

[54] **GUIDE MECHANISM FOR SLIDING DOORS FOR MOTOR VEHICLES** 3,233,657 2/1966 Kirby ..... 16/97 X

[75] Inventor: **Ernst Maneck**, Tappenbeck, Germany

**FOREIGN PATENTS OR APPLICATIONS**

814,863 6/1969 Canada ..... 49/215

[73] Assignee: **Volkswagenwerk Aktiengesellschaft**, Wolfsburg, Germany

*Primary Examiner*—Kenneth Downey  
*Attorney, Agent, or Firm*—Ernest F. Marmorek

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[57] **ABSTRACT**

[30] **Foreign Application Priority Data**

June 22, 1973 Germany ..... 2331843

[52] U.S. Cl. .... **49/215; 49/221**

[51] Int. Cl.<sup>2</sup> ..... **E05D 15/10**

[58] Field of Search ..... 49/213-216, 49/218, 221, 223, 225; 16/97

A guide mechanism for a sliding door for a motor vehicle such as a van. The guiding mechanism is characterized in that it includes a roller carriage along which the door slides. An element of a synthetic material or a plastic holds three sides of a rail which forms a bearing for the axle of a roller. This element acoustically and mechanically insulates the axle from other metal parts of the guide mechanism. This in turn will reduce the noise which is usually generated when the door is opened or closed.

[56] **References Cited**

**UNITED STATES PATENTS**

3,100,667 8/1963 Schwenk ..... 49/214

**7 Claims, 4 Drawing Figures**

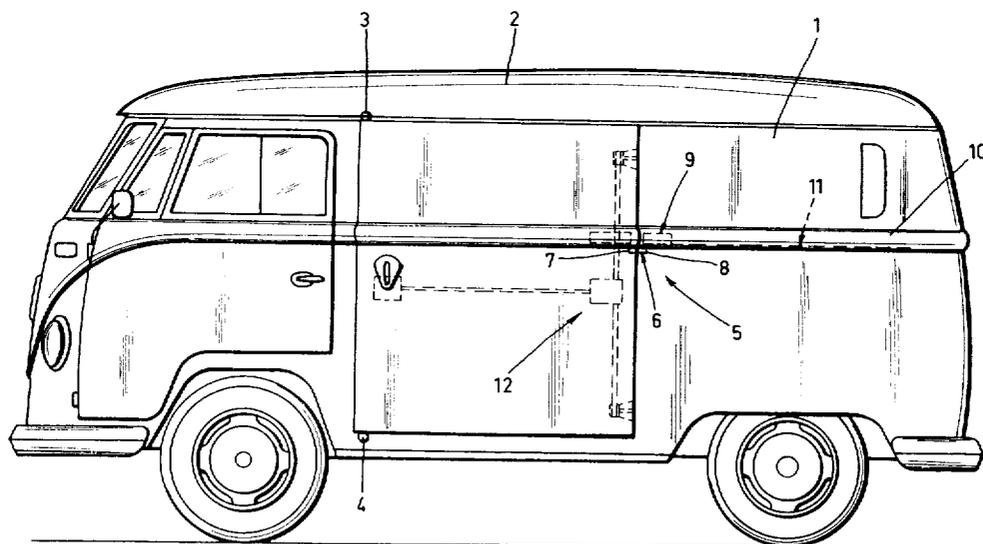
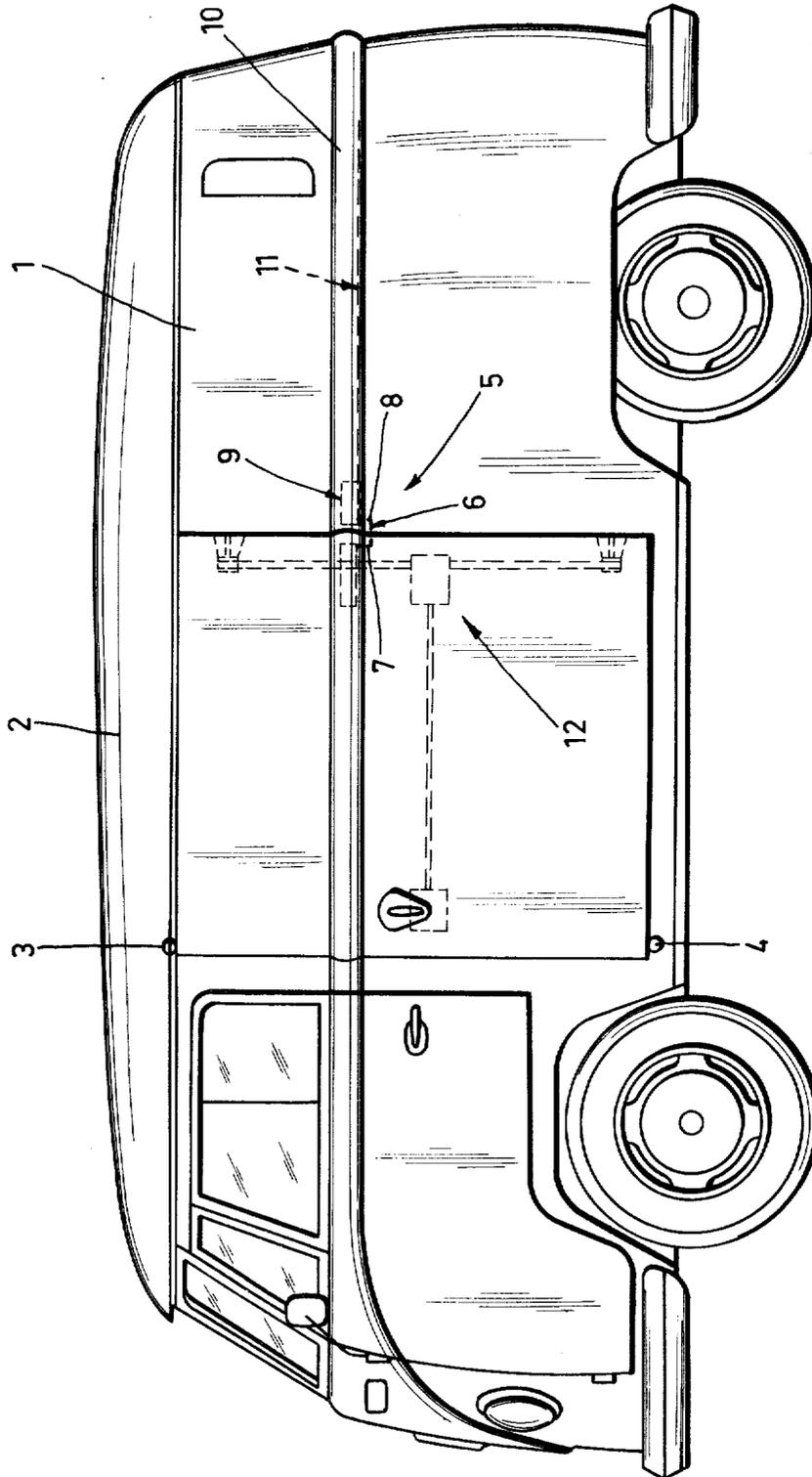


Fig. 1



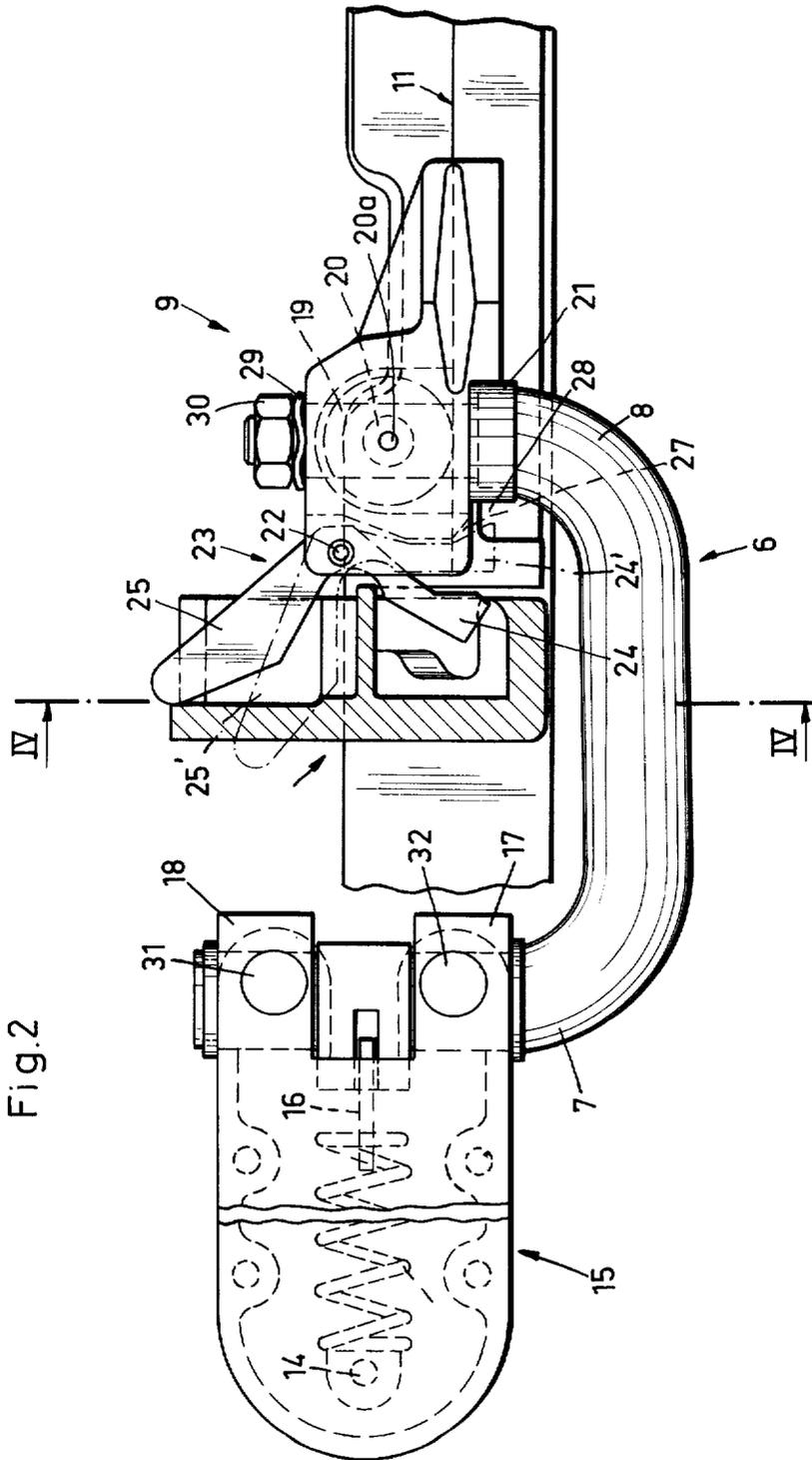


Fig.3

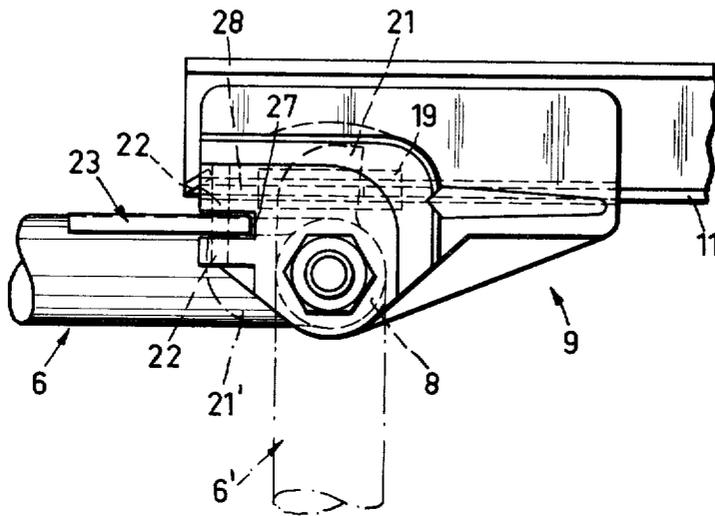
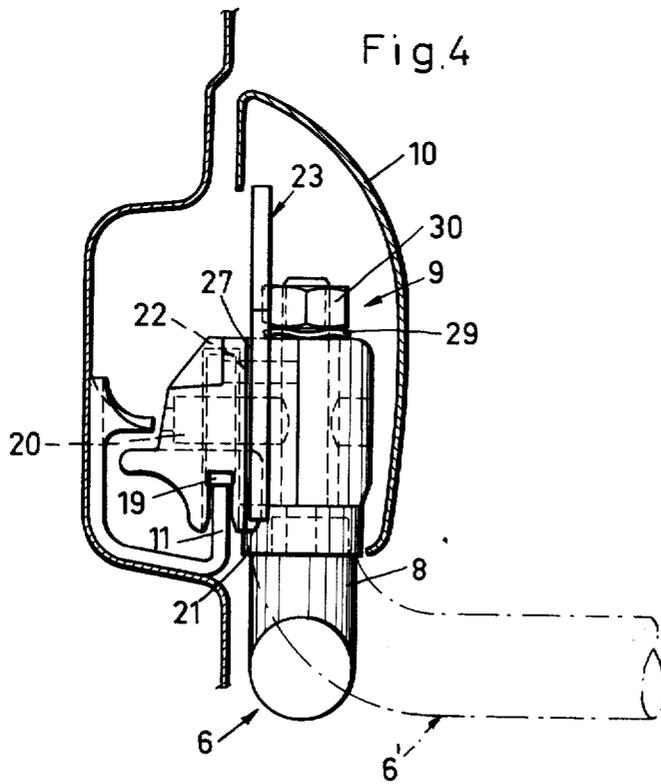


Fig.4



## GUIDE MECHANISM FOR SLIDING DOORS FOR MOTOR VEHICLES

### BACKGROUND OF THE INVENTION

This invention relates generally to motor vehicles and particularly relates to a sliding door for such vehicles such, for example, as a van.

Such sliding doors are known from the German published application No. 1,248,488 and from the corresponding U.S. Pat. No. 3,100,667. These prior patents disclose a guide mechanism for a sliding door which may be swung outwardly of the plane of the vehicle and may then be moved in a plane parallel to the wall of the vehicle. Such a sliding door may be provided with a hinge armature including a U-shaped frame which is so journalled that one of its legs is swingably attached to the sliding door while the other or second leg is swingably attached to a roller carriage. The roller carriage rolls on a rail fixed to the wall by means of at least one roller. The second leg is fixedly connected with a nose or latch behind which engages a pawl element when the sliding door has been swung outwardly with respect to the wall and which prevents the return of the U-shaped frame by engaging one arm of a two armed lever which may be swung about an axis. The other arm of the lever is associated with a locking block within the range of the end of the rail facing the closed sliding door. The arrangement is such that the other arm of the lever swings the pawl element out of engagement with the nose or latch when the sliding door is closed. Furthermore, means are provided for arresting the roller carriage with respect to the rail when the sliding door is closed. The two-armed lever and the means for arresting the roller carriage consist of horizontal levers which may be swung about a vertically extending axis, that is in the plane of the door or parallel thereto against the force of springs.

It is accordingly an object of the present invention to provide such a guide mechanism which is particularly suitable for the sliding door of a van or small delivery truck and which is so arranged that opening and closing of the sliding door takes place with a minimum of noise.

Particularly for sliding doors or motor vehicles consisting essentially of large sheet metal parts and a frame for holding the sheet metal, the danger arises that while the roller carriage rolls over the rail in order to move the sliding door a disagreeable noise may be generated.

### SUMMARY OF THE INVENTION

In accordance with the present invention the roller carriage consists of a synthetic or plastic material forming an element which surrounds the rail on three sides and which forms a bearing for the axle of the roller on both sides thereof. This axle is now insulated from other metal parts of the hinge armature. Further, the axle of the two-armed lever is maintained in an approximately horizontal direction by the synthetic material element while the two-armed lever is formed as an angular lever which is swung by gravity behind the nose or latch.

The investigations and thoughts which have lead to the present invention have shown that an effective noise damping is effected by means of an acoustical decoupling between the various metal parts by the synthetic material element. Further the generation of noise is diminished in that the two-armed lever which pre-

vents the swinging back of the U-frame when the sliding door is swung outwardly of the plane of the wall does not assume a definite position under the influence of springs, but under the influence of gravity.

In another embodiment of the invention the number of metal parts is further reduced in that the means for arresting the roller carriage is formed by the nose and a stop at the rail behind which the nose is positioned when the sliding door is closed. Here the nose cooperates with the two-armed lever depending upon whether the sliding door is in the open position or in the closed position to prevent the swinging back of the sliding door into the closed position. Alternatively the nose cooperates with the rail for the purpose of holding the roller carriage in the position associated with the closed position of the door. Due to the multiple functions of the nose the construction of the roller carriage is simplified because it only has to carry one or more rollers as well as a two-armed lever. As previously explained, the nose is fixedly secured to the leg of the U-shaped frame swingably journalled at the roller carriage.

The journal of the axle for the two-armed lever may be constructed in a very simple way in that the roller carriage surrounds three sides of the rail. Thus, the roller carriage forms a relatively deep groove for receiving the rail and the roller so that the carriage can form a bearing for the axle of the roller at both sides. If the axle is sufficiently rigid the journals therefor do not have to receive any bending moments. In order to lock this axle, that is to prevent movement of the axle out of the synthetic material element, the leg of the U-shaped frame which is swingably secured to the synthetic material element may be so arranged that the synthetic material element receives at least partially the second leg of the U-shaped frame. Furthermore the axle of the roller extends adjacent to the second leg with a surface of the generating surface and is disposed opposite the same in a recess which is approximately vertical to the second leg and extends through the synthetic material element which includes a stop for the other front surface of the axle. Opposite the other front surface of the axle there may be provided in the synthetic material element a reduction of the diameter of the bore serving as a stop so that one must exert force on this front surface by means of a tool for removing the axle.

Still another embodiment of the invention further reduces the generation of noise during movement of the door. Here the second leg of the U-shaped frame extends through the synthetic material element. This is already the case for the roller carriage of the previously known construction. The second leg may be tightened between the nose and a spring disk disposed below a nut which is screwed on the end of this leg.

The novel features that are considered characteristic of this invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and method of operation, as well as additional objects and advantages thereof, will best be understood from the following description when read in connection with the accompanying drawings.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of a small delivery truck or van provided with a sliding door according to the present invention and which includes the hinge armature of the invention;

FIG. 2 is a side elevational view of the hinge armature with locking block;

FIG. 3 is a plan view of the roller carriage; and

FIG. 4 is a sectional view taken on line IV—IV of FIG. 2.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings wherein the same elements are designated by the same reference characters and particularly to FIG. 1, there is illustrated, by way of example, a motor vehicle such, for example, as a van having a side wall 1. In order to load and unload goods from the motor vehicle there is provided an opening which is normally covered by the sliding door 2. This sliding door is swung outwardly in the direction of the observer, that is out of the opening in the wall 1, thereby to open the door. Subsequently the door is pushed in a direction away from the vehicle in a plane parallel to the plane of the wall 1. In order to guide and hold the door there is provided an upper and lower guide 3 and 4 as explained in the previously referred to German and U.S. patents. The guides 3 and 4 are disposed within the range of the front edge of the sliding door. There is further provided a guide mechanism generally designated 5 within the range of the rear edge of the sliding door approximately in the middle of its height. The present invention relates to the construction of the guide mechanism 5. As shown in FIG. 1, the guide mechanism includes a hinge armature, one essential element of which is the U-shaped frame 6, both legs of which extend upwards. With one of the legs 7 shown to the left in FIG. 1, the U-shaped frame 6 is swingably attached to the sliding door 2. The other or second leg 8 shown to the right in FIG. 2 is also swingably connected to the roller carriage 9. The roller carriage 9 in the embodiment illustrated includes a roller which rolls over the rail 11 which extends behind the cover 10 in the wall 1 when the door 2 is moved.

It will be understood that the sliding door 2 is also provided with a lock mechanism which is generally indicated at 12. However, since the lock mechanism forms no part of this invention it has not been illustrated or described in detail.

Referring now to FIG. 2, the U-shaped frame 6 is shown in the position which it assumes when the door is closed. To this end the door must be pushed into the door opening and against the action of a drawspring 13. The left-hand end of the drawspring 13 is attached to a pin 14 to which is also attached a hinge-like holder for the first leg 7 of the frame 6 which is formed by an armature element 15. The right-hand end of the drawspring 13 is hooked to the lever 16 which eccentrically attacks the first leg 7 so that the drawspring 13 exerts a moment on the frame 6. While the first leg 7 extends through the eye portions 17 and 18 of the armature portion 15 and is connected between these portions 17 and 18 rigidly with the lever 16, the second leg 8 of the U-shaped frame 6 extends through the roller carriage 9 which is formed as a synthetic material element. In this embodiment the roller carriage includes a roller 19 which runs over the guide rail 11 secured to the wall. The carriage 9 surrounds the rail 11 over a certain length so that a rotation of the carriage 9 about a vertical axis through the rail 11 is prevented. Since the carriage 9 surrounds the rail 11 on three sides, as shown particularly in FIG. 4, that is it is provided with a longitudinal

groove for receiving the rail, the axle 20 of the roller 19 is journalled at both sides of the roller by the carriage 9. This provides a particularly simple and efficient journal for the axle 20. The second leg 8 of the U-shaped frame 6 extends through the carriage 9 as shown in FIG. 2 behind the axle 20 in such a manner that the rear surface of the axle 20 as viewed in FIG. 5, is opposed to the outer surface of the second leg 8. Furthermore, the bore provided in the carriage 9 for receiving the axle 20 has, as shown in FIG. 2 in the front region of the carriage 9, a smaller diameter than the axle 20. Accordingly the axle 20 is prevented from sliding out of the carriage 9 in any direction without the necessity to provide additional safety devices. The axle 20 is inserted from the rear as shown in FIG. 2 before the second leg 8 of the U-shaped frame 6 is pushed into the carriage 9.

Fixedly secured to the second leg 8 there is provided the nose or latch 21 which cooperates with the angle lever 23 which is rotatably journalled about the horizontal axle 22. The lower arm 24 of the two arms, as shown in the figure, forms together with the latch 21 a pawl element while the relatively heavy upper arm 25 tends to swing about the axle 22 in a downward direction under the influence of gravity whereby the pawl element 24 is brought into engagement with the latch 21. In the position of the sliding door which as illustrated is in the closed position the angle lever 23 is swung by the locking block 26 in a clockwise direction as shown in full lines so that the pawl element 24 is moved out of engagement with the latch 21. The locking block 26 is secured to the wall within the range of the rail 11 adjacent the door. When the sliding motion necessary for closing the door is almost finished by the action of the locking block 26 the angle lever 23 acting as a stop for the other arm 25 and is so swung that the locking block 26 operates as a stop for the other arm 25 of the angle lever 23. Only then is the lower arm 24, which operates as an arresting member, is disengaged from the latch 21 and thereupon the U-frame 6 which when the door is opened is in its approximately vertical position, can now be swung forwardly out of the plane of FIG. 2 into the position illustrated in FIG. 2.

As shown in FIG. 3, the carriage 9 is provided with a cutout 27 facing the sliding door for receiving at least partially the pawl element 24 in its effective position so that also the axle 22 is journalled at both sides of the lever 23 in the synthetic material element 9.

FIG. 2 illustrates in dash-dot lines at 25' the position of the angle lever 25 when the door is open. In this case the pawl element assumes the position shown at 24' and is disposed as shown in FIG. 3 behind the latch which assumes the position shown at 21'. In this embodiment it is assumed that the two positions of the latch enclose an angle of approximately 90°. This follows in that also between the position of the U-shaped frame when the door is closed and shown at 6 and the position of the frame when the door is opened which is shown at 6', there exists an angle of approximately 90° as shown in FIG. 3.

The fact that the nose or latch 21 is rigidly connected with the second leg 8 of the U-shaped frame 6 makes it possible to utilize the nose 21 in its position corresponding to the closed door also for stopping the roller carriage 9 when the door is closed. To this end a lateral cutout 28 is provided in the rail 11 into which the nose 21 extends when the door is closed. A motion

of the roller carriage 9 can only take place after the U-shaped frame has been swung into its opening position shown at 6' (see FIGS. 3 and 4).

The synthetic material carriage 9 prevents various metal parts of the hinge armature, particularly the roller 19, the frame 9 and the angle lever 23, from touching each other. In this manner, as has been proven by experiment, a disturbing transmittal of noise such as are caused when the roller 19 rolls over the rail 11, is avoided. This sound insulating effect is further enhanced in the illustrated embodiment in that the synthetic material carriage 9 is tensioned by the second leg 8 of the U-shaped frame 6 secured between a support formed by the nose 21 and a spring disk 29 below a nut 30 which is threaded to the free end of the second leg 8. The spring disk 29 also causes a reduction of the development of noise when the sliding door is moved.

As shown particularly in FIGS. 3 and 4, the angle lever 23 rests behind the U-shaped frame 6 as shown in FIG. 2. This is necessary because when the U-shaped frame is in the position corresponding to the closed door there must be space for the locking block 26 as shown in FIG. 2. This locking block in the embodiment illustrated is screwed to the wall as shown at 31 and 32. These locking areas 31 and 32 are covered when the door is closed by the eye portions 17 and 18 of the armature element 15.

The synthetic material element of the carriage 9 may, for example, consist of 6.6 polyamide which is obtainable from Beyer A. G. or from Farbwerke Hoechst A. G. This material may be used with 30 percent glass fibers.

What is claimed is:

1. Guide mechanism for a sliding door capable of being swung out of an opening in and within a plane parallel to a wall of a vehicle, said mechanism comprising:

- a. a hinged armature having a U-shaped frame and having a first and second leg;
- b. said first leg being swingably secured to said sliding door;
- c. a roller carriage, said second leg being swingable secured to said roller carriage, said roller carriage having a roller;
- d. a rail fixed to the vehicle for permitting said roller to roll thereover;
- e. a nose fixed to said second leg;
- f. a two-armed lever, one arm of said lever forming a pawl element;
- g. locking block associated with the other arm of said lever and within the range of the end of said rail when said sliding door is closed, said nose being disengaged from said pawl element when said sliding door is closed;
- h. means for arresting the motion of said roller carriage on said rail when said door is closed;
- i. said roller carriage being formed of a synthetic material element surrounding substantially three sides of said rail, said synthetic material element forming a bearing for the axle of said roller, whereby said axle is isolated from other metal parts of said hinged armature, the axle of said two-armed lever extending in an approximately horizontal direction and being journaled in said synthetic material element; and
- k. means pivoting said two-armed lever for pivotal movement under the influence of gravity and in a

vertical plane so that said lever tends under said influence of gravity to swing behind said nose to prevent swinging-back of said U-shaped frame.

2. Mechanism as defined in claim 1 characterized in that said means for arresting said roller carriage is formed by said nose and a stop on said rail and that said nose is positioned behind said stop when said sliding door is closed.

3. Mechanism as defined in claim 2, wherein said stop is formed by the edge of a lateral recess in said rail into which said nose extends when said sliding door is closed.

4. Mechanism as defined in claim 1 wherein said one of said lever is disposed at least partially in a recess in said synthetic material element.

5. Mechanism as defined in claim 1 wherein said second leg of said U-shaped frame extends through said synthetic material element and is fixed between said nose and a spring disk disposed below a nut threaded on the end of said second leg.

6. Mechanism as defined in claim 1 wherein said second leg of said U-shaped frame is at least partially received in said synthetic material element and wherein the axle of said roller extends adjacent to said second leg in a vertically extending cutout, said cutout being disposed opposite the surface of said second leg, said synthetic material element including a stop for the other surface of said axle.

7. Guide mechanism for a sliding door capable of being swung out of an opening in and within a plane parallel to a wall of a vehicle, said mechanism comprising:

- a. a hinged armature having a U-shaped frame provided with a first leg swingably secured to said sliding door, and with a second leg;
- b. a roller carriage having a roller, said second leg being swingably secured to said roller carriage;
- c. a guide rail for said roller fixed to the vehicle;
- d. arresting means for arresting the motion of said roller carriage on said rail when said door is closed, including a nose on said second leg and a stop on said rail and formed by an edge of a lateral recess in said rail into which said nose extends when said sliding door is closed;
- e. a two-armed lever having one arm which forms a pawl element, and an other arm;
- f. a locking block associated with said other arm of said lever and within the range of the end of said rail when said sliding door is closed, said nose being disengaged from said pawl element when said door is closed;

said roller carriage being formed of a synthetic plastic material element surrounding substantially three sides of said rail and formed with a recess in which said one arm is at least partially disposed, said synthetic plastic material element forming a bearing for the axle of said roller so that the axle is isolated from other metal parts of said hinged armature, the axle of said two-armed lever extending in an approximately horizontal direction and being journaled in said synthetic plastic material element, said second leg of said U-shaped frame being at least partially received in said synthetic plastic material element and the axle of said roller extending adjacent to said second leg in a vertical cut-out which is opposite the surface of said second leg, said two-armed lever being so arranged that it can be swung by the influence of gravity behind said nose for preventing swinging-back of said U-shaped frame.

\* \* \* \* \*

UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,903,648 Dated Sept. 9, 1975

Inventor(s) Ernst Maneck

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 4, line 8, change "5" to --2--.

Signed and Sealed this

ninth Day of March 1976

[SEAL]

Attest:

RUTH C. MASON  
Attesting Officer

C. MARSHALL DANN  
Commissioner of Patents and Trademarks

UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,903,648 Dated September 9, 1975

Inventor(s) Ernst Maneck

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Figure 2 should appear per attachment

6-15-76 issue DATE

