

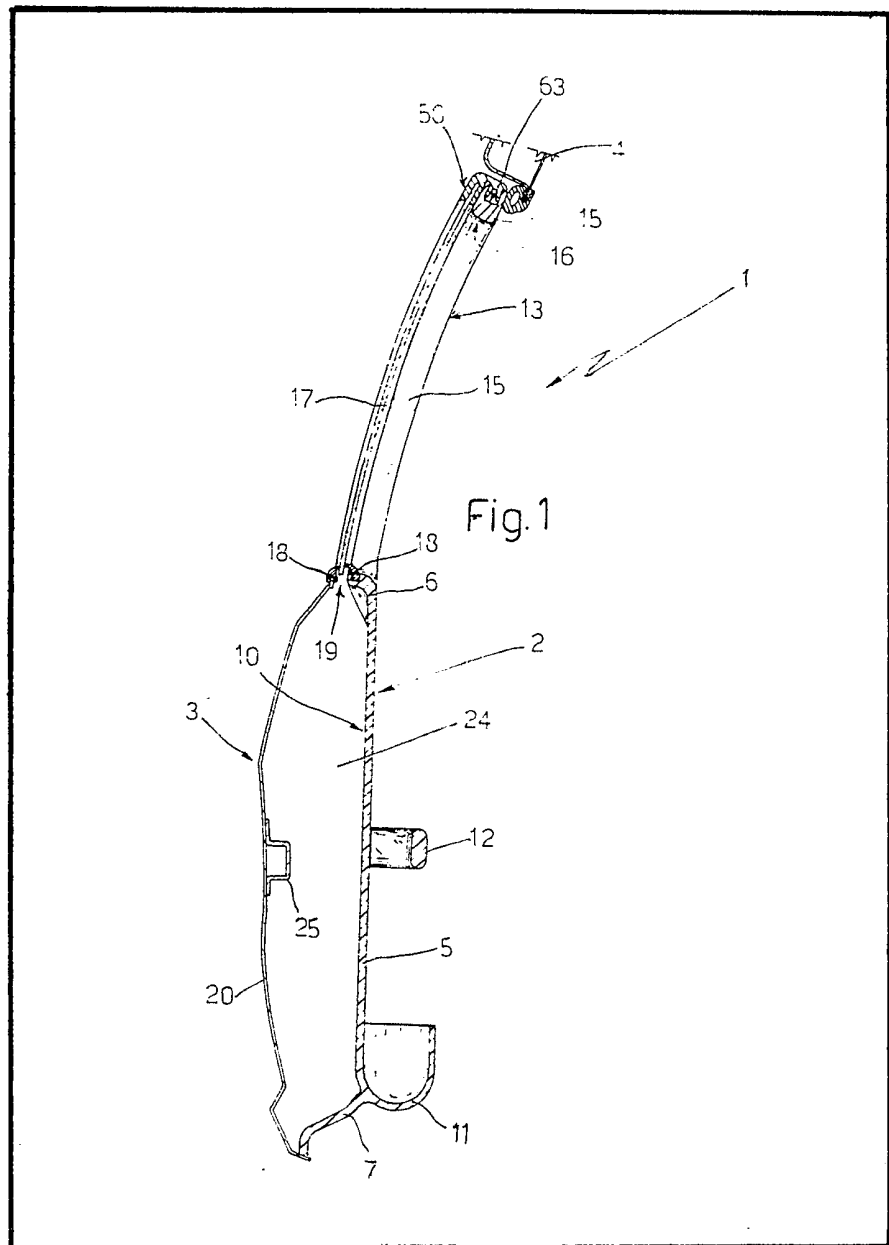
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(54) **Motor vehicle door**

(57) A motor vehicle door, wherein an upper frame 13 and a lower dished plate 5, which are integral with each other and are constructed in a single piece 2, are joined to a rigid panel 3, which can be hinged to the vehicle body; the panel being joined to said

dished plate such as to define a chamber 24 internally housing at least a window regulator device premounted on said plate; the upper frame 13 surrounding an aperture arranged to be closed by a mobile window 17 and comprising a surface facing outwards from the motor vehicle and covered by a guide channel 50 for said window.



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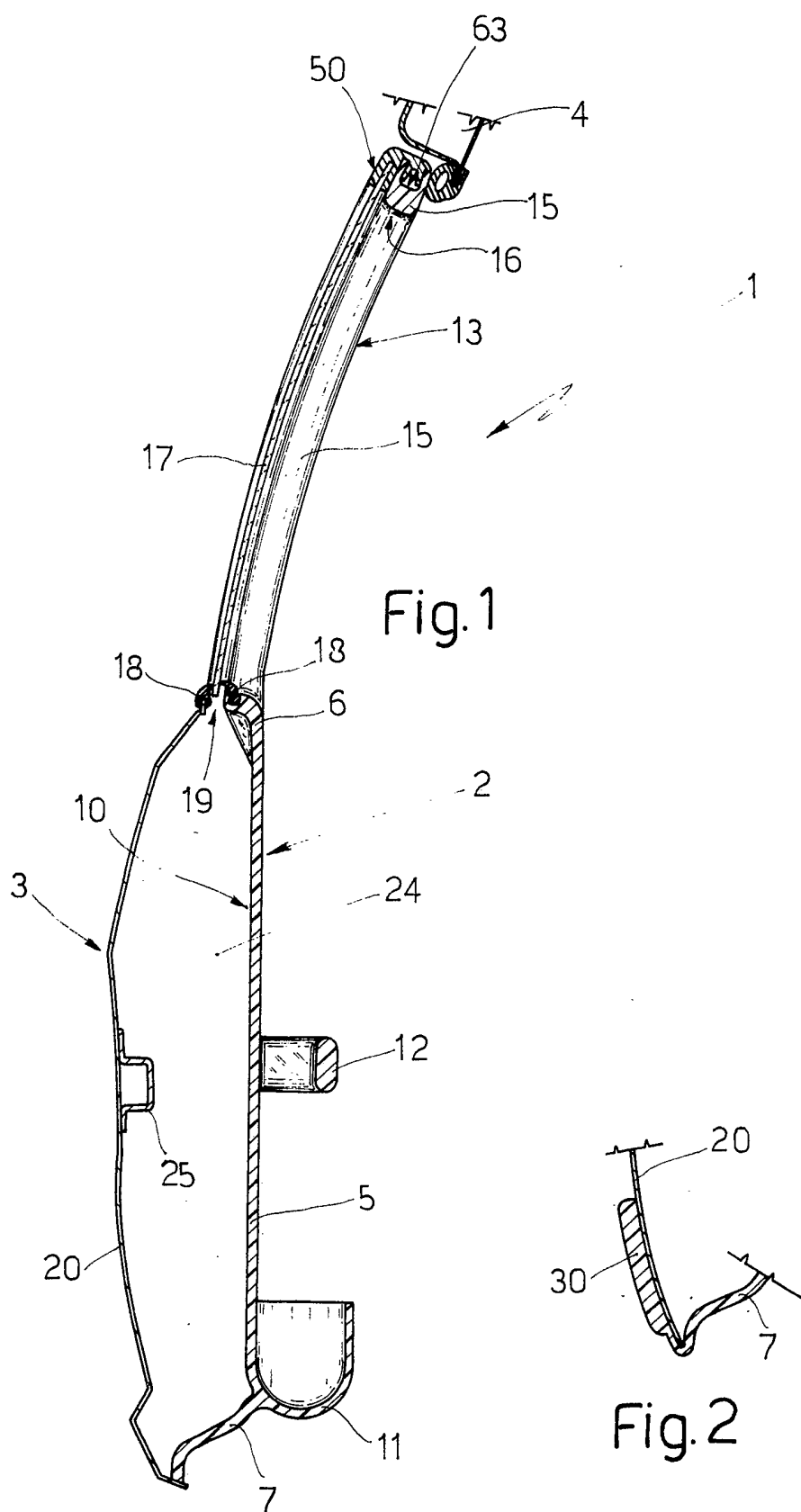
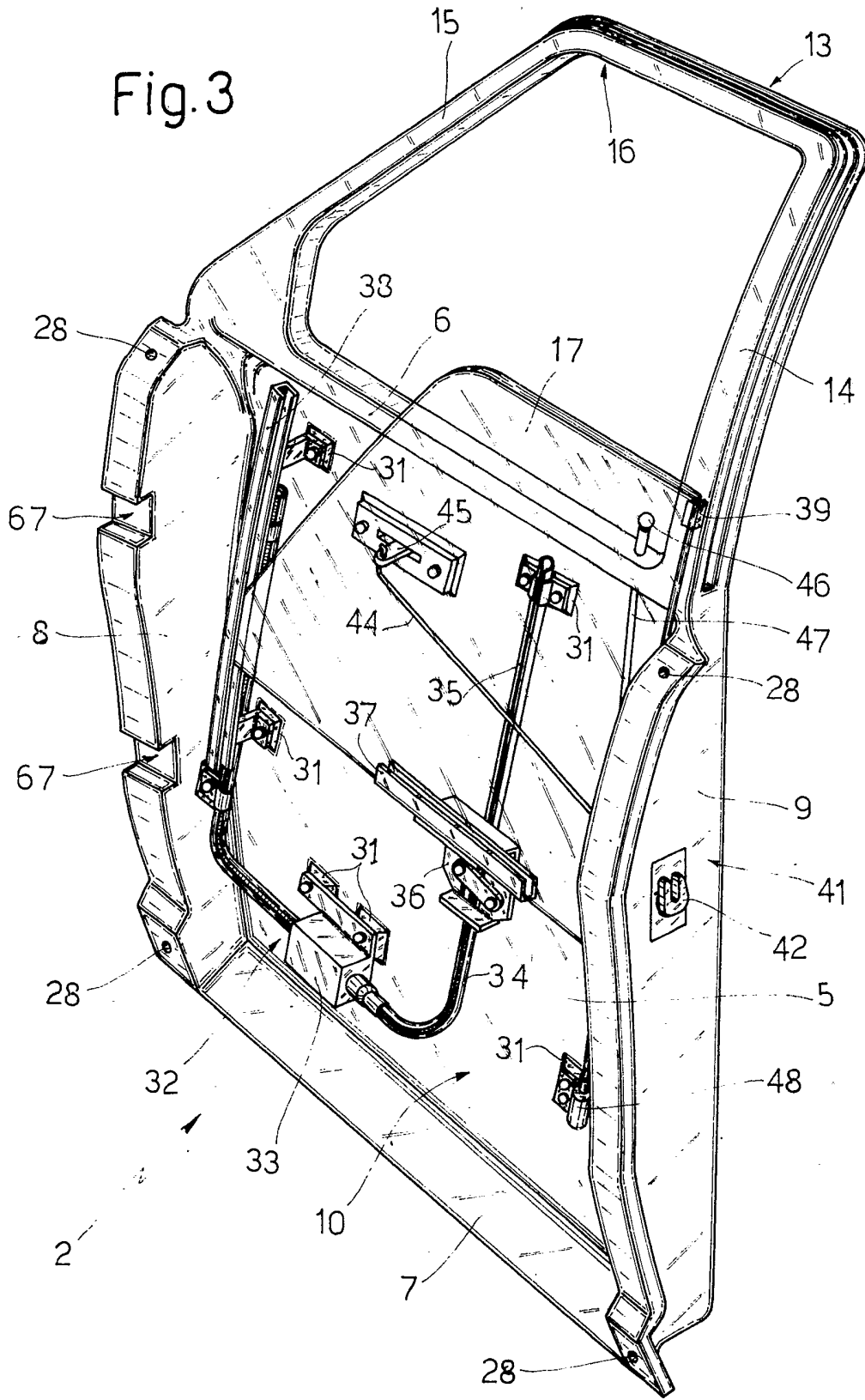


Fig. 3



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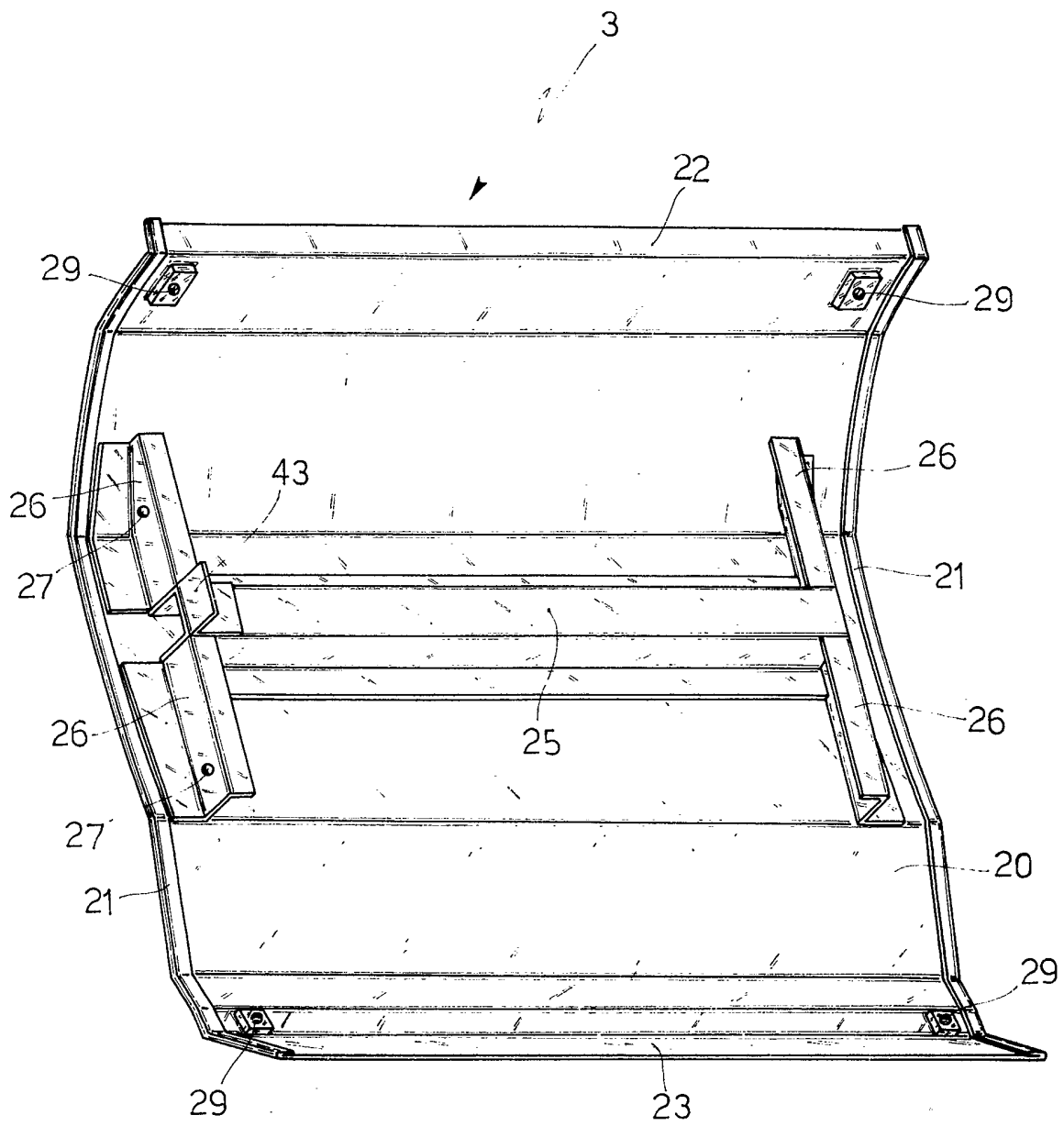


Fig. 4

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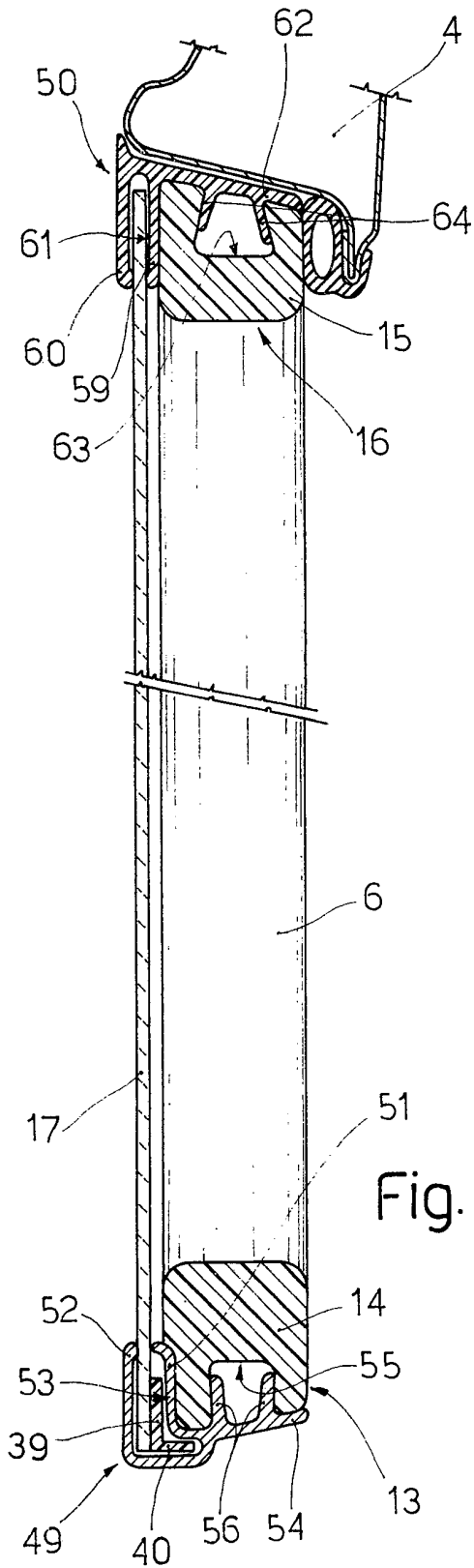


Fig. 5

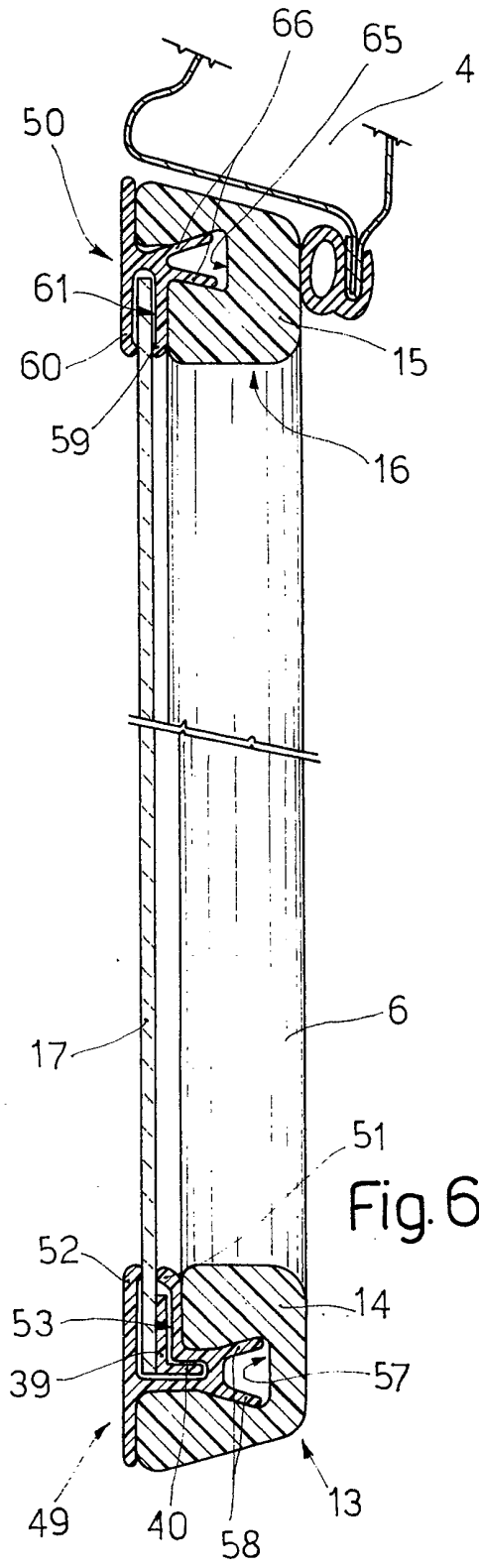


Fig. 6

## SPECIFICATION

**A motor vehicle door**

This invention relates to a motor vehicle door.

The doors represent one of the most  
 5 complicated and costly structural parts of a motor  
 vehicle body, because they not only have to be  
 sufficiently rigid to resist external impact, but  
 must also support a plurality of devices which are  
 difficult to assemble and properly set up, such as  
 10 a window regulator device with its mobile  
 window, a lock and other possible devices such as  
 a centrally controlled door locking device.

Because of their structural complexity, motor  
 vehicle doors represent a considerable part of the  
 15 total cost of the vehicle, both because of the  
 materials used and, in particular, because of the  
 considerable assembly time required.

The object of the present invention is to  
 provide a door, the structure of which is simplified  
 20 to a maximum extent, and which is such as to  
 allow at least a proportion of the devices  
 connected to it to be assembled on the work  
 bench, so as to reduce the assembly time of the  
 production line to a minimum.

25 said object is attained according to the present  
 invention by a motor vehicle door comprising an  
 external structure and an internal structure,  
 characterised in that said internal structure  
 comprises an upper frame and a lower plate  
 30 which are integral with each other and  
 constructed in a single piece preferably of  
 moulded plastics, and said external structure  
 comprises a substantially rigid panel preferably  
 constructed of internally stiffened metal plate,  
 35 which can be hinged to a vehicle body and is  
 joined to said plate in order to define a chamber  
 housing at least a window regulator device for a  
 mobile window which closes an aperture upperly  
 defined by said frame; said window regulator  
 40 device being connected to said plate.

According to a preferred embodiment of the  
 present invention, the air resistance of the door is  
 reduced to a minimum in that said frame supports  
 a connected guide channel for said window; said  
 45 channel being rigidly connected to said frame and  
 covering that surface thereof which faces  
 outwards from the motor vehicle.

In this manner, when in its closed position, the  
 window is substantially in line with the outer  
 50 surface both of the frame and of said panel, so  
 reducing vorticity along the door to a minimum.

Further characteristics and advantages of the  
 present invention will be apparent from the  
 description given hereinafter with reference to the  
 55 accompanying drawings, which illustrate some  
 non-limiting embodiments thereof, and in which:

Figure 1 is a section on a vertical plane through  
 a door constructed according to the present  
 invention;

60 Figure 2 is a section through a modification of  
 a detail of Figure 1;

Figure 3 is a diagrammatic perspective view of  
 a detail of Figure 1, with parts removed for clarity;

Figure 4 is a diagrammatic perspective view of

65 a further detail of Figure 1, with parts removed for  
 clarity;

Figure 5 is a section on the line V—V of Figure  
 1; and

70 Figure 6 is a section analogous to that of  
 Figure 5, and relative to a modification of the  
 detail of Figure 3.

Figure 1 illustrates a door indicated overall by  
 the reference numeral 1, and comprising an  
 internal structure 2 constructed in a single piece  
 75 preferably from moulded plastics, and an external  
 structure 3 to be connected to a vehicle body 4,  
 by means of non-illustrated hinges.

As shown in Figure 1 and in particular in Figure  
 3, the internal structure 2 comprises a lower plate  
 80 5 having an upper rim 6, a lower rim 7, a front  
 side rim 8 and a rear side rim 9 which are directed  
 outwards in such a manner as to define a cavity  
 10 with its concavity facing outwards. An  
 appendix 11 (Figure 1) is rigidly joined to that  
 85 surface of the plate 5 facing the interior of the  
 motor vehicle, and is bent upwards in order to  
 define an object tray disposed below an arm  
 support handle 12, which is preferably formed in  
 one piece with the plate 5 together with the  
 90 appendix 11 by moulding.

The internal structure 2 also comprises an  
 upper frame 13 constituted by a substantially  
 vertical upright 14 extending upwards from the  
 upper end of the rear side rim 9, and an arcuate  
 95 portion 15 extending between the upper end of  
 the upright 14 and the upper end of the front side  
 rim 7 of the plate 5. Together with the upper rim  
 6 of the plate 5, the frame 13 defines an aperture  
 16 arranged to be closed by a mobile window 17  
 100 slidably mounted between two lip gaskets 18  
 disposed in a substantially horizontal position  
 along the opposing edges of a slot 19 existing  
 between the upper rim 6 of the plate 5 and the  
 upper edge of the external structure 3.

As shown in particular in Figures 1 and 4, the  
 external structure 3 comprises a panel 20 of  
 profiled metal plate, of which the side edges 21  
 extend in a substantially vertical direction in  
 contact with the side rims 8 and 9 of the plate 5,  
 110 its upper edge 22 has connected to it one of the  
 gaskets 18, and its lower edge 23 extends in  
 contact with the lower rim 7 of the plate 5 so as  
 to close the cavity 10 and define a chamber 24.

A box section 25 of substantially horizontal  
 115 axis is rigidly joined, preferably by gluing, to that  
 surface of the panel 20 facing the chamber 24,  
 and to each end of it there are connected two  
 flanges 26 of substantially vertical axis which  
 have a substantially Z cross-section. The flanges  
 120 26 comprise bores 27 for connecting them to the  
 side rims 8 and 9 which respectively face them,  
 and the panel 20 is connected to the upper and  
 lower ends of the rims 8 and 9 by screws (not  
 shown) extending through bores 28 in the plate 5  
 125 and into corresponding dead bores provided in  
 respective blocks 29 joined to the inner surface of  
 the panel 20 preferably by gluing.

According to the modification shown in Figure  
 2, the lower portion of the panel 20 is covered

externally by a protection fascia 30 constituted by the end portion of the rim 7 of the plate 5 suitably bent upwards.

As shown in Figure 3, moulded blocks 31 are disposed on that surface of the plate 5 facing the chamber 25, and are arranged to allow fixing for example of a window regulator device indicated overall by 32 and comprising an electric motor 33 for operating a flexible screw 34 extending along a rigid guide 35 and connected to a slide 36 slidably mounted on the end portion of said guide, which extends in a direction parallel to the axis of the upright 14. A substantially horizontal support 37 is connected to the slide 36, and is connected to the lower horizontal edge of the window 17, of which the front edge slidably engages in a channel 38 fixed to the plate 5, and the rear edge extends in a vertical direction substantially parallel to the axis of the upright 14 and channel 13, and has connected to it a block 39 provided with a lateral guide rib 40.

As shown in Figure 3, the chamber 24 also houses a locking device 41 comprising a lock 42 mounted through a respective bore provided in the side rim 9 of the plate 5 and simply resting thereon. The lock 42 is fixed in position by screws, not shown, mounted through bores, not shown, provided in a bracket 43 (Fig. 4) rigid with the cross member 25, and is operated by a rod 44 connecting to a handle 45 extending through the plate 5. The lock 42 can be locked by a rod 47, or by operating a centralised electromechanical device 48 rigidly connected to a block 31 on the plate 5.

As shown in Figure 5, along the upright 14 and the arcuate portion 15 of the frame 13 there extend two guide channels indicated respectively by 49 and 50, of substantially rigid plastics construction.

The channel 49 comprises two lips 51 and 52 disposed facing each other to define a slot 53 substantially of L cross-section and communicating with the outside by way of a narrow side opening engaged by the window 17, of which the block 39 and rib 40 slidably engage the channel 53 to prevent the window 17 from making any transverse movement as it opens and closes the aperture 16. The lip 51 is disposed on the inside of the lip 52, and is in contact with that surface of the upright 14 facing outwards from the vehicle, and there is rigidly joined to it an appendix 54 extending in contact with the outer side surface of the upright 14 so as to close a groove 55 provided axially in this latter surface and snap-engaged by two ribs 56 extending from the appendix 54 parallel to the lips 51 and 52 and on the same side of the appendix 54 as these latter.

According to the modification shown in Figure 6, the upright 14 is provided with an axial groove 57 provided in that surface thereof facing outwards from the vehicle, and is snap-engaged by two axial ribs 58 extending from the lip 51 transversely to the plane of the window 17.

The channel 50 also comprises two lips 59 and 60 facing each other to define a substantially rectangular slot 61 communicating with the outside by way of a narrow axial side opening slidably engaged by the window 17. The lip 59 is disposed on the inside of the lip 60 and is in contact with that surface of the portion 15 facing outwards from the vehicle, and has rigidly connected to it an appendix 62 extending along the portion 15 transversely to the plane of the window 17, and in contact with the outer side surface of the portion 17 so as to close a groove 63 which adjoins the groove 55 and extends along the curved portion 15. The interior of the groove 63 is snap-engaged by two ribs 64 extending from the appendix 62 parallel to the lips 59 and 60, and provided on the same side thereof as these latter in order to fix the channel 50 to the frame 13.

According to the modification shown in Figure 6, the curved portion 15 is provided with an axial groove 65 adjoining the groove 57, and provided in that surface of the portion 15 facing outwards from the vehicle. The groove 65 is snap-engaged by two axial ribs 66 extending from the lip 59 transversely to the plane of the window 17.

The described door 1 is assembled in three successive stages, of which the first consists of mounting all the devices housed in the cavity 10, mounting the window 17 and mounting the channels 49 and 50 on to the internal structure 2 while on the work bench, the second stage consists of connecting the external structure 3 to the vehicle body 4 while on the assembly line, and the third stage consists of connecting the internal structure 2, while on the assembly line, to the external structure 3, of which the hinges (not shown) for connection to the vehicle body 4 extend through transverse slots 67 provided in the rim 8 of the plate 5, and connecting the lock 42 to the relative bracket 43.

From the foregoing, it is apparent that the constructional, assembly and maintenance costs of the door 1 can be drastically reduced because of the simplicity of its structure, the possibility of preassembling all its internal members on the work bench, and the extremely small number of its component elements. In addition, the structure of the channels 49 and 50 not only enables the structure of the frame 13 to be simplified, but in particular enables the window 17 to be mounted substantially on the outside of the door 1 so as to substantially reduce to zero the formation of vortices which on known doors are due to the cavity defined by the window when in its closed position inside its frame.

### Claims

1. A motor vehicle door comprising an external structure and an internal structure, characterised in that said internal structure (2) comprises an upper frame (13) and a lower plate (5) integral with each other, and said external structure (3) comprises a substantially rigid panel (20) which can be hinged to a vehicle body (4) and is joined

- to said plate (5) in order to define a chamber (24) housing at least a window regulator device (32) for a mobile window (17) which closes an aperture (16) upperly defined by said frame (13);  
5 said window regulator device (32) being connected to said plate (5).
2. A door as claimed in claim 1, characterised in that said internal structure (2) is constructed in a single piece from moulded plastics.
- 10 3. A door as claimed in claim 1 or 2, characterised in that said panel (20) is constructed of internally stiffened plate.
4. A door as claimed in any one of the preceding claims, characterised in that said frame  
15 supports a connected guide channel (49, 50) for said window (17); said channel (49, 50) being rigidly connected to said frame (13) and covering that surface thereof which faces outwards from the motor vehicle.
- 20 5. A door as claimed in claim 4, characterised in that said channel (49, 50) is of substantially rigid plastics construction.
6. A door as claimed in claim 4 or 5, characterised in that said channel (49, 50) is  
25 snap-connected to said frame (13).
7. A door as claimed in claim 6, characterised in that said channel (49, 50) has a portion for connection to said frame (13) comprising two ribs disposed substantially as a V and snap-engaged  
30 in a relative seat provided along said frame (13).
8. A door as claimed in claim 7, characterised in that said seat is constituted by a groove (55, 63) that provided along a lateral surface of said frame (13) substantially transverse to said  
35 window (17).
9. A door as claimed in claim 7, characterised in that said seat is constituted by a groove (57, 65) provided along that surface of said frame which faces outwards.
- 40 10. A door as claimed in one of claims 4 to 9, characterised in that said frame (13) comprises a substantially vertical upright (14) and an arcuate portion (15) extending between the upper end of said upright (14) and said plate (5); said channel  
45 comprising a first portion (49) and a second portion (50) which extend along said upright (14) and along said arcuate portion (15) respectively, and having different cross-sections.
11. A door as claimed in claim 10,  
50 characterised in that said window (17) is provided along its substantially straight edge with a rib (40) which together with the periphery of the window (17) is slidably housed in a longitudinal seat (53) provided along said first channel portion (49) and  
55 having a substantially L cross-section.
12. A door as claimed in any one of the preceding claims, characterised in that said plate (5) has its lower rim (7) bent outwards and upwards to define an external protection fascia  
60 (30) for the lower portion of said panel (20).