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(54) A SLIDING DOOR ASSEMBLY

SCHIEBETÜRANORDNUNG

ENSEMBLE DE PORTE COULISSANTE

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Description

Technical Field

[0001] This invention relates to improvements for the enhancement of the strength of a sliding door under high loads.

Background of Art

[0002] In the present state of art, the doors of motor vehicles are opened and closed by means of rotation around a vertical or a horizontal axis or a sliding movement along a horizontal line. The latter type of doors are called sliding doors. A sliding door assembly basically consists of tracks at three different levels (upper, middle, lower), casters moving forward and backward in these tracks, brackets on the door and the body, and a lock. Similar applications are disclosed in GB2367849, FR2658762 or US4569553.

[0003] However, sliding doors may be dangerous when they are disconnected from the body under major forces. In order to solve this problem, wedge, hood and/or pins are attached at certain positions on the door and the body. It aims at providing the required strength by means of both pins and hooks before the door is disconnected from the body under load. On the other hand, these solutions are costly in terms of engineering and manufacturing; and are not aesthetic.

[0004] Furthermore these designs do not perform as required in burst tests. Under normal conditions, the rollers move on the tracks by means of the guide members. During the test, upper and lower roller mechanisms leave the track at a load of 7 kN and only the lock prevents the door from disconnecting from the body. In further steps of the test, the flanges on the corners are opened, resulting in deformation of the door. Due to the deformation on the upper track, the door bends and the roller disconnects from the track transmitting the entire load onto the lower track and the middle lock. As the load increases, at 17,8 kN the roller arm is bent and slid out thereof. Consequently, the door is deformed in the middle part and disconnected from the body.

[0005] In order to prevent such deformations, several solutions have been offered in the prior art. For example in EP0102053 (Fig. 5, no. 16) and US4582357 (Fig. 4, no. 20) tracks having a cornered C cross are disclosed. In the same European Patent document (Fig, 7, no. 38) and US 4560197 (Fig. 4, no.14) the track is strengthened by using a second layer of material. However this second layer of material does not cover the entire profile of the track but only a certain part thereof. In addition to this, US4560197 discloses an obstruction part having a vertical wall being added on the roller arm (Fig 5, no.19). However this part is preferably used to prevent the separation of the door from the body by standing on a second vertical wall on the track rather than increasing the mechanical strength of the arm.

[0006] FR2656259 discloses a sliding door assembly for a vehicle comprising a track fixed to the vehicle body and an arm attached to the door. As seen in Figs. 3 and 4, the arm 13 carries a pivotable support trolley 12 which slides in the track 20 to guide the movement of the door. The support trolley 12 comprises a roller 30 and a caster 32. The orientation of the roller 30 is maintained with respect to the track 20 by means of a rudder 16, 18. Any lateral loads on the support trolley are exerted on the caster 32 which is guided by lateral walls 37 of the track 20.

Brief Disclosure of Invention

[0007] The object of this invention is to provide a sliding door comprising assemblies which do not get separated from the body even under high loads.

[0008] Another object of this invention is to manufacture a sliding door, which is not deformed or unlocked under high loads.

[0009] Another object of this invention is to make the sliding door burglar proof.

[0010] According to the invention there is provided a sliding door used in motor vehicles comprising

- a door sliding between a closed position and an open position on the door opening of a vehicle body,
- at least one arm fixed onto the door,
- at least one track fixable onto the vehicle body, the track having a C-shaped cross

section and walls on the side where the arm fits into, and providing movement of the door along the track by means of a guide member which comprises at least one roller and at least one caster on the edge of said arm fitting into the track from the side with walls and moving in the track, whereby at least two legs extend from the arm towards the floor and ceiling of the track and separation of the arm from the track is prevented by engagement of the legs with the walls. The legs extending towards the floor and the ceiling of the guide member in addition to the casters and rollers moving inside the track transfer the load applied to the door to the tracks and the body in an efficient manner. These legs are preferably four in number and standing against each other symmetrically.

[0011] The tracks have a cornered C-shaped cross section and comprise walls at the side where the arm enters in. Moreover for the further enhancement of the strength at the edge parts, the track thickness may be increased and produced as a double-layer with a support member having the same profile. In another embodiment of the invention, a support member is added to the edge of the track, which will be subjected to load when the door is closed.

[0012] By adding a support member to the arms, the torsional force occurring during the load on the arm is eliminated and the sliding of the arm is prevented from being slid away.

Detailed Disclosure of Invention

[0013] The sliding door assembly realized in order to attain above mentioned objects of the present invention has been illustrated in the attached drawings, wherein;

Figure 1 is an exploded perspective view of the upper assembly.
Figure 2 is a perspective view of the upper assembly.
Figure 3 is a cross sectional view of the upper assembly.
Figure 4 is an exploded perspective view of the lower assembly.
Figure 5 is a perspective view of the lower assembly.
Figure 6 is another perspective view of the lower assembly.
Figure 7a is A-A cross sectional view of the upper assembly.
Figure 7b is B-B cross sectional view of the upper assembly.
Figure 8 is a perspective view of the reference system by which the invention is disclosed.
Figure 9 is a perspective view of the mounted form of the invention.

[0014] The components shown in the figures have been enumerated as below;

10. Sliding door assembly
11. Door
20. Upper assembly
21. Track
22. Wall
23. Arm
24. Caster
25. Roller
26. Leg
27. Support member
28. Head piece
29. Guide member
30. Lower assembly
31. Track
33. Arm
34. Caster
36. Leg
37. Support member
38. Arm support member
39. Guide member

[0015] The sliding door assembly (10) which is the subject of this invention is used in motor vehicles and comprises

- a door (11) sliding between a closed position and an open position over the door opening of a vehicle body,
- at least one arm (23 and 33) fixed to the door,
- at least one track (21 and 31) fixable to the vehicle body, the track having a C-shaped cross section and walls (22) on the side where the arm fits into and providing the movement of the door along the track by means of a guide member (29) comprising at least one roller (25) and at least one caster (24 and 34) on the edge of said arm (23 and 33) fitting into the track from the side with walls (22) and moving (in s-direction) in the track (21 and 31), whereby at least two legs (26 and 36) extend from the arm towards the floor and ceiling of the track (Figure 1 and 4).

[0016] The sliding door moves between an open position, in which it stands away from the door opening in the vehicle, and a closed position, in which it closes the door opening completely. The direction of the movement between these two positions is determined by the tracks (21 and 31) under, above and/or in the middle of the body and extending in s-direction through the door opening.

[0017] The track and the door are connected via guide members (29). The guide member (29) comprises an arm (23) in an elbow shape extending towards the guide member (in y-s plane) by rotating through approximately 90° from the door plane, casters and rollers at the edge of this arm moving inside the track. The basic function of the caster and rollers is to transfer the load on the door to the body by means of the tracks and reduce friction occurring during this movement. In a preferred embodiment of the invention, in addition to the rollers and casters, legs projecting from (parallel to x-y axis) the arms and standing on the floor and ceiling of the tracks are utilized for the better transfer of the load. In order to distribute the load efficiently, there are four legs on the left and right side of the arm extending symmetrically upwards or downwards. Furthermore, projections parallel to the floor or ceiling (parallel to y-s axis) are added to the edge of the leg for increasing the contact surface between the leg and the track and reducing the pressure on the contact surface.

[0018] The embodiment of this invention on the upper track is seen in Figures 1-3. In these figures, the strength of the track is enhanced by the addition of a support member (27) having the same cross section to a part of the track which is loaded in the closed position. In order to provide movement of the door which is compatible with the shape of the track, a loose head piece rotating around a vertical axis is added to the arm, and the rollers and legs are attached to the arm via this loose head piece.

[0019] The embodiment of the invention on the lower track is seen in Figure 4. In this embodiment two legs (34) are employed. The surfaces of the legs parallel to the ceiling of the track do not need to be extended. The support member (37) added to the track has an L-shaped profile. Due to the structural features in the lower track, it is recessed deeper and the arm is elongated towards the side part. Therefore the so-called arm is supported by a support member (38).

[0020] The sliding door, which is the subject of this invention is not disconnected from the body even under

high load and deformed accordingly thanks to the above described improvements. As the casters do not slide out of the track and locks are not opened, the security of the vehicle is ensured. Therefore the strength of the vehicle is increased economically without any changes on its kinematics' functions.

Claims

1. A motor vehicle sliding door (20) comprising:

   - a door (11) sliding between a closed position and an open position on the door opening of a vehicle body,
   - at least one arm (23) fixed onto the door,
   - at least one track (21) fixable onto the vehicle body, the track having a C-shaped cross section and walls (22) on the side where the arm fits into, and providing movement of the door along the track by means of a guide member (29) which comprises at least one roller (25) and at least one caster (24) on the edge of said arm (23) fitting into the track from the side with walls (22) and moving in the track (21), whereby at least two legs (26) extend from the arm towards the floor and ceiling of the track and separation of the arm from the track is prevented by engagement of the legs (26) with the walls (22).

2. A sliding door (20) as defined in Claim 1 **characterized by** a guide member comprising projections at the edge of the leg parallel to the floor or the ceiling of the track.

3. A sliding door as defined in any of the Claims above **characterized by** a track (21) being covered by a support member (27) having the same profile.

4. A sliding door as defined in Claim 1 or 2 **characterized by** a track (21) comprising a support member (27) added to an edge, which is subjected to the load when the door is in closed position.

5. A sliding door as defined in any of the Claims above **characterized by** four legs (26) extending from the arm towards the floor or ceiling of the track.

Patentansprüche

1. Schiebetür (20) für ein Kraftfahrzeug, umfassend:

   - eine Tür (11), die zwischen einer geschlossenen Stellung und einer geöffneten Stellung an der Türöffnung eines Fahrzeugaufbaus verschiebbar ist,
   - wenigstens einen an der Tür befestigten Arm (23),
   - wenigstens eine Schiene (21), die an dem Fahrzeugaufbau befestigbar ist, wobei die Schiene einen C-förmigen Querschnitt und Wände (22) auf der Seite, auf der der Arm eingepasst ist, aufweist, und die eine Bewegung der Tür entlang der Schiene mit Hilfe eines Führungselements (29) bereitstellt, das wenigstens eine Walze (25) und wenigstens eine Lenkrolle (24) am Rand des Arms (23) umfasst, die von der Seite mit den Wänden (22) aus in die Schiene passt und sich in der Schiene (21) bewegt, wodurch sich wenigstens zwei Beine (26) von dem Arm zu dem Boden und der Decke der Schiene erstrecken und eine Trennung des Arms von der Schiene durch einen Eingriff der Beine (26) mit den Wänden (22) verhindert wird.

2. Schiebetür (20) nach Anspruch 1, **gekennzeichnet durch** ein Führungselement, das an dem Rand des Beins Vorsprünge umfasst, die parallel zu dem Boden oder der Decke der Schiene verlaufen.

3. Schiebetür nach einem der vorhergehenden Ansprüche, **gekennzeichnet durch** eine Schiene (21), die von einem Halteelement (27) abgedeckt ist, das das gleiche Profil aufweist.

4. Schiebetür nach Anspruch 1 oder 2, **gekennzeichnet durch** eine Schiene (21), die ein an den Rand angefügtes Halteelement (27) umfasst, das einer Last ausgesetzt ist, wenn sich die Tür in der geschlossenen Stellung befindet.

5. Schiebetür nach einem der vorhergehenden Ansprüche, **gekennzeichnet durch** vier Beine (26), die sich von dem Arm zu dem Boden oder der Decke der Schiene erstrecken.

Revendications

1. Porte coulissante (20) de véhicule automobile comprenant :

   - une porte (11) coulissant entre une position fermée et une position ouverte sur l'ouverture de porte d'une carrosserie de véhicule,
   - au moins un bras (23) fixé sur la porte,
   - au moins un chemin de roulement (21) pouvant être fixé sur la carrosserie du véhicule, le chemin de roulement ayant une section transversale en forme de C et des parois (22) du côté où s'emboîte le bras, et assurant le déplacement de la porte le long du chemin de roulement au moyen d'un élément de guidage (29) qui comprend au moins un galet (25) et au moins une roulette (24) sur le bord dudit bras (23) s'emboîtant dans le

chemin de roulement depuis le côté avec des parois (22) et se déplaçant dans le chemin de roulement (21), moyennant quoi au moins deux pattes (26) s'étendent depuis le bras vers le sol et le plafond du chemin de roulement et l'entrée en prise des pattes (26) avec les parois (22) empêche le bras de se séparer du chemin de roulement.

2. Porte coulissante (20) selon la revendication 1, **caractérisée par** un élément de guidage comprenant des saillies au niveau du bord de la patte parallèle au sol ou au plafond du chemin de roulement.

3. Porte coulissante selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le chemin de roulement (21) est couvert par un élément de support (27) présentant le même profil.

4. Porte coulissante selon la revendication 1 ou 2, **caractérisée en ce que** le chemin de roulement (21) comprend un élément de support (27) ajouté à un bord et qui est soumis à la charge quand la porte est en position fermée.

5. Porte coulissante selon l'une quelconque des revendications précédentes, **caractérisée en ce que** quatre pattes (26) s'étendent depuis le bras vers le sol et le plafond du chemin de roulement.

Figure 1

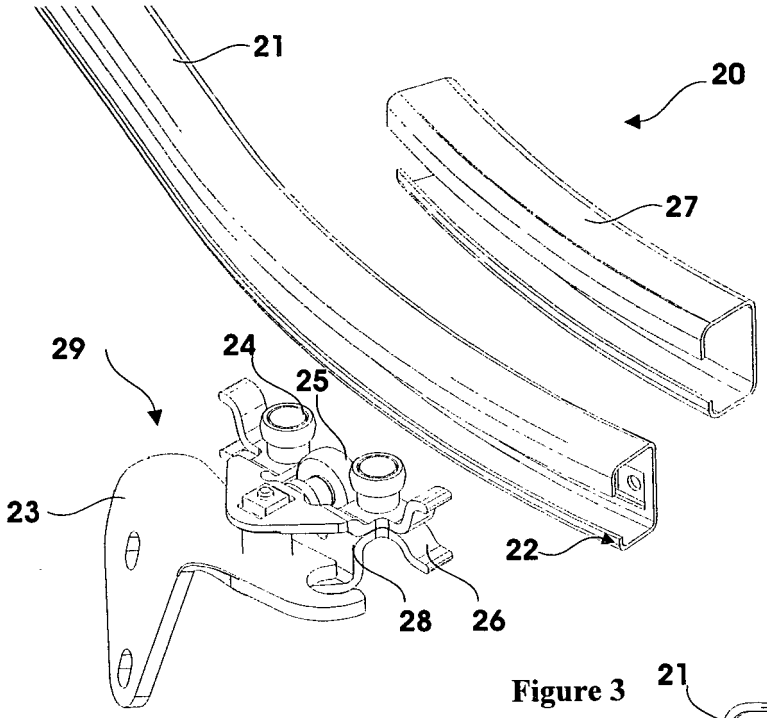


Figure 3

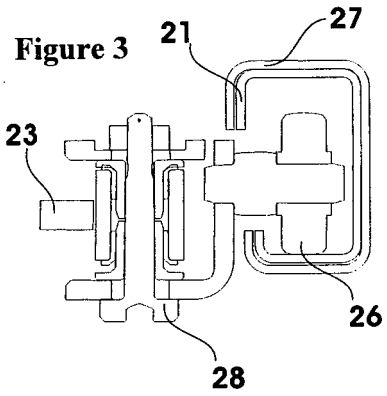


Figure 2

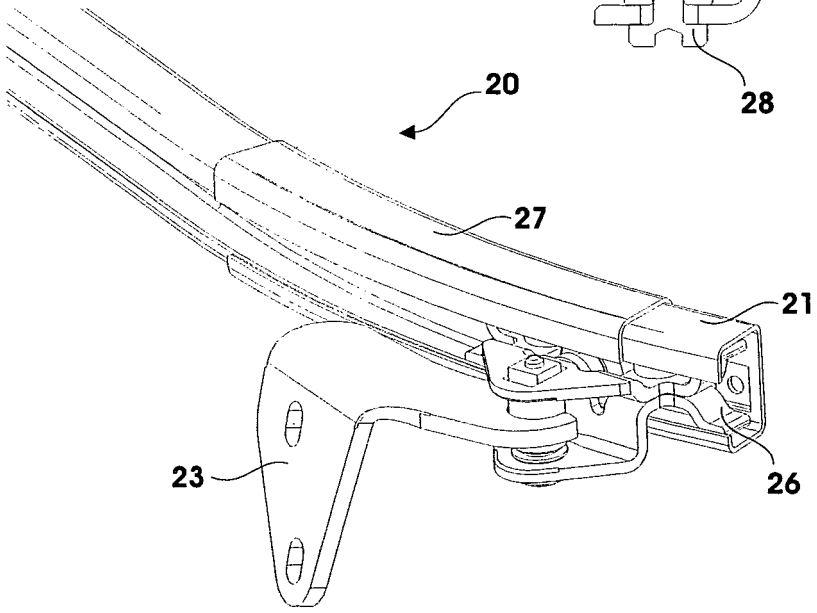


Figure 4

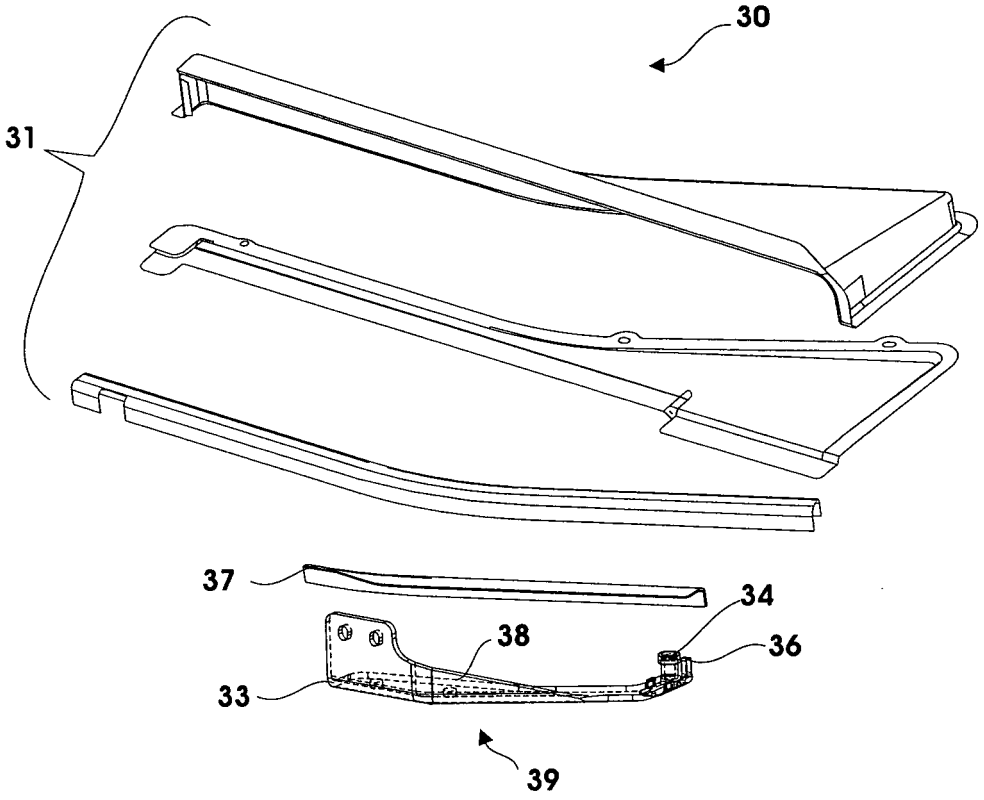


Figure 5

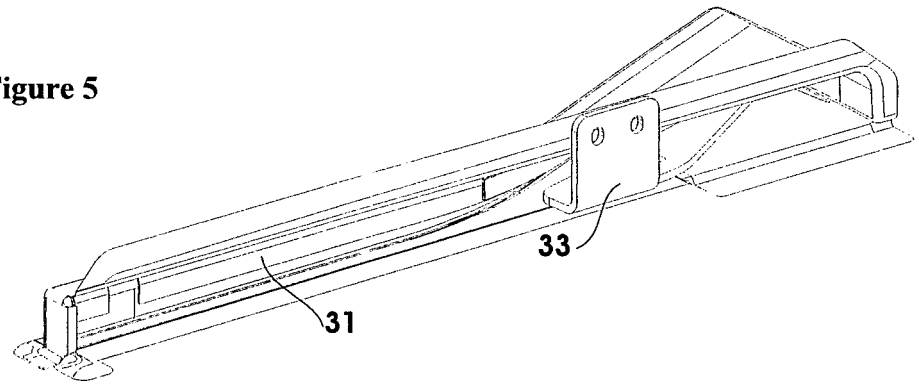


Figure 6

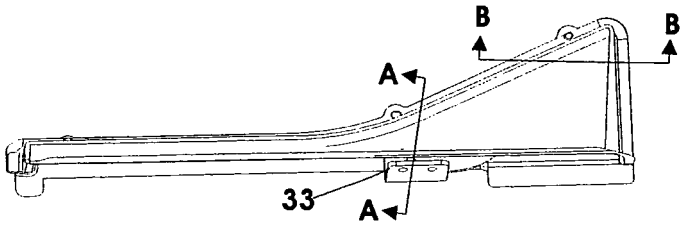


Figure 7a

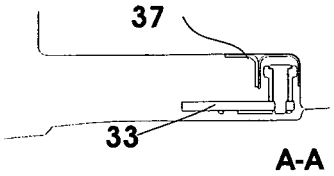


Figure 7b

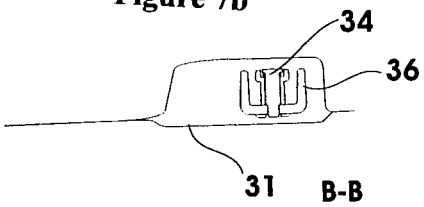


Figure 8

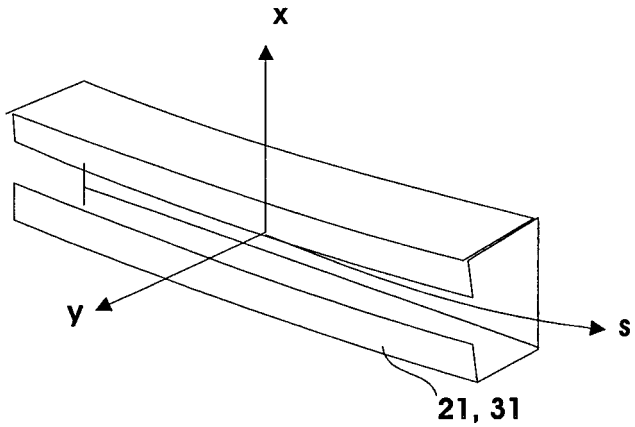
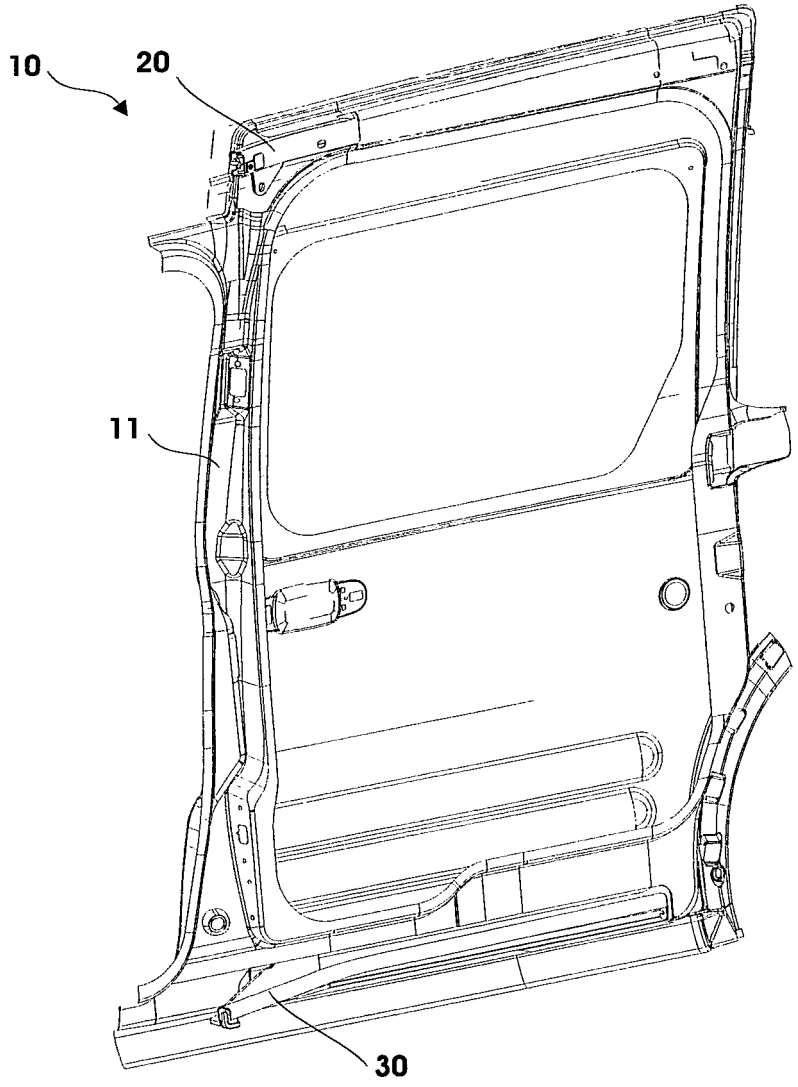


Figure 9



REFERENCES CITED IN THE DESCRIPTION

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