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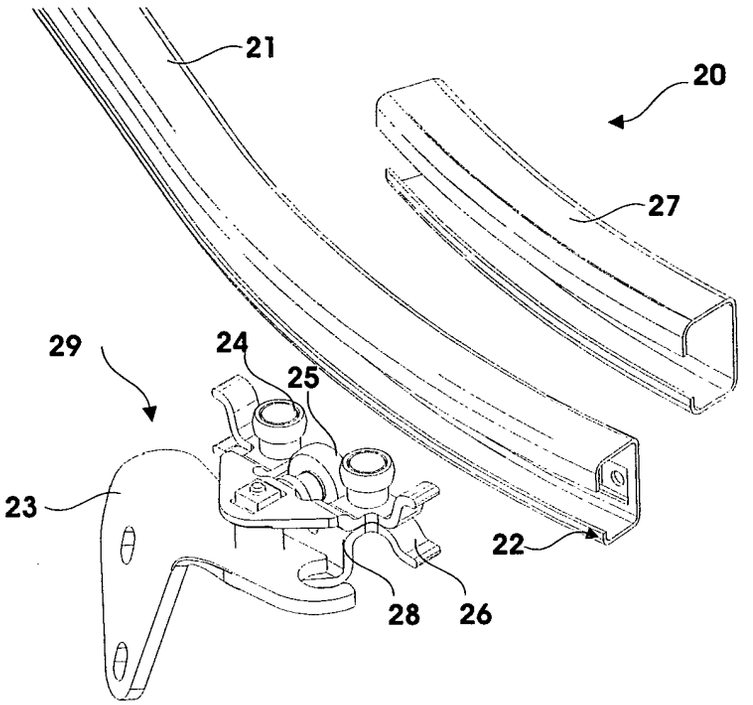
(54) A sliding door assembly

(57) This invention relates to the improvements for the enhancement of the strength of the sliding door under high loads. In addition to the casters (24) and rollers (25) moving in the track (21), legs (26) standing on the floor and ceiling of the track (21) are added to the assembly for efficient transfer of the load on the door to the body via the tracks.

Figure 1



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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-shaped cross section 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 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.

Brief Disclosure of Invention

[0006] 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.

[0007] Another object of this invention is to manufacture a sliding door, which is not deformed or unlocked under high loads.

[0008] One object of this invention is to make the sliding door burglar proof.

[0009] In order to attain the objects of this invention, legs leaning against the floor and the ceiling of the guide member have been added in addition to the casters moving inside the track and rollers to the assembly for the transfer of the load applied to the door to the tracks and the body in an efficient manner respectively. These legs are preferably four in number and standing against each other symmetrically.

[0010] 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 strength at the edge parts, the track thickness is increased and produced as a double-layer using a support member having the same profile. In another embodiment of the invention, a support member is added to the part of the track which will be subjected to load when the door is closed.

[0011] By adding a support member to the arms, the torsional force occurring during loading of the arm is eliminated and the sliding of the arm is prevented from being slid away.

Detailed Disclosure of Invention

[0012] 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.

[0013] 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

[0014] The sliding door assembly (10) which is the subject of this invention preferably used in motor vehicles comprises

- a door (11) sliding between a closed position and an open position over the door opening on the vehicle body,
- at least one arm (23 and 33) fixed to the door,
- at least one track (21 and 31) fixed to the body,

an arm providing the movement of the door along the track and a guide member (29) comprising at least one roller (25) and at least one caster (24 and 34) on the edge of the so-called arm (23 and 33) and moving (in s-direction) in the so-called track (21 and 31), characterized with at least one leg (26 and 36) standing on the floor or ceiling of the track (Figure 1 and 4).

[0015] 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.

[0016] 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.

[0017] 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.

[0018] 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).

[0019] 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 sliding door (20) preferably used in motor vehicles comprising

- a door (11) sliding between a closed position and an open position over the door opening on the vehicle body,
- at least one arm (23 and 33) fixed to the door,
- at least one track (21 and 31) fixed to the body, and

providing the movement of the door along the track for a guide member (29) which comprises at least one roller (25) and at least one caster (24 and 34) on the edge of the arm (23 and 33) and moving (in s-direction) in the so-called track (21 and 31), **characterized** with at least one leg (26 and 36) extend-

ing from the arm and standing on the floor or ceiling of the track.

2. A sliding door (20) according to Claim 1, **characterized** with 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 according to any of the preceding Claims, **characterized** with tracks (21) comprising walls (22) on the side where the arm fits into.

4. A sliding door according to any of the preceding Claims, **characterized** with a track (21) being covered by a support member (27) having the same profile.

5. A sliding door according to any of Claims 1-3, **characterized** with a track (21) comprising a support member (27) added to a part, which is subjected to load when the door is in the closed position.

6. A sliding door according to any of the preceding Claims, **characterized** with an arm (33) comprising a support member (38).

Figure 1

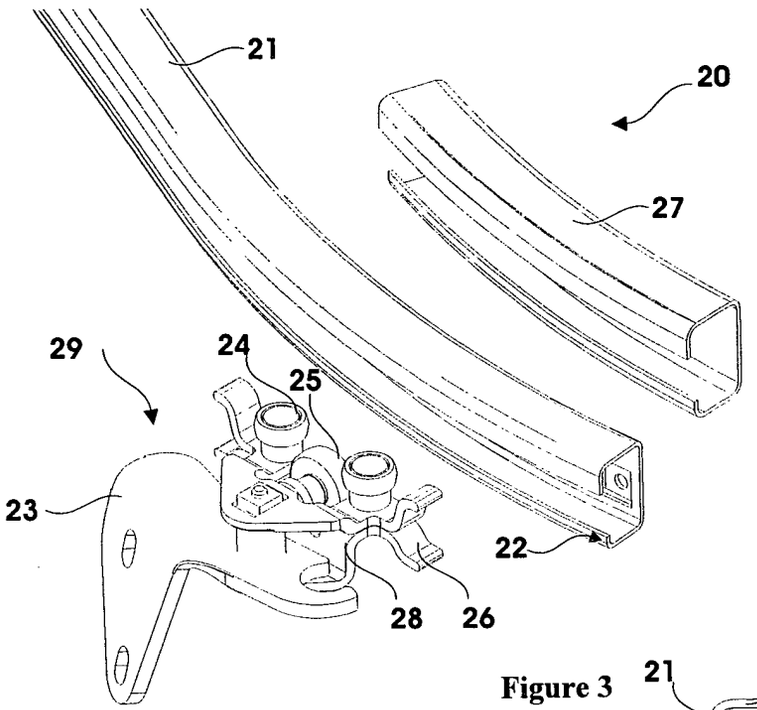


Figure 3

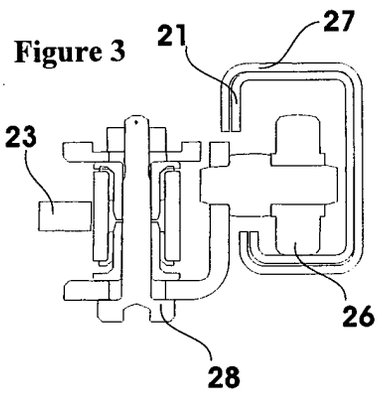


Figure 2

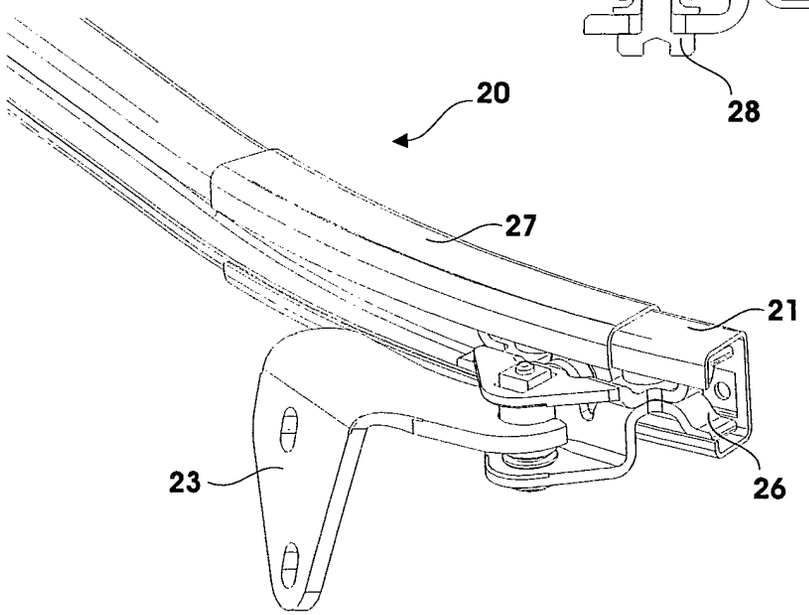


Figure 4

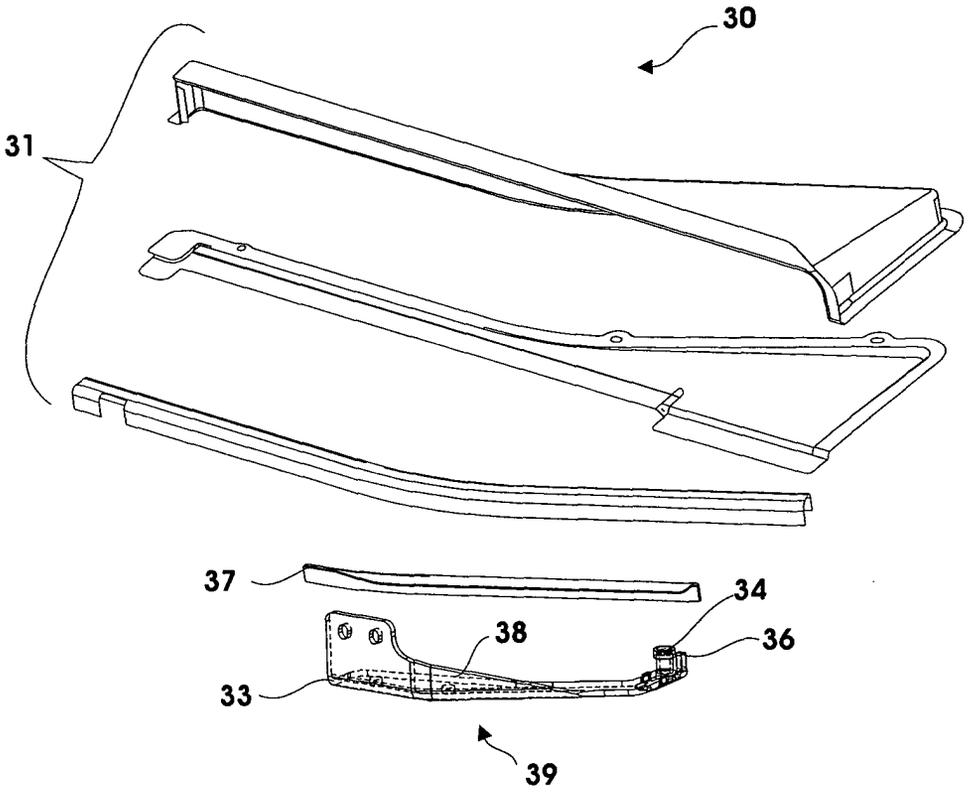


Figure 5

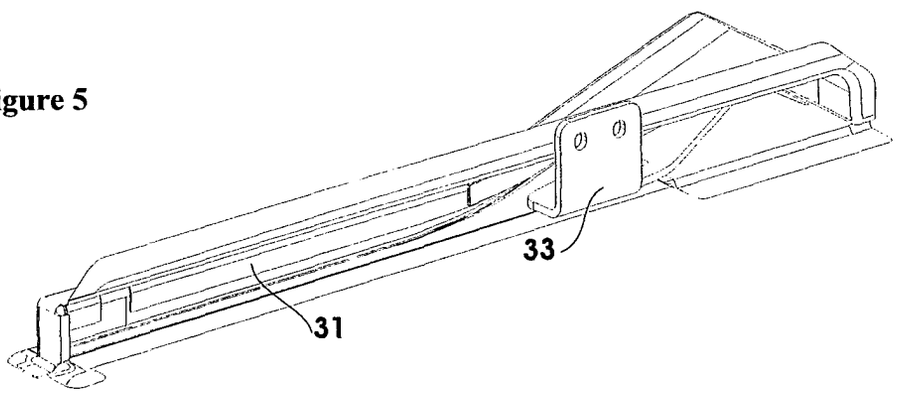


Figure 6

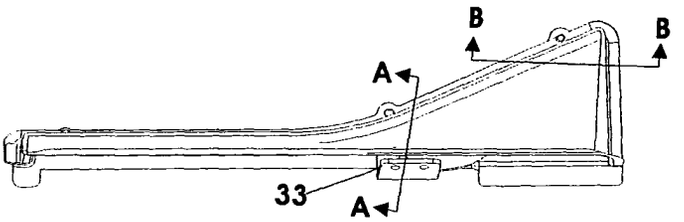


Figure 7a

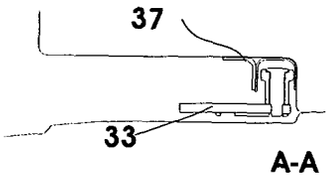


Figure 7b

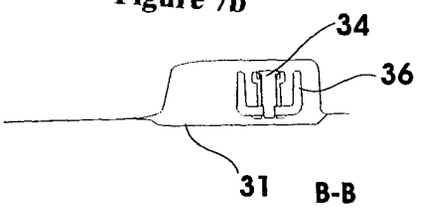


Figure 8

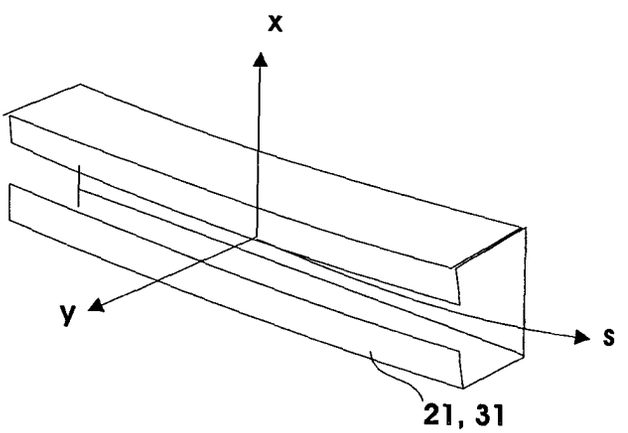
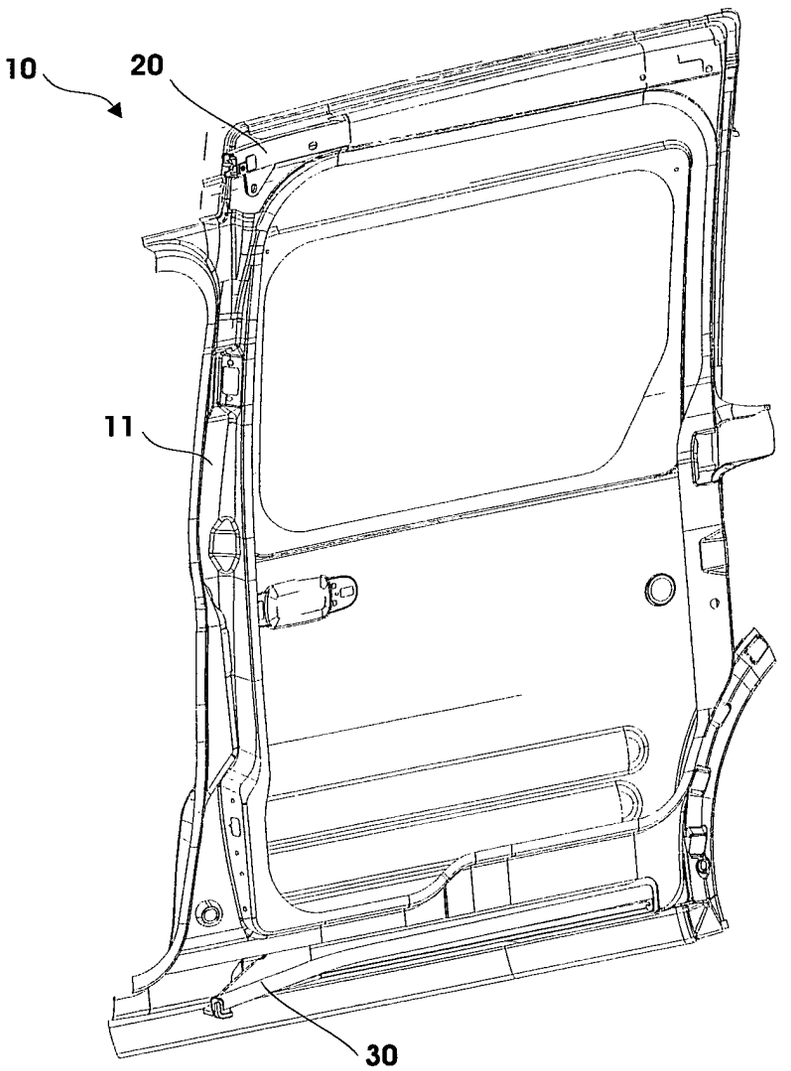


Figure 9



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EUROPEAN SEARCH REPORT

Application Number
EP 04 07 5526

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X Y	FR 2 656 259 A (FIAT AUTO SPA) 28 June 1991 (1991-06-28) * page 4, line 3 - line 15 * * page 4, line 32 - page 5, line 13 * * figures 1-4 * ---	1-3,6 4,5	E05D15/06 E05D15/10
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D,Y	US 4 560 197 A (MINAMI TATSUO) 24 December 1985 (1985-12-24) * column 2, line 30 - line 34 * * figures 3,4,7 * -----	4,5	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

E05D
B60J

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 June 2004	Mund, A

CATEGORY OF CITED DOCUMENTS

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