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(71) Applicant
KBD Automotive Limited

(Incorporated in the United Kingdom)

1 Sylvan Court, Sylvan Way, Southfields Business
Park, Basildon, Essex, SS15 6TH, United Kingdom

(72) Inventors
Ronald Frederick Collier
Denis Lyn Crundall Allan
Dennis Baynes

(74) Agent and/or Address for Service
Ruffhead & Vaufrourard
Maldstone Road (STC Site), Fooks Cray, Sidcup,
Kent, DA14 5HT, United Kingdom

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(56) Documents cited
GB 1522526 A GB 1519027 A GB 1439940 A
GB 1332739 A GB 1301703 A GB 1228904 A
GB 1218990 A GB 1218953 A US 4945677 A

(58) Field of search
UK CL (Edition K) E1J JCH JDH
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(54) Vehicle sliding door mounting arrangement

(57) A sliding door arrangement, especially for motor vehicles, comprises a door slidable into and out of a door opening 5 in a surrounding frame or other structure and pivotally and slidably connected relative to the frame or other structure by means of at least one pivoted door support arm 2 arrangement. Guide means 8 are pivotally connected to the arm arrangement for slidably receiving a guide member 10 of a door guide structure fixedly secured to the door. The guide member or another member fixed relative to the door provides striker means 19, positioned so that as the door is moved from an open position towards its closed position the door slides until the striker means engages the guide means pivotally connected to the pivoted door support arm arrangement, whereupon pivotal movement of the arm arrangement then takes place so that as the door continues to be moved the door is drawn laterally towards the door opening.

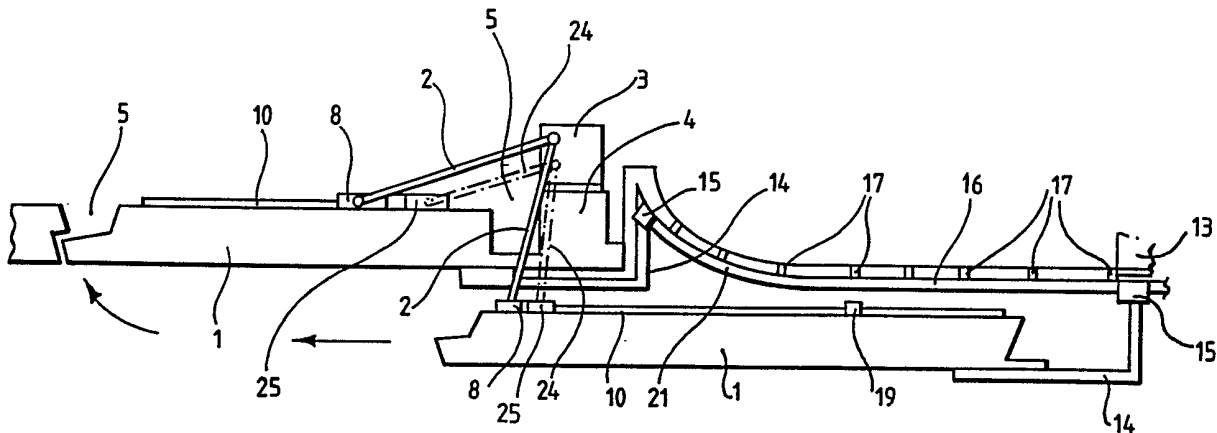


FIG. 2.

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

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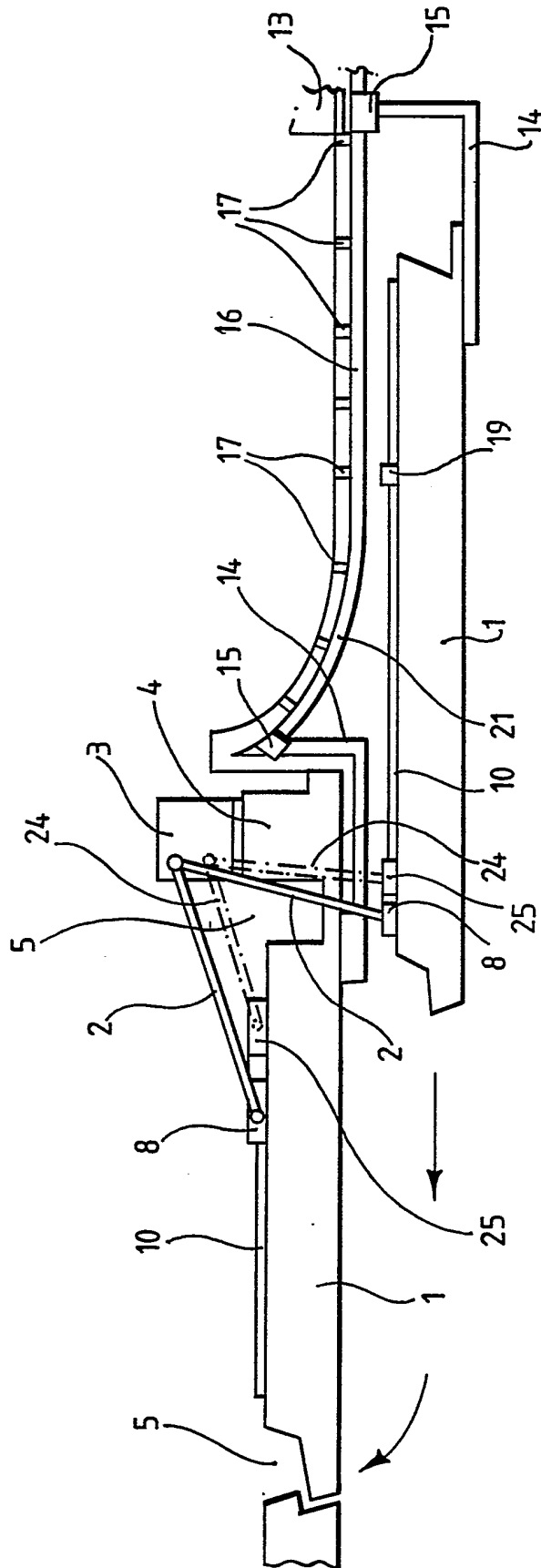


FIG. 2.

IMPROVEMENTS RELATING TO SLIDING DOOR ARRANGEMENTS

This invention relates to sliding door arrangements and is more especially, but not exclusively, concerned with sliding door arrangements for use in motor vehicles (e.g. motor cars, vans etc.).

According to the present invention there is provided a sliding door arrangement, in which a door slidable into and out of a door opening in a surrounding relatively fixed frame or other structure is pivotally and slidably connected relative to the fixed frame or other structure by means of a pivoted door support arm arrangement to which guide means are pivotally connected for slidably receiving a guide member of a door guide structure fixedly secured to the door and in which the guide member or another member fixed relative to the door provides striker means positioned so that as the door is moved from an open position towards its closed position the door slides until the striker means engages the guide means pivotally connected to the pivoted door support arm arrangement whereupon pivotal movement of the arm arrangement then takes place so that as the door continues to be moved the door is drawn laterally towards the door opening, preferably in order to provide a substantially flush fitting with the surrounding structure.

To enhance door stability a further slidable connection between the door and the surrounding door frame or other structure may be provided and may comprise a fixed runner or guide bar extending generally centrally along the

structure toward the door opening and slidably engaged by a connecting member secured to the door at or near the centre of the trailing end thereof, the runner or guide bar having a laterally inwardly curved end portion adjacent the door opening so that the door is drawn inwards by the aforesaid further slidable connection when the door approaches the position at which it is virtually covering the door opening.

The pivoted door support arm arrangement may comprise one or more pivoted arms each of which preferably has two guide members pivotally attached to it for slidably receiving respective parallel guide rails of the guide structure fixedly secured to the door. A plurality of such pivoted door support arm arrangements makes for improved door stability.

In applying the sliding door arrangement of the present invention to motor vehicles the pivoted door support arm arrangement may conveniently be attached directly or indirectly to the usual vertical door frame pillar (the so-called "B" pillar). The further slidable connection between the door (e.g. front door) and the body structure of the vehicle may be provided by means of a single guide runner or bar which extends along the side of the vehicle body and is engaged by a sliding connection member attached to the door at or near what will be the trailing end of the door during a door closing operation. This single guide runner may have a curved end part near the door opening which part may extend into a suitable cavity provided in the vehicle body structure immediately adjacent the aforesaid vertical door frame pillar.

In the case of motor vehicle having sliding doors, the forefront end of the sliding door in a door closing operation and the door frame of the vehicle body will be provided with respective parts of a latching arrangement which automatically lockingly engage one another as the door reaches the fully closed position in order to provide anti-door-burst protection in the case of accidents.

As will be appreciated, the sliding door arrangement of the present invention may be incorporated in sliding door versions of new motor vehicles during the manufacture thereof but the sliding door arrangement also lends itself
5 very well to the conversion of existing hinged door motor vehicles to sliding door vehicles.

Especially for the conversion of hinged doors of existing vehicles to sliding doors, the present invention also provides a conversion kit which comprises a door
10 support arm device for attachment to the usual vertical door frame pillar (i.e. so-called "B" pillar) and having pivotally connected to a pivoted arm thereof one or more guide members for making sliding connection with guide parts
15 of a door guide structure for attachment to the rearside of a vehicle door, a striker device being provided which is attached or for attachment to the guide structure so that during a closing movement of the vehicle door the striker device engages a guide member to initiate pivotal movement
of the pivoted arm to draw the door into the door opening.

20 The door support arm of the kit may comprise a further pivoted arm of a different length also having one or more guide members pivotally connected thereto for making sliding connection with the guide parts of the guide structure.

The conversion kit may also include a door guide track
25 for attachment preferably generally centrally to the side of the vehicle for sliding engagement by a slide device for fitting preferably generally centrally to the trailing edge of the vehicle door, the guide track being curved inwardly at the end thereof adjacent the door opening in order to
30 draw the door inwards towards the end of a door closing movement.

By way of example the present invention will now be described with reference to the accompanying drawings in which:

35 Figure 1 shows a fragmentary diagrammatic perspective view of a motor vehicle embodying a sliding door arrangement according to the invention; and,

Figure 2 shows a diagrammatic fragmentary plan view of the sliding door arrangement shown in Figure 1.

Referring to the drawings, the motor vehicle illustrated comprises sliding front doors, one of which is shown at 1. The sliding door arrangement for the door 1 comprises a pivoted door support arm 2 which is pivotally mounted on a support member 3 (Figure 2) which is fixedly secured to the back of the usual vertical "B" pillar 4 (Figure 2) of the vehicle which effectively forms part of the door frame defining a door opening 5. The pivoted door support arm 2 has two vertically displaced laterally extending arm limbs 6 and 7 on the free ends of which are pivotally mounted respective preferably ball-race guide members 8 and 9 which can pivot about a common vertical axis. These guide members 8 and 9 slidably receive respective parallel guide rails 10 and 11 of a door guide structure 12 fixedly secured to the back or inner surface of the door 1. Thus it will be appreciated that the door 1 is effectively pivotally and slidably connected to the vehicle body structure 13 by the pivoted door support arm 2 and the guide members 8 and 9.

A further slidable connection between the door 1 and the vehicle body structure 13 is made by means of an L-shaped member 14 (Figure 2) secured to the door end nearest the back of the vehicle and which is provided with a sliding connection member 15 for slidable movement of the member along a guide runner 16 (e.g. tubular bar) secured, as by means including plastic spacers 17, to the side of the vehicle. This guide runner 16 may be suitably designed so as not to detract from the ascetic appeal of the vehicle.

In operation of the sliding door arrangement as can best be understood from Figure 2, the door 1 in the open position thereof lies alongside the vehicle body and towards the right as viewed in the figure and the door is supported at its respective sides by the pivoted door support arm 2 and the slidable connection 15.

In order to close the door 1, the door is moved to the

left using door grip 18, the slidable connection provided by the guide members 8 and 9 co-operating with the guide rails 10 and 11, respectively, and the sliding connection 15 co-operating with the guide runner 16 allowing such sliding movement. When the door 1 reaches a position where it overlaps a substantial part of the front door opening 5 striker members 19 and 20 conveniently attached to the guide rails 10 and 11 engage the ends of the guide members 8 and 9, respectively, so that thereafter the pivoted door support arm 2 pivots about the support member 3 in the clockwise direction as viewed in Figure 2 whilst the guide members themselves pivot on the free ends of the arm limbs 6 and 7. Contemporaneously, the sliding connection 15 sliding along the bar 16 reaches an inwardly curved bar section 21 so that the trailing edge of the door will then start to be drawn inwards towards the vehicle body.

As further sliding movement of the door takes place in the final part of the door closing operation pivotal movement of the door support arm 2 and the laterally inward displacement of the connection 15 causes the door to be drawn virtually laterally into the door opening 5 to provide, as illustrated in Figure 2, a substantially flush door fitting with the vehicle body in full accordance with safety considerations and/or requirements.

In order to prevent, or at least substantially reduce, the burst door risk in the event of accident impact the closing edge of the sliding door 1 and the front edge of the door frame are provided with co-operating plug and socket parts 22 and 23 (Figure 2) of a latch device which automatically lockingly engage one another as the door finally closes.

To enhance the stability of the sliding door 1 relative to the vehicle body a further pivoted door support arm, as shown in dotted form at 24 in Figure 2, may be provided. In this case the arm 24 will be similar to the support arm 2 having two laterally extending limbs on each of which guide members (one of which is shown at 25) are

pivotally mounted for slidably engaging the guide rails 10 and 11.

It will be appreciated that neither upper nor lower guides need to be provided for supporting the vehicle door during sliding movement thereof.

It will also be appreciated from the foregoing that the relatively simple and inexpensive but effective design of the sliding door arrangement according to the present invention can readily be incorporated in the manufacture of sliding door versions of new motor vehicles. However, the sliding door design also lends itself extremely well to the conversion of existing hinge door versions of motor vehicles to sliding door versions and the various components of the sliding door arrangement can readily be provided in the form of a conversion kit for converting hinged doors of existing vehicles to sliding doors.

It will also be appreciated that the invention is not limited to sliding door arrangements for vehicle front doors as in the specifically described embodiment and moreover the sliding door arrangement of the invention could also be applied with advantage in many other applications when flush fitting sliding doors are required.

CLAIMS:

A sliding door arrangement, in which a door slidable into and out of a door opening in a surrounding frame or other structure is pivotally and slidably connected relative to the frame or other structure by means of at least one pivoted door support arm arrangement to which guide means are pivotally connected for slidably receiving a guide member of a door guide structure fixedly secured to the door and in which the guide member or another member fixed relative to the door provides striker means positioned so that as the door is moved from an open position towards its closed position the door slides until the striker means engages the guide means pivotally connected to the pivoted door support arm arrangement whereupon pivotal movement of the arm arrangement then takes place so that as the door continues to be moved the door is drawn laterally towards the door opening.

2. A sliding door arrangement as claimed in claim 1, in which the pivotal movement of the or each arm arrangement causes the door to be drawn laterally towards the door opening to a position where it is substantially flush with the surrounding structure.

3. A sliding door arrangement as claimed in claim 1 or claim 2, in which to enhance door stability a further sliding connection is provided between the door and the surrounding door frame or other structure.

4. A sliding door arrangement as claimed in claim 3, in which the further sliding connection comprises a fixed guide bar or runner extending generally centrally along the structure toward the door opening and slidably engaged by a connecting member secured to the door at or near the centre of the trailing end thereof, the runner or guide bar having a laterally inwardly curved end portion adjacent the door opening so that the trailing edge of the door is drawn inwards by the further slidable connection when the door approaches the position at which it is virtually covering the door opening.

5. A sliding door arrangement as claimed in any preceding claim, in which the or each pivoted door support arm arrangement comprises at least one pivoted arm preferably having two guide members pivotally attached to it
5 for slidably receiving respective parallel guide rails of the guide structure fixedly secured to the door.

6. In a motor vehicle a sliding door arrangement as claimed in any preceding claim, in which the pivoted door support arm arrangement is attached directly or indirectly
10 to the usual vertical door frame pillar of the vehicle.

7. A sliding door arrangement as claimed in claim 6 when dependent on claim 3, in which the further sliding connection between the door and the body structure of the vehicle is provided by a single guide runner or bar which
15 extends along the side of the vehicle body and is engaged by a sliding connection member attached to the door at or near what will be the trailing end of the door during a door closing operation.

8. A sliding door arrangement as claimed in claim 7,
20 in which the single guide runner has a curved end part near the door opening which end part extends into a suitable cavity provided in the vehicle body structure immediately adjacent the vertical door frame pillar.

9. A sliding door arrangement as claimed in any one
25 of claims 6 to 8, in which the foremost end of the sliding door in a door closing operation and the door frame of the vehicle body are provided with respective co-operating parts of a latching arrangement which automatically lockingly engage one another as the door reaches the fully closed
30 position in order to provide anti-door-burst protection.

10. A door conversion kit for converting a hinged door of a motor vehicle to a sliding door, the kit comprising a door support arm device for attachment to the usual vertical door frame pillar and having pivotally connected to a
35 pivoted arm thereof one or more guide members for making sliding connection with guide parts of a door guide structure for attachment to the rear side of a vehicle door,

a striker device being provided which is attached or for attachment to the guide structure so that during a closing movement of the vehicle door the striker device engages a guide member to initiate pivotal movement of the pivoted arm to draw the door into the door opening.

5 to draw the door into the door opening.

11. A door conversion kit as claimed in claim 10, further comprising a pivoted arm of a different length also having one or more guide members pivotally connected thereto for making sliding connection with the guide parts of the guide structure.

10 guide structure.

12. A door conversion kit as claimed in claim 10 or claim 11, further comprising a door guide track for attachment preferably generally centrally to the side of the vehicle for sliding engagement by a slide device for fitting preferably generally centrally to the trailing edge of the vehicle door, the guide track being curved inwardly at the end thereof adjacent the door opening in order to draw the door inwards towards the end of a door closing movement.

15 preferably generally centrally to the trailing edge of the vehicle door, the guide track being curved inwardly at the end thereof adjacent the door opening in order to draw the door inwards towards the end of a door closing movement.

13. A sliding door arrangement for a motor vehicle

20 substantially as hereinbefore described with reference to the accompanying drawings.

Patents Act 1977
 Examiner's report to the Comptroller under
 Section 17 (The Search Report)

Application number

9100686.6

Relevant Technical fields

- (i) UK CI (Edition K) E1J: JCH, JDH
 (ii) Int CL (Edition 5) B60J E06B

Search Examiner

J ROWLATT

Databases (see over)

- (i) UK Patent Office
 (ii)

Date of Search

27 APRIL 1992

Documents considered relevant following a search in respect of claims

1-13

| Category (see over) | Identity of document and relevant passages | Relevant to claim(s) |
|------------------------|---|-------------------------|
| X | GB 1522526 A (LUNKE AND SOHN) The whole document is relevant | 1, 2, 6 and 9 |
| X | GB 1519027 A (LUNKE AND SOHN) The whole document is relevant | 1, 2, 6 and 9 |
| X | GB 1439940 A (WESTINGHOUSE) The whole document is relevant | 1-3 6 and 9 |
| X | GB 1332739 A (SA VEHICULES INDUSTRIELS) Whole document relevant | 1-3, 6 and 9 |
| X | GB 1301703 A (BODE) The whole document is relevant | 1-3, 6 and 9 |
| X | GB 1228904 A (BODE) The whole document is relevant | 1-9 |
| X | GB 1218990 A (BODE) The whole document is relevant | 1-9 |
| X | GB 1218953 A (BODE) The whole document is relevant | 1-9 |
| X | US 4945677 A (BODE) The whole document is relevant | 1-3, 6 and 9 |

| Category | Identity of document and relevant passages | Relevant to claim(s) |
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Categories of documents

X: Document indicating lack of novelty or of inventive step.

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