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(54) Sliding door

(57) The invention relates to a sliding door arrangement, especially for a vehicle, with a door 5 which is adapted for being opened by a sliding movement and a pivoting movement. According to the invention, a sliding locking unit 1 is provided for locking the sliding movement of the door 5 during the pivoting movement of the door 5 and/or a pivoting locking unit 2 is provided for locking the pivoting movement of the door 5 during the sliding movement of the door 5. This is advantageous since the sliding door allows a secure opening of the door 5 during the sliding movement and the pivoting movement of the door 5.

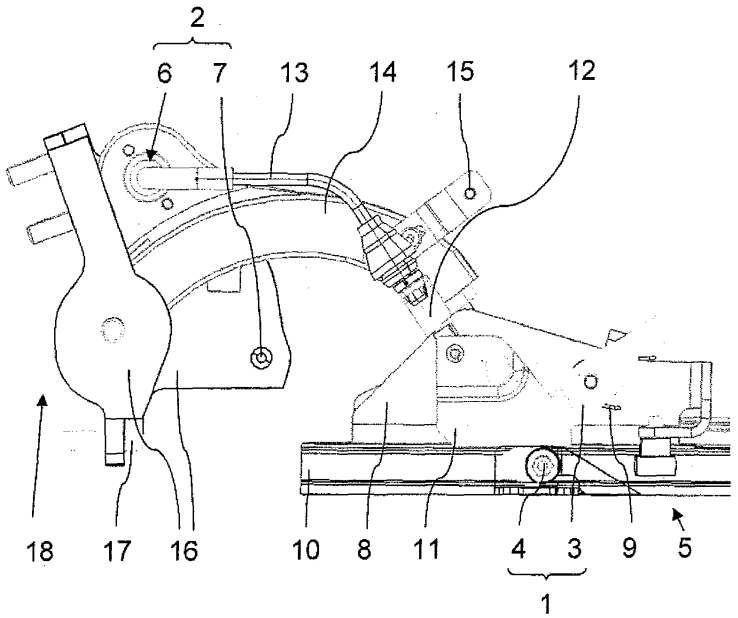

FIG. 1

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Description

[0001] The invention relates to a sliding door arrangement, especially for a vehicle, with a door which is adapted for being opened by a sliding movement and a pivoting movement.

[0002] Sliding doors are well known for use in vehicles, such as automotive vehicles, and allow door operation in a narrow parking space or when the automotive vehicle is parked closely to an object. They provide improved ingress/egress through a door opening to an occupant comPartment of the automotive vehicle. Sliding doors are used in luxury cars as well as in medium sized vehicles.

[0003] From US 6,183,039 a pivot and slide door system for an automotive vehicle is known that includes a door adapted to be supposed in a door opening of a vehicle body. The pivot and slide door system also includes a pivot assembly attached to the vehicle body and cooperating with the door to pivot the door from a closed position to a pivot position. The pivot and slide door system further includes a slide assembly cooperating with the pivot assembly to slide the door from the pivot position to an open position.

[0004] However, the slide door system described in US 6,183,009 and other prior art arrangements do not allow for a reliable operation, given that the door moves both in a lateral and longitudinal direction during door opening. Especially the transition from the lateral to the longitudinal direction of door movement is difficult and has not been successfully engineered in prior art.

[0005] It is the object of the invention to provide a sliding door which allows for a secure opening of the door.

[0006] This object is achieved by a sliding door arrangement, especially for a vehicle, with a door which is adapted for being opened by a sliding movement and a pivoting movement **characterized in that** a sliding locking unit is provided for locking the sliding movement of the door during the pivoting movement of the door and/or a pivoting locking unit is provided for locking the pivoting movement of the door during the sliding movement of the door. This means that during the sliding movement of the door the pivoting movement of the door is locked and/or during the pivoting movement of the door the sliding movement of the door is locked.

[0007] Such a sliding door arrangement allows a very secure door opening, wherein the movement of the sliding door is well guided in its lateral and longitudinal direction, respectively. Another advantage of the present invention is that the sliding door improves ease of operation of the door and is not dependent on door size. A further advantage of the present invention is that the sliding door can have a manual or powered operation. Yet another advantage of the present invention is that the sliding door can be used with the same door opening and seal as current hinge mounted doors. This is especially advantageous in case of a rail is mounted on the inside of a door since this improves design and optics of the vehicle by avoiding a visible rail on the vehicle body.

[0008] According to a preferred embodiment of the invention, the sliding locking unit is adapted for positively locking a first connecting means and a second connecting means. This way, the sliding movement of the door is positively locked during the pivoting movement of the door between a first connecting means and a second connecting means.

[0009] In general, the first connecting means and/or the second connecting means can be provided in any positively locking form. However, according to a preferred embodiment of the invention, the first connecting means is provided as a hook and the second connecting means is provided as a roller, wherein the hook is adapted for hooking into or releasing the roller, respectively. In other words, the hook and the roller provide a positive locking when the hook hooks into the roller. This locks the sliding movement of the door during the pivoting movement of the door.

[0010] In a further preferred embodiment of the invention, the pivoting locking unit is adapted for positively locking a third connecting means and a fourth connecting means. This means that during the sliding movement of the door the pivoting movement of the door is locked positively by the third connecting means and by the fourth connecting means.

[0011] In general, the third connecting means and the fourth connecting means can be provided as any positively locking means. However, according to a preferred embodiment of the invention, the third connecting means is provided as a pin and the fourth connecting means is provided as a hole, wherein the pin is adapted for being inserted into or for being released out of the whole, respectively. Hence, the pin and the hole provide positive locking when the pin is inserted into the hole.

[0012] According to another preferred embodiment of the invention, a trolley and a rail are provided, wherein the rail is fixed to the door and the trolley is attached slidably to the rail for enabling the sliding movement of the door. Preferably, the rail is mounted on the middle of the door, so that additional rails and trolleys can be provided for supporting the sliding movement of the door, wherein the additional rails and trolleys are preferably mounted on the top and/or the bottom of the door. This is advantageous since mounting the rail on the door, instead on the body, improves design and optics of the vehicle. In addition, a door stop system can be provided to stop the sliding movement of the door when the trolley reaches the end of the rail.

[0013] According to a further preferred embodiment of the invention, a pivoting arm and an arm support are provided, wherein the arm support is attached to the body, the pivoting arm is attached pivotably to the arm support and the pivoting arm is attached pivotably to the trolley for enabling the pivoting movement of the door. In this way, and preferably in combination with an additional rail and an additional trolley, the door can perform the pivoting movement. It is further preferred that the pivoting arm

is attached pivotably to the arm support and the pivoting arm is attached pivotably to the trolley by means of a hinge or a joint.

[0014] According to another preferred embodiment of the invention, the hook is attached pivotably to the trolley, and the roller is attached to the door. Preferably, the hook is attached to the trolley by means of, for example, a bull bearing.

[0015] It is further preferred that, according to another embodiment of the invention, a hook spring is provided for loading the hook with spring load for automatically pivoting the hook towards the roller to hook into the roller. This means, as the roller is attached to the door that the hook hooks automatically into the roller once the door, respectively the roller, has been slided close enough to the hook.

[0016] According to another preferred embodiment of the invention, the pin is attached to the pivoting arm, and the hole is provided in the arm support. This means, as the pivoting arm is attached pivotably to the arm support, that the pin is inserted into the hole once the pivoting arm is pivoted into a respective position relative to the arm support. Preferably the pin is inserted into the hole once the pivoting movement during the opening of the door has been finished. This means, that by inserting the pin into the hole, the pivoting movement of the door is lockable.

[0017] In a further preferred embodiment of the invention, a rotation part is attached pivotably to the trolley for inserting and/or releasing the pin, respectively, and a rotation part spring is provided for loading the rotation part with a spring load for pivoting the rotation part to insert the pin, wherein the rotation part is adapted for being pivoted by the roller to release the pin. In other words, the sliding movement of the door, to which the roller is attached, pivots the rotation part, which then releases the pin. This also means that the pin is loaded with spring load by the rotation part for inserting the pin into the hole once the pivoting arm has reached a respective position relative to the arm support.

[0018] According to another preferred embodiment of the invention, a Bowden cable is provided between the rotation part and the pin. Further, a Bowden cable housing is preferred for housing the Bowden cable between the rotation part and the pin. This way, the Bowden cable inserts and/or releases the pin once the rotation part is pivoted by the roller.

[0019] According to a further preferred embodiment of the invention, a releaser is provided that is attached to the pivoting arm for releasing the hook. Thus, the hook that is hookable into the roller, can be released by a pivoting movement of the pivoting arm. Preferably, the releaser is provided for example as a bold, a pin or a spike. It is further preferred that the releaser releases the hook at the end of the pivoting movement of the door during opening.

[0020] Further, and according to another preferred embodiment of the invention, the roller is adapted to the door in such a manner that, during the end of the sliding movement of the door, the roller pivots the rotation part to release the pin. This means that at the end of the sliding movement of the door, during which the pivoting movement of the door is locked, the roller releases the pin so that the pivoting movement of the door becomes unlocked and the hook hooks into the roller and locks the sliding movement of the door.

[0021] These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

[0022] In the drawings:

Fig. 1 depicts a part of the sliding door according to a preferred embodiment of the invention in a schematic view,

Fig. 2 depicts the part of the sliding door during a pivoting movement,

Fig. 3 depicts the part of the sliding door at the end of the pivoting movement,

Fig. 4 depicts the part of the sliding door during a sliding movement, and

Fig. 5 depicts another part of the sliding door in a schematic view.

[0023] From Fig. 1 part of a sliding door according to a preferred embodiment of the invention can be seen in a schematic view. The sliding door comprises a sliding locking unit 1 and a pivoting locking unit 2. The sliding locking unit 1 is provided as a hook 3 and as a roller 4, wherein the hook 3 is adapted for hooking into or releasing the roller 4, respectively. The hook 3 and the roller 4 provide positive locking. The sliding locking unit 1, as depicted in Fig. 1, locks a sliding movement of a door 5 during a pivoting movement of the door 5 by hooking the hook 3 into the roller 4.

[0024] The pivoting locking unit 2 comprises a pin 6, as indicated, and a hole 7, wherein the pin 6 and the hole 7 provide positive locking when the pin 6 is inserted into the hole 7. The pivoting locking unit 2 locks the pivoting movement of the door 5 during the sliding movement of the door 5.

[0025] The hook 3 is attached pivotably to a trolley 8. A hook spring 9 is provided for loading the hook 3 with spring load for automatically pivoting the hook 3 towards the roller 4 to hook into the roller 4, as depicted in Fig. 1. The trolley 8 is attached slidably to a rail 10, which is attached to the door 5.

[0026] Further, a rotation part 11 is attached pivotably to the trolley 8. A Bowden cable 12 is provided in a cable housing 13 between the pin 6 and the rotation part 11, wherein the cable housing 13 is provided for guiding the pin 6 as well. In this way, the rotation part 11 can insert or release the pin 6, respectively, when being pivoted by

the roller 4. As shown in Fig. 1, the roller 4 pivoted the rotation part 11 in such a manner that the pin 6 is released.

[0027] A pivoting arm 14 is attached pivotably to the trolley 8. A releaser 15 is attached to the pivoting arm 14 for releasing the hook 3. The pivoting arm 14 is furthermore attached pivotably to an arm support 16. The hole 7 is provided in the arm support 16. The arm support 16 further provides a stopper 17 to stop the pivoting movement of the pivoting arm 14 at the end of the pivoting movement of the door 5 when opening the door 5. The arm support 16 is attached to a body 18 of a vehicle.

[0028] While Fig. 1 depicts the door 5 in a closed position, Fig. 2 depicts the door 5 during the pivoting movement. As can be seen from Fig. 2, the door 5 is still locked by the hook 3, which is hooked into the roller 4, for the sliding movement.

[0029] At the end of the pivoting movement during opening of the door 5, the pivoting arm 14 is stopped by the stopper 17, as depicted in Fig. 3., and the releaser 15 releases the hook 3, so that roller 4 is not hooked any more by the hook 3 to enable the sliding movement of the door 5.

[0030] This way, the door 5 can perform the sliding movement, as depicted in Fig. 4. This also means, as the roller 4 has slid away from the rotation part 11, that the rotation part 11 pivots, as it is loaded with spring load, so that the pin 6 is inserted into the hole 7. In this way, the pivoting movement of the door 5 becomes locked, while the sliding movement of the door 5 is still possible.

[0031] Fig. 5 depicts the sliding door in another schematic view from the inside of the vehicle. In addition to the trolley 8 and the rail 10, an additional lower rail 19 and an additional lower trolley mechanism 20 are provided. The additional lower rail 19 and the additional lower trolley mechanism 20 support the guiding of the door 5 during the opening of the door 5.

[0032] While the invention has been illustrated and described in detail in the drawings and foregoing description, such illustration and description are to be considered illustrative or exemplary and not restrictive; the invention is not limited to the disclosed embodiments.

[0033] Other variations to the disclosed embodiments can be understood and effected by those skilled in the art in practising the claimed invention, from a study of the drawings, the disclosure, and the appended claims. In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "are" or "an" does exclude a plurality. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures can not be used to advantage. In reference signs in the claims should not be construed as limiting the scope.

Claims

1. Sliding door arrangement, especially for a vehicle, with a door (5) which is adapted for being opened by a sliding movement and a pivoting movement, **characterized in that**
   a sliding locking unit (1) is provided for locking the sliding movement of the door (5) during the pivoting movement of the door (5) and/or
   a pivoting locking unit (2) is provided for locking the pivoting movement of the door (5) during the sliding movement of the door (5).

2. Sliding door arrangement according to claim 1, **characterized in that** the sliding locking unit (1) is adapted for positively locking a first connecting means and a second connecting means.

3. Sliding door arrangement according to claim 2, **characterized in that** the first connecting means is provided as a hook (3) and the second connecting means is provided as a roller (4), wherein the hook (3) is adapted for hooking into or releasing the roller (4), respectively.

4. Sliding door arrangement according to any of claims 1 to 3, **characterized in that** the pivoting locking unit (2) is adapted for positively locking a third connecting means and a fourth connecting means.

5. Sliding door arrangement according to claim 4, **characterized in that** the third connecting means is provided as a pin (6) and the fourth connecting means is provided as a hole (7), wherein the pin (6) is adapted for being inserted into or for being released out of the hole (7), respectively.

6. Sliding door arrangement according to any of claims 1 to 5, **characterized in that** a trolley (8) and a rail (10) are provided, wherein the rail (10) is fixed to the door (5) and the trolley (8) is attached slidably to the rail (10) for enabling the sliding movement of the door (5).

7. Sliding door arrangement according to any of claims I to 6, **characterized in that** a pivoting arm (14) and an arm support (16) are provided, wherein the arm support (16) is attached to a body, especially to a vehicle body, the pivoting arm (14) is attached pivotably to the arm support (16) and the pivoting arm (14) is attached pivotably to the trolley (8) for enabling the pivoting movement of the door (5).

8. Sliding door arrangement according to any of claims 3 to 7, **characterized in that** the hook (3) is attached pivotably to the trolley (8), and the roller (4) is attached to the door (5).

9. Sliding door arrangement according to any of the claims 3 to 8, **characterized in that** a hook spring (9) is provided for loading the hook (3) a with spring load for automatically pivoting the hook (3) towards the roller (4) to hook into the roller (4).

10. Sliding door arrangement according to any of claims 5 to 9, **characterized in that** the pin (6) is attached to the pivoting arm (16), and the hole (7) is provided in the arm support (16).

11. Sliding door arrangement according to any of claims 5 to 10, **characterized in that** a rotation part (11) is attached pivotably to the trolley (8) for inserting and/or releasing the pin (6), respectively, and a rotation part spring is provided for loading the rotation part (11) with a spring load for pivoting the rotation part (11) to insert the pin (6), wherein the rotation part (11) is adapted for being pivoted by roller (4) to release the pin (6).

12. Sliding door arrangement according to any of claims 5 or 11, **characterized in that** a Bowden cable (12) is provided between the rotation part (11) and the pin (6).

13. Sliding door arrangement according to any of claims 5 to 12, **characterized in that** a releaser (15) is provided that is attached to the pivoting arm (14) for releasing the hook (3).

14. Sliding door arrangement according to any of claims 5 to 13, **characterized in that** the roller (4) is adapted to the door (5) in such a manner that during the end of the sliding movement of the door (5) the roller (4) pivotes the rotation part (11) to release the pin (6).

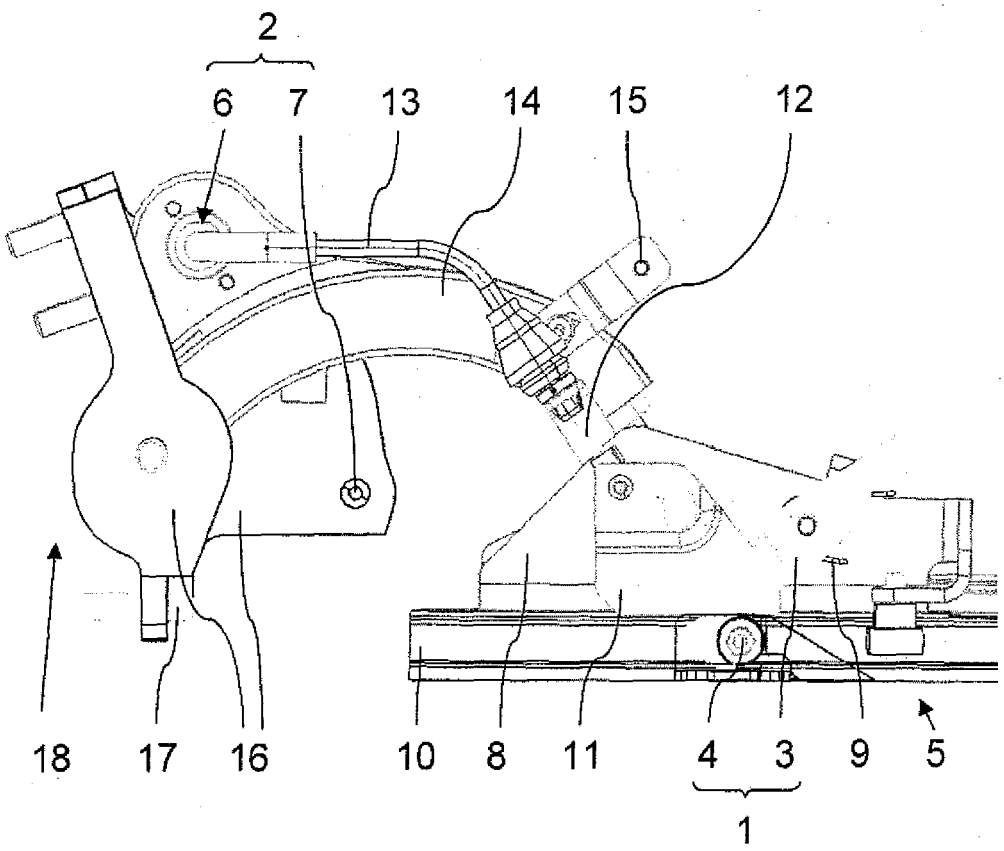

FIG. 1

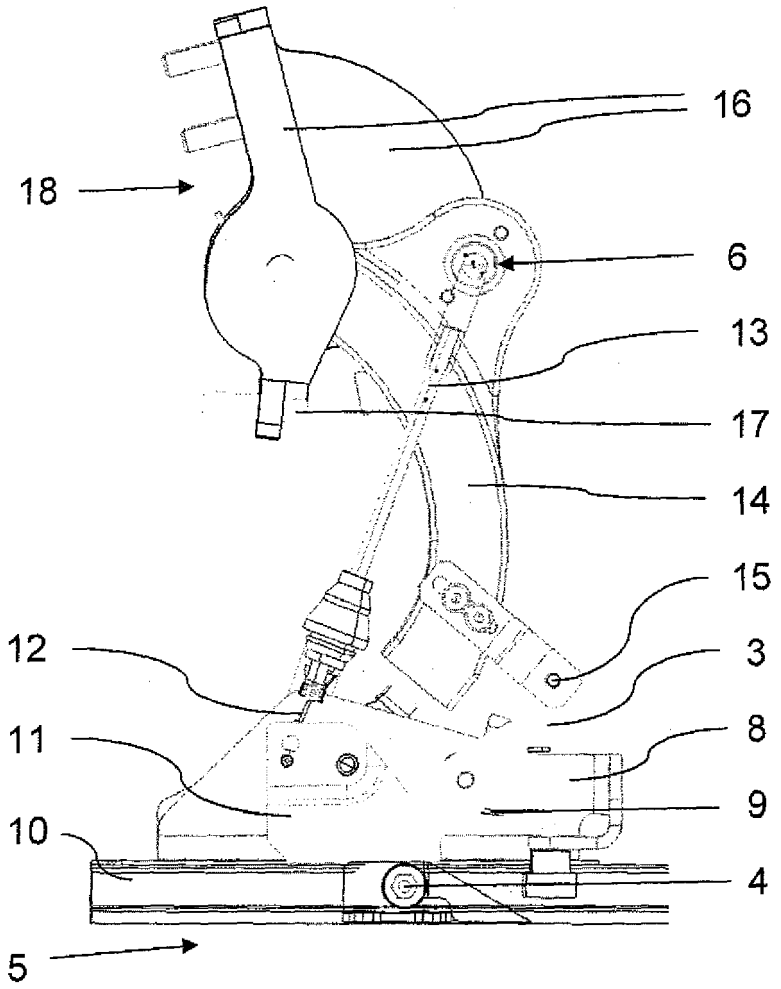

FIG. 2

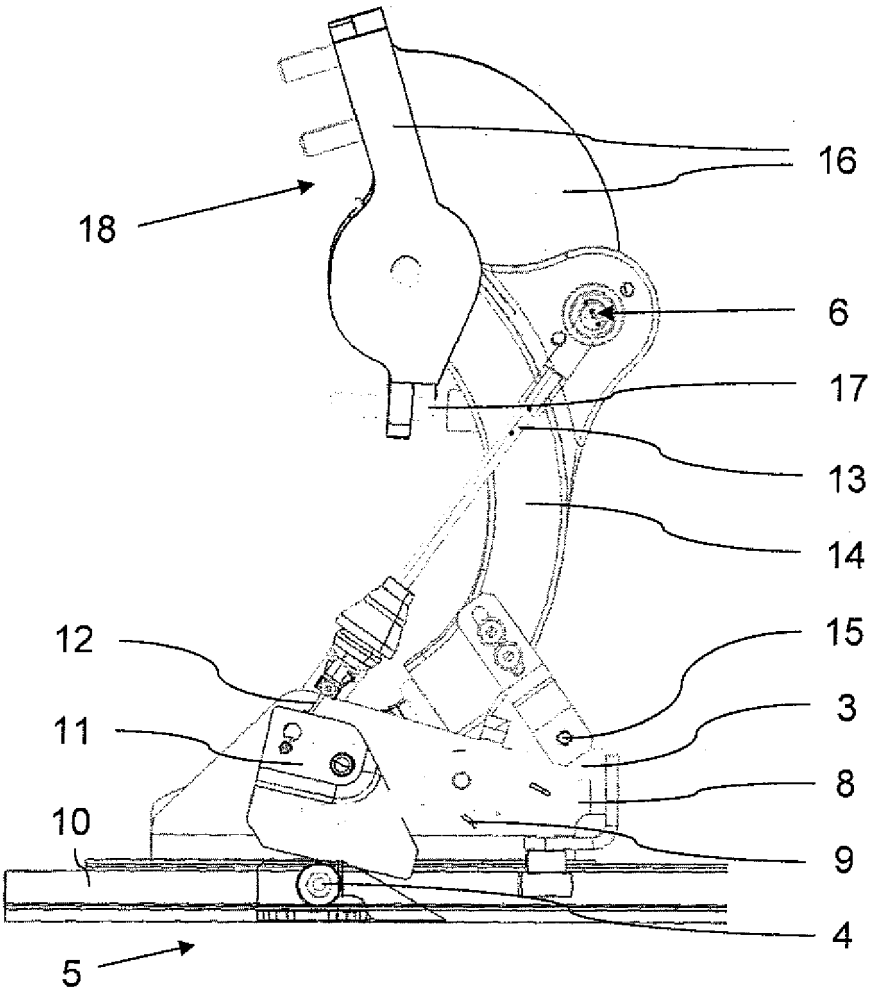

FIG. 3

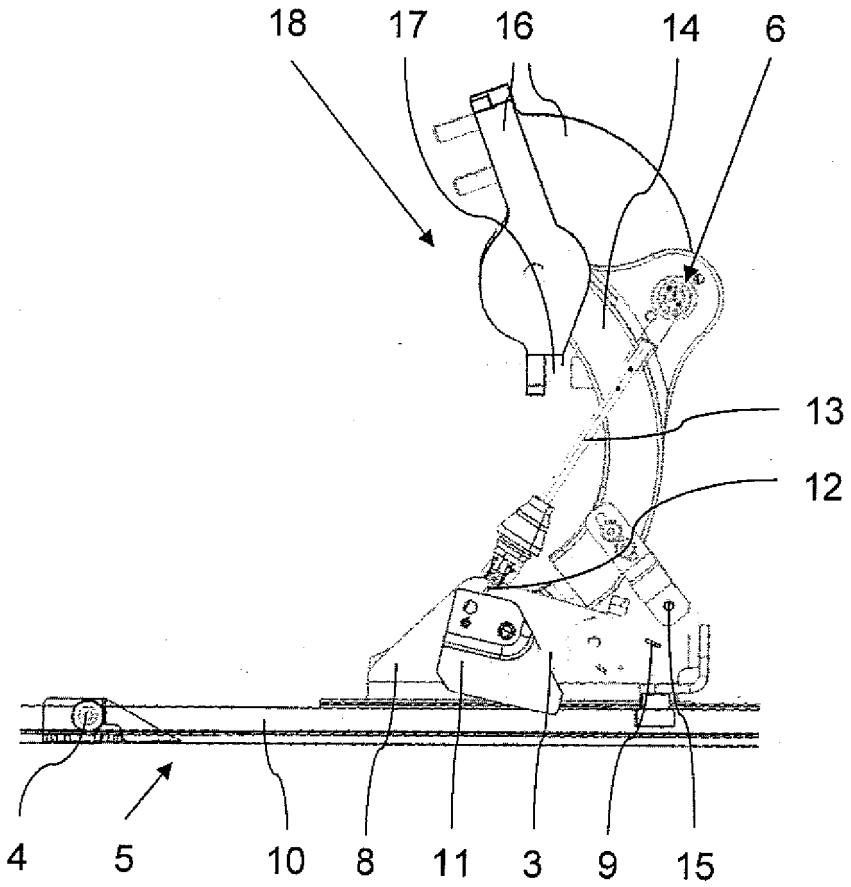

FIG. 4

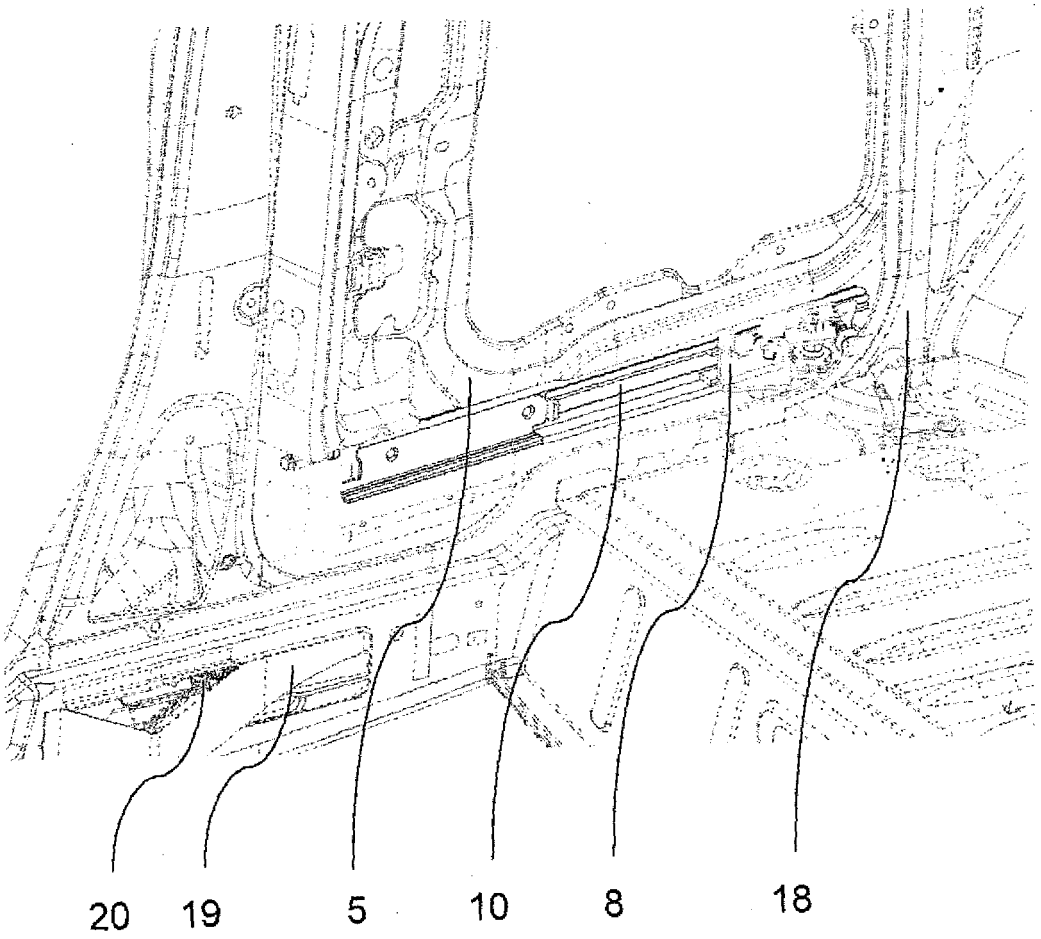

FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 08 15 5216

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 788 177 A (PEUGEOT CITROEN AUTOMOBILES SA [FR]) 23 May 2007 (2007-05-23)	1-7,10	INV. E05D15/10
A	* paragraphs [0069] - [0080], [0094] - [0104]; figures 6,8 *	11,12,14	
X	FR 2 891 569 A (PEUGEOT CITROEN AUTOMOBILES SA [FR]) 6 April 2007 (2007-04-06) * page 7, line 12 - page 9, line 28; figure 5 *	1-7,10	
X	DE 298 19 083 U1 (LUNKE & SOHN AG [DE]) 18 February 1999 (1999-02-18)	1,2,4-7	
A	* page 9, lines 27-32; figures *	13	
A	US 6 036 257 A (MANUEL MARK [US]) 14 March 2000 (2000-03-14)	11,12	

TECHNICAL FIELDS SEARCHED (IPC)

E05D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	11 September 2008	Witasse-Moreau, C

CATEGORY OF CITED DOCUMENTS

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1788177 A	23-05-2007	FR 2893544 A1	25-05-2007
FR 2891569 A	06-04-2007	NONE	
DE 29819083 U1	18-02-1999	NONE	
US 6036257 A	14-03-2000	NONE	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 6183039 A **[0003]**
- US 6183009 B **[0004]**