) and a closed position (II).

Said first arm (40), provided in said rail mechanism (100), is connected to the end of said roller (30) in the door (10) opening direction by means of a first hinge (41) from one end and connected to the edge of the door (10) in the door (10) closing direction from the other end. Said first arm (40) comprises at least two parts in a manner connected to at least one intermediate hinge (42) which provides rotational movement from a location which is close to the middle point in order to be extended in an opening position of the door (10) and in order to be shortened in a closing position of the door (10).

As can be seen in Figure 6b and 6c, when the door (10) passes to opening position, the first arm (40) advances the door (10) in a manner moving the door (10) at a predetermined distance in the advancing direction outwardly from the vehicle. In order for the first arm (40) to advance the door (10) towards the outside of the vehicle in a specific rotation axis, a secondary rail (60) is provided which is connected to the primary rail (20). Said first arm (40) realizes rotation by following the route of the secondary rail (60) in order to advance the door (10) towards outside of the vehicle at a specific distance.

Said roller (30) is connected to the other end of said second arm (50), connected to the end part thereof in the door (10) closing direction, and to the edge of the door (10) in the door (10) opening direction. Said second arm (50) has a structure which elongates at an open position (I) of the door (10) and which shortens at a closed position (II) of the door (10). Said second arm (50) essentially has a telescopic structure.

In Figure 5a and 5b, the representative isometric views of the condition of the rail mechanism (100), providing opening and closing of the door (10), on the vehicle body (11) where the door (10) is completely closed are given. In order to pass the door (10) to closed position, said roller system (30) is rested to the end part of said primary rail (20) in the door (10) closing direction. In this part, the first arm (40) is folded one above the other through the part where the intermediate hinge (42) is provided and realizes rotation in the door (10) closing direction through the end where the first hinge (41) is provided. At the same time, the second arm (50) which is in telescopic structure is completely shortened and rotates from the end, where the second hinge (51) is provided, in the door (10) opening direction and is positioned in a parallel manner to the primary rail (20). Thus, the door (10) passes to the closed position.

In Figure 7a and 7b, the representative isometric views of the condition of the rail mechanism (100), providing opening and closing of the door (10), on the vehicle body (11) where the door (10) is completely open are given. In order for the door (10) to pass to completely open position, said roller (30) is rested to the end part of the door (10) opening direction of said primary rail (20). In this part, the first arm (40) realizes rotation and extends in the door (10) opening direction by means of the first hinge (41) and the intermediate hinge (42). At the same time, the second arm (50), having telescopic structure, completely extends and the door (10) passes to completely open position.

In a possible embodiment of the present invention, in order to provide automatic opening and closing of the door (10), there is at least one motor (70) in the rail mechanism (100). As can be seen in Figure 8a and 8b, a motor (70) is connected to the end part of the primary rail

(20). There is at least one first drive element (71) which is driven by said motor (70). The first drive element (71) which moves by means of operation of the motor (70) transfers movement to at least one belt (80) by means of at least one second drive element (81). Said belt (80) provides movement to said roller (30). Since the roller (30) moves automatically inside the primary rail (20), the door (10) is automatically opened and closed.

The belt (80), provided in said rail mechanism (100), also prevents dust entry into the primary rail (20). Therefore, there may be belt (80) in the rail mechanism (100) of non-automatic doors (10).

Thanks to said embodiment, the door (10) weight is kept balanced by the rail mechanism (100). Moreover, thanks to the primary rail (20) structure which is in flat structure, excessive gap formation for the movement of the roller system (30) inside the primary rail (20) is prevented and the problems which occur during movement of the door are prevented.

The protection scope of the present invention is set forth in the annexed claims and cannot be restricted to the illustrative disclosures given above, under the detailed description. It is because a person skilled in the relevant art can obviously produce similar embodiments under the light of the foregoing disclosures, without departing from the main principles of the present invention.

**REFERENCE NUMBERS**

- 100.** Rail mechanism
  - 10.** Door
  - 5 **11.** Vehicle body
  - 20.** Primary rail
  - 30.** Roller
  - 40.** First arm
    - 41.** First hinge
    - 10 **42.** Intermediate hinge
  - 50.** Second arm
    - 51.** Second hinge
  - 60.** Secondary rail
  
  - 15 **(I)** Open position
  - (II)** Closed position
  
  - 70.** Motor
    - 71.** First drive element
  - 20 **80.** Belt
    - 81.** Second drive element

**CLAIMS**

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1. A rail mechanism (100) in order to provide opening and closing of sliding doors (10) in vehicles, characterized by comprising a primary rail (20) fixed onto the vehicle body (11), at least one roller (30) positioned inside said primary rail (20) and which provides advancing of the door (10) between an open position (I) and a closed position (II), a first arm (40) whose one end is connected to the end part of said roller (30) in door (10) opening direction by means of a first hinge (41) and whose other end is connected to the edge of the door (10) in the door (10) closing direction and an extendable second arm (50) whose one end is connected to the end part of said roller (30) in the door (10) closing direction by means of a second hinge (51) and whose other end is connected to the edge of the door (10) in the door (10) opening direction.
2. A rail mechanism (100) according to claim 1, wherein said primary rail (20) has a flat structure which extends in the direction of the width of the vehicle body (11).
3. A rail mechanism (100) according to claim 1, wherein said second arm (50) has a telescopic structure.
4. A rail mechanism (100) according to claim 1, wherein said first arm (40) comprises at least one intermediate hinge (42) for providing separation into at least two parts in order for the door (10) to extend in an opening position (I) and in order for the door to be folded and shortened in a closing position (II).
5. A rail mechanism (100) according to claim 1 or 4, wherein in order to provide a predetermined movement of the door (10) outwardly from the vehicle for opening the door (10), at least one secondary rail (60) is provided which is connected to the primary rail (20) and which guides the axial movement of the first arm (40) in the part where said first arm (40) is connected to the end of said roller (30).
6. A rail mechanism (100) according to claim 1, wherein at least one belt (80) is provided which is connected to said first rail (20) in order to prevent entry of dust and similar items into said primary rail (20).
7. A rail mechanism (100) according to claim 1 or 6, wherein in order to provide automatic opening and closing of the door (10), at least one first drive element (71) is provided which moves at least one second drive element (81) which provides

movement to said belt (80) and at least one motor (70) is provided which moves said first drive element (71).

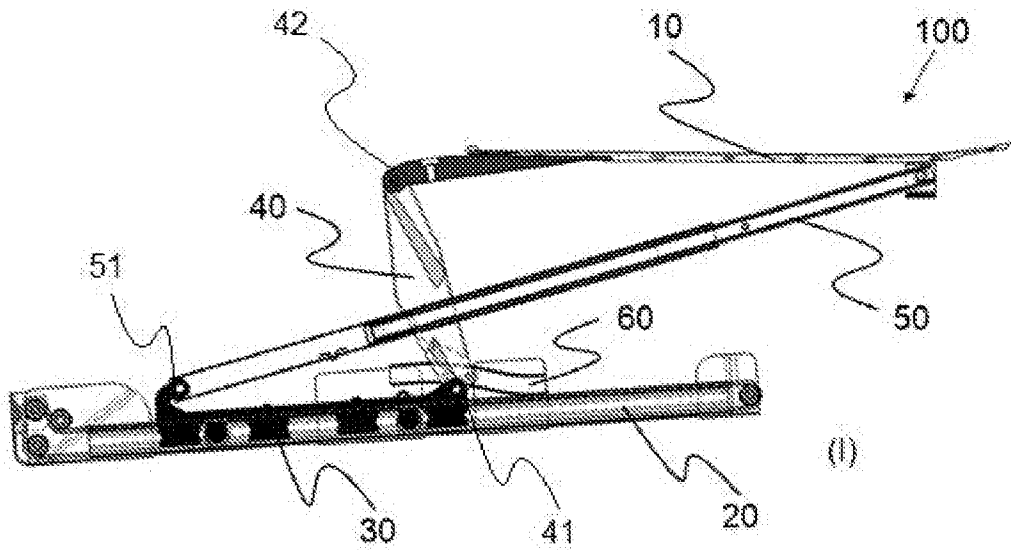


Figure 1

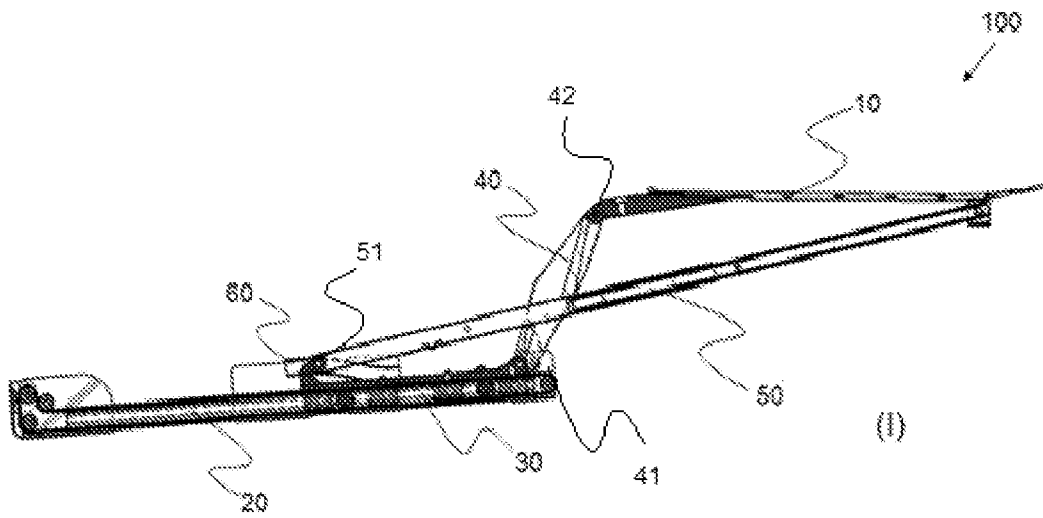


Figure 2

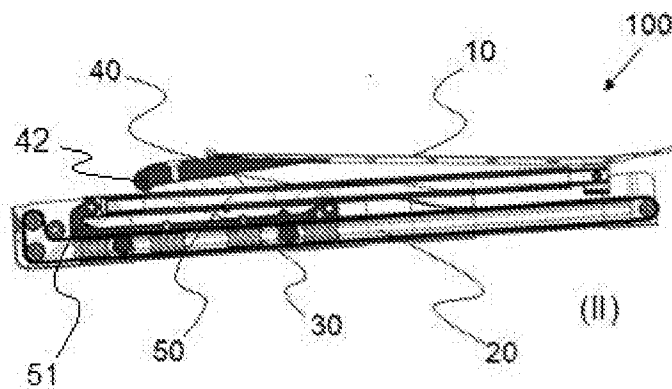


Figure 3

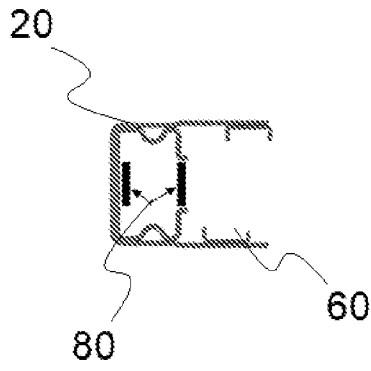


Figure 4

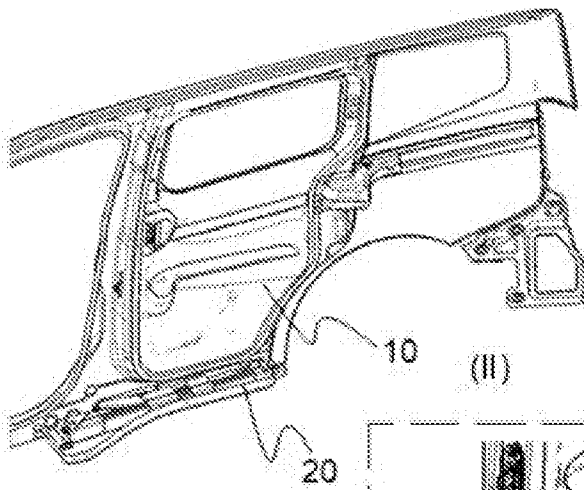


Figure 5a

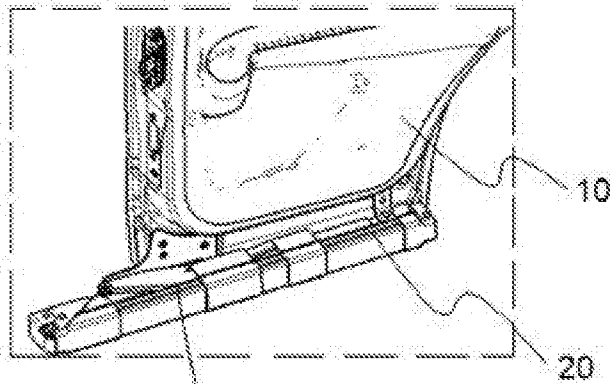


Figure 5b

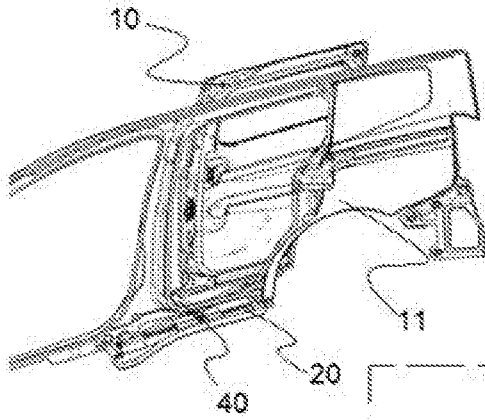


Figure 6a

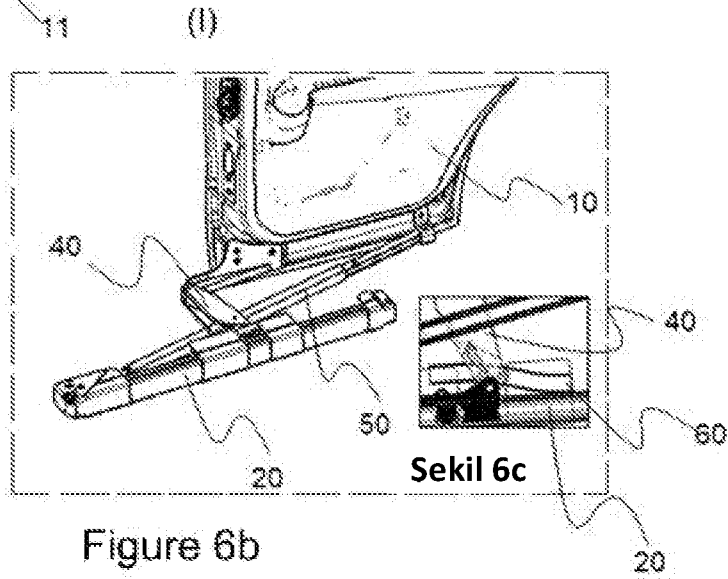


Figure 6b

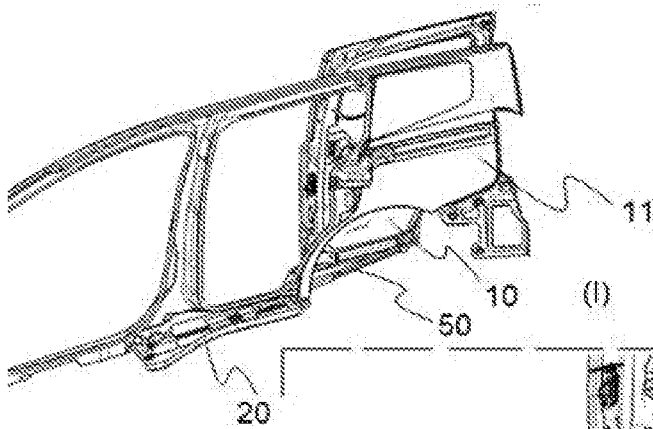


Figure 7a

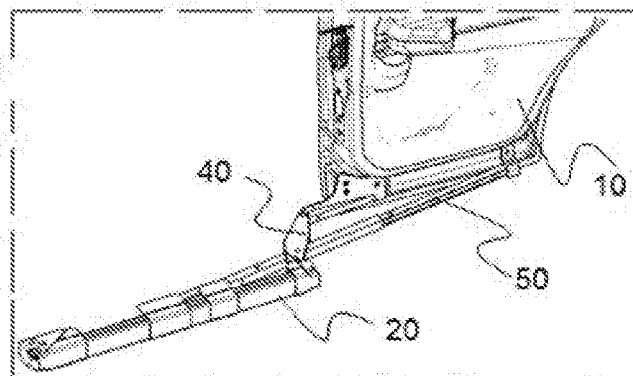


Figure 7b

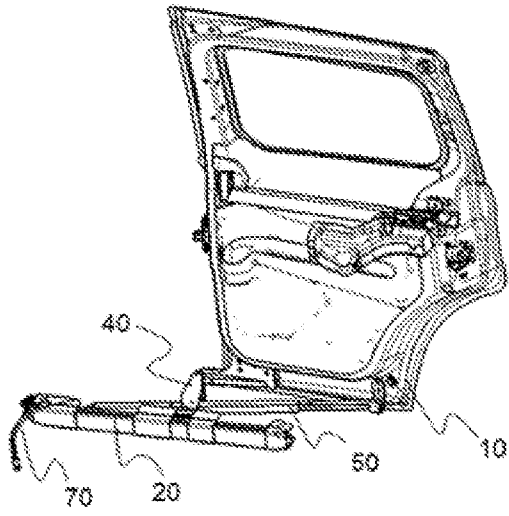


Figure 8a

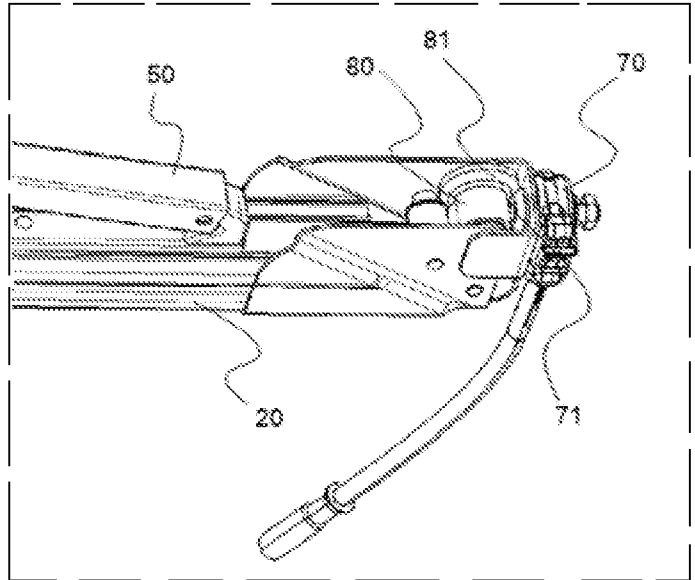


Figure 8b

## INTERNATIONAL SEARCH REPORT

International application No.

**PCT/TR2018/050419**

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
B60J 5/06 (2006.01)i		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) B60J		
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 practicable, search terms used) WPI, Epodoc		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A Y	WO 2017003562 A1 (FCA US LLC [US]) 05 January 2017 (2017-01-05) the whole document	1-4 5 6-7
Y	US 2018087304 A1 (NIO USA INC [US]) 29 March 2018 (2018-03-29) paragraphs 19,27,37-38,47	6-7
A	US 6036257 A (GEN MOTORS CORP [US]) 14 March 2000 (2000-03-14) the whole document	1-7
A	US 2010127530 A1 (FORD GLOBAL TECHNOLOGIES, LLC) 27 May 2010 (2010-05-27) the whole document	1-7
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
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Date of the actual completion of the international search <b>09 October 2019</b>		Date of mailing of the international search report <b>09 October 2019</b>
Name and mailing address of the ISA/TR <b>Turkish Patent and Trademark Office (Turkpatent) Hipodrom Caddesi No. 115 06560 Yenimahalle Ankara Turkey</b> Telephone No. (90-312) 303 11 82 Facsimile No. +903123031220		Authorized officer  <b>Burak Altındal</b>  Telephone No.

**INTERNATIONAL SEARCH REPORT**  
**Information on patent family members**

International application No. <b>PCT/TR2018/050419</b>
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				CN 107849882 A	27 March 2018
				EP 3317483 A1	09 May 2018
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