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[33] **France**

[31] **97,915**

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Attorney—Stevens, Davis, Miller & Mosher

[54] **METHODS OF MANUFACTURING VEHICLE DOORS**

3 Claims, 14 Drawing Figs.

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 29/509, 49/378, 296/146

[51] Int. Cl..... B21d 51/00

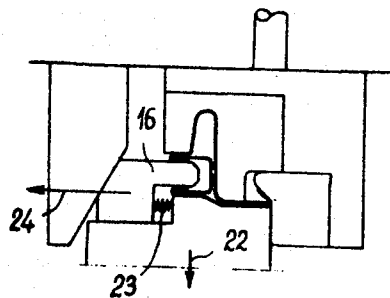
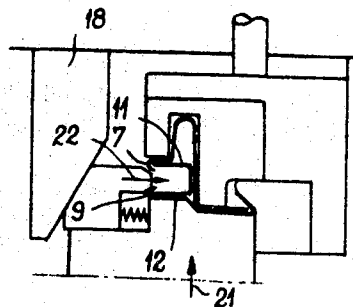
[50] Field of Search..... 29/509,
 470.5; 113/116 (C); 49/378; 296/146

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ABSTRACT: A method of manufacturing vehicle doors comprising a window and consisting of three sheet metal elements pressed or made of sections, said elements constituting the first one an external door panel in which the window opening is formed, the second one an internal box-sectional door element in which the window opening is also formed, and the third one a window frame consisting of channel sections, having their side flanges directed towards the middle of the opening. The edges of the window openings folded inwardly of the door are engaged in the frame and folded each against the internal face of the corresponding flange of the channel section, respectively, the peripheral edge of the external panel and box-sectioned element being subsequently folded on each other.



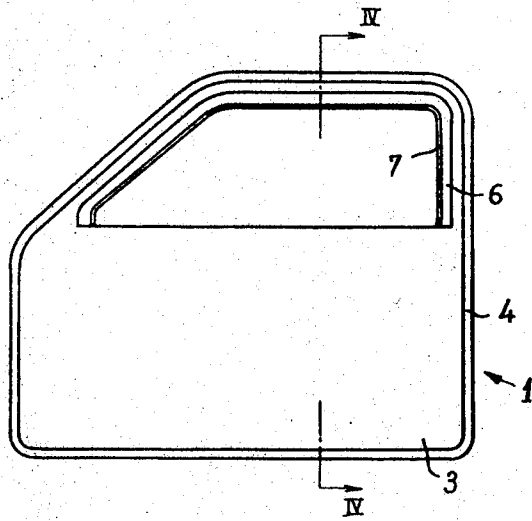


Fig-1

Fig. 2

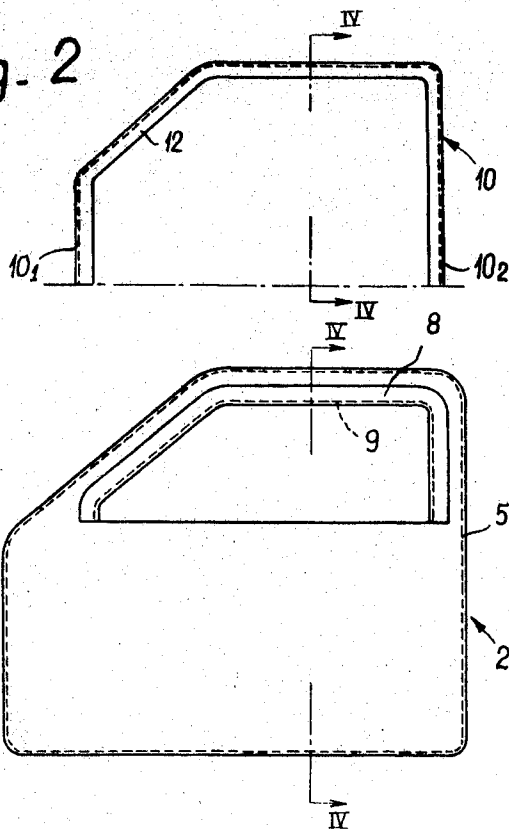


Fig-4

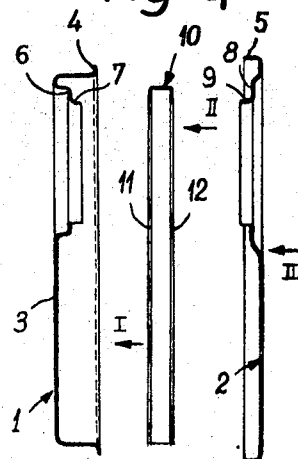


Fig-3

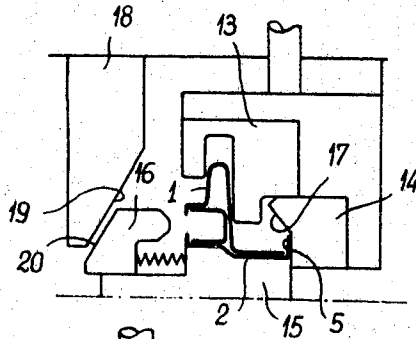


Fig-5

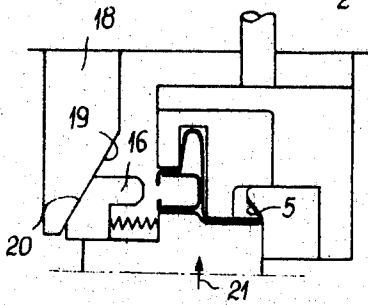


Fig-6

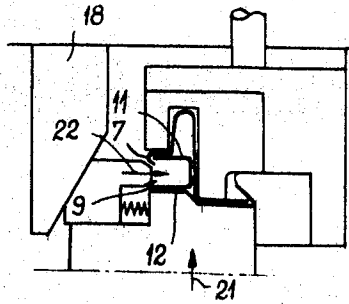


Fig-7

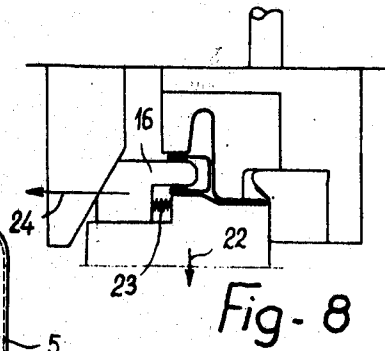


Fig-8

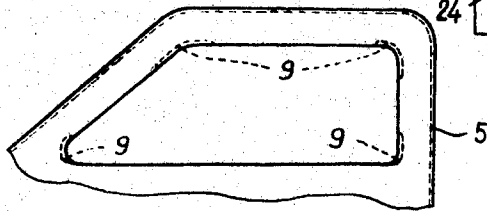


Fig-9

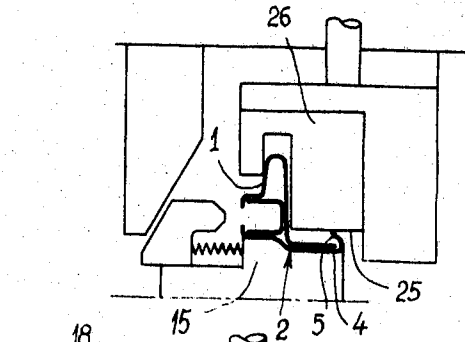


Fig. 10

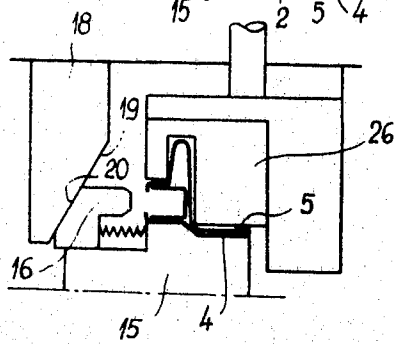


Fig. 11

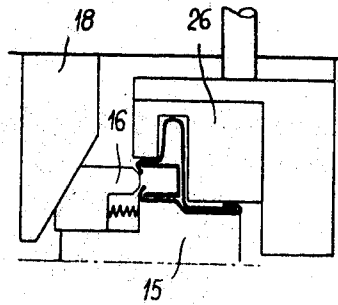


Fig. 12

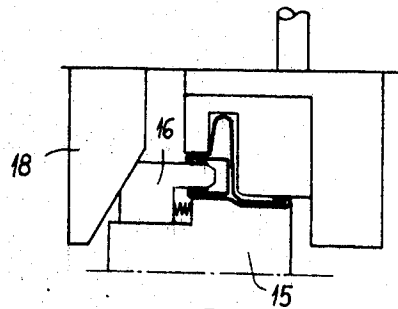


Fig. 13

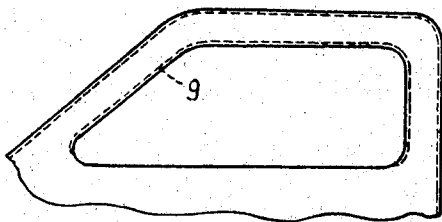


Fig. 14

METHODS OF MANUFACTURING VEHICLE DOORS

This invention relates to a method of manufacturing vehicle doors from sheet metal elements preshaped by pressing.

It is known that the doors of vehicles, especially those comprising a window opening, consist as a rule of a relatively great number of pressed parts assembled by welding. The manufacture of these doors is particularly costly due to the considerable capital investment required for making the necessary tool equipment.

The method of this invention avoids the chief drawback and provides, in a much simpler manner, vehicle doors having an improved mechanical strength. This method consists in manufacturing a door provided with a window opening from three pressed elements or sections constituting the one an external door panel in which the window opening is formed, the second element constituting the inner box-sectioned structure in which the window opening is also formed, the third element constituting a window frame provided with extensions for guiding the winding window, said third element consisting of channel sections having their side flanges directed toward the middle of the opening. The edges of the window openings are bent inwards of the door at right angles to the general plane of the door. To assemble the door, the panel and box-sectioned elements are applied against each other with the window frame interposed therebetween so that said bent edges of the window openings engage each the frame along each flange of the channel section, respectively. Said edges are each folded respectively against the inner face of the corresponding flange of the channel section by means of a crimping operation, while the peripheral edge of the outer panel element and of the box-sectioned element are also folded on each other.

To facilitate the crimping operation applied to said peripheral edges the peripheral edge of the external panel element may be flanged down in the same direction as the edge of said opening, so that it can fit over the peripheral edge of the box-sectioned element.

The general configuration of the external panel element and of the box-sectioned element, as well as the specific configuration of the peripheral edges and of the edges of the window openings which permits the assembling of these elements by crimping, are obtained without major difficulties by applying a single pressing operation to each element.

Advantageously the three elements mentioned hereinabove are assembled by crimping in two steps. During the first step the flanges of the channel section of said frame element are crimped into the flanged edges of the window openings but only at the corners of said openings, and simultaneously a pre-folding of one of the peripheral edges on the other edge is accomplished. In the second step the flanges of the remaining portions of the frame element are crimped while the flanging of one of the peripheral edges on the other edge is completed.

This invention is also concerned with other details and advantageous features which will appear as the following description proceeds with reference to the accompanying drawing illustrating diagrammatically by way of example a typical form of embodiment of the invention. In the drawing:

FIG. 1 is an elevational view showing a box-sectioned door element;

FIG. 2 shows a window frame element;

FIG. 3 shows a window frame element;

FIG. 3 is an elevational view showing an external door panel element;

FIG. 4 shows in side elevational view the three component elements of the door disposed in alignment prior to the assembling thereof;

FIGS. 5 to 8 inclusive are diagrammatic sectional views showing crimping tools in the different positions providing the first assembling step;

FIG. 9 shows one fraction of the door upon completion of the first assembling step;

FIG. 10 to 13 are diagrammatic sectional views showing the crimping tools in the various positions providing the second assembling step; and

FIG. 14 shows one fraction of the assembled door.

As a rule, and to simplify the disclosure, the openings and accessories for operating, closing and locking the door and its winding windows are omitted from the drawing, the same also applying to the joints, beading, and trim. Similarly, it is assumed in this example that the window is of the type adapted to receive a sliding pane or winding glass, and in this case the frame element is open to permit the passage of said glass and comprises downward extensions for guiding the glass. However, if desired, the window may also receive a fixed window pane, and in this case the frame element is closed at the bottom.

FIGS. 1, 3 and 4 show respectively the box-sectioned element 1 and the external panel element 2 of the door, as obtained from the pressing operation.

The bottom 3 of box-sectioned element 1 constitutes the inner panel of the door. The peripheral edge 4 of this box-sectioned element is bent outwardly in a plane substantially parallel to the general plane of the box-sectioned element. The peripheral edge 5 of the external panel 2 is bent inwardly of the door in a direction at right angles to the general plane of this panel.

The window opening is cut out in a flat-bottomed pressed element projecting inwardly of the box-sectioned element 1. The edge 7 of this opening (except for the lower horizontal portion thereof) is bent inwardly of the box-sectioned element in a direction substantially perpendicular to the bottom 6, as shown.

The window opening formed in the external panel 2 is also cut out from a flat-bottomed pressed part 8 and the edge 9 of this opening (except for the lower horizontal portion thereof) is bent substantially at right angles to the bottom 8, i.e. in the same direction as the peripheral edge.

The window frame 10 comprising lower extensions 10₁ and 10₂ consists of a channel section having its side flanges 11 and 12 directed substantially toward the middle of the window opening.

To perform the assembling operation the box-sectioned element 1 and the external panel 2 are so applied against each other, with the frame 10 interposed therebetween, that the edges 7 and 9 of the window opening each engage the frame along the edges of the flanges 11 and 12 respectively, the bottoms 6 and 8 of the pressed portions engaging said flanges 11 and 12 respectively, while the peripheral edge 4 of box-sectioned element 1 fits into the peripheral edge 5 of the outer panel element 2.

It will be readily understood by those conversant with the art that all necessary accessories (not shown) such as gussets, reinforcing members, supports, brackets, hinge elements, inter alia, have been secured beforehand to the corresponding element.

The three elements 1, 2 and 10 are then disposed between the press tools illustrated in FIG. 5.

These tools consist of a movable block 13 rigid with a folding member 14, these two members being disposed in front of the box-sectioned element, of a die 15 receiving the external panel thereon, and of a punch 16 slideably mounted on the die 15 for movement in a direction parallel to the plane of the window frame and oriented towards the opening formed between the two flanges of the channel section. The folding member 14 has an operative surface 17 consisting of a plane inclined by about 45° in relation to the plane of the door, under which the edge 5 of the external panel 2 is disposed as shown.

Power means (not shown) capable of imparting a movement of translation and consisting for example of cylinder piston actuators are provided for moving the movable block 13 towards and away from the die 15, and to move these two members jointly in one of the two directions in relation to the fixed frame structure of the press (not shown).

Finally, a frame structure element comprises a cam member 18 having an oblique or skew operative surface 19 adapted to coact with a corresponding sliding or rolling member 20 rigid with the punch 16 in such a way that during the upward move-

ments of the die in relation to said frame structure, said member 20 engages the surface 19 and thus causes the punch 16 to slide in the direction of the opening or bottom of said channel section.

The above-described device operates as follows during the first crimping stages:

Referring to FIG. 5, it will be seen that the three door elements 1, 2 and 10 are positioned between the die 15 and movable block 13.

During the movement of these two tool elements towards each other the skew operative surface 17 of the folding member 14 slides along the peripheral edge 5 and folds same by about 45°

As clearly shown in FIG. 6 the three door elements are then rigidly maintained between the movable block 13 and die 15. In this position the complete movable tool receives a movement of translation in the direction of the arrow 21, during which the cam 18 engages the corresponding slide member 20 rigid with punch 16 and moves the latter into the space provided between the flanges 11 and 12 of the frame element, i.e. in the direction of the arrow 22 (FIG. 7).

FIG. 8 illustrates the manner in which the punch 16 completes the folding of the edges 7 and 9 of the opening against the inner face of flanges 11 and 12. To remove the door, it is only necessary to lower the die 15 in the direction of the arrow 22. A suitable return member 23 such as a spring urges the punch 16 away from the channel section, i.e. in the direction of the arrow 24. As clearly shown in FIG. 9, only the corners of the window opening, or the portions adjacent thereto, are crimped during this first crimping step.

The second step is performed by using a tool differing from the preceding one only by the fact that the folding member having an oblique working face is replaced by a working surface 25 substantially parallel to the general plane of the door (see FIG. 10.) Thus, when the movable block 26 and the die 15 are moved towards each other the peripheral edge 4 of the outer panel 2 is folded against the peripheral edge 4 of box-sectioned element 1 (FIG. 11).

As in the first step the punch 16 engages the gap formed between the flanges 11 and 12 of the window frame while the movable block 26 and die 15 perform jointly their movement of translation. During this movement the cam 18 engages the slide member 20 rigid with punch 16 (FIGS. 11, 12 and 13) which completes the crimping on the right-hand portions of the window frame (FIG. 14).

Although the above description and the attached drawing refer essentially to an exemplary form of the embodiment of the present invention, it will readily occur to anybody conversant with the art that various modifications and variations may be brought thereto without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. A method of manufacturing vehicle doors having a window and consisting of three stamped metal elements, the first element constituting the external door panel in which a window is formed, the second element constituting the internal box section panel in which a window opening is formed, the third element constituting a window frame between the panels having channel sections in which the side flanges thereof are directed towards the center of the window openings, including the steps of folding the edges of said window openings inwardly of the door at right angles to the general plane of the

door, applying the first and second elements against each other while interposing the third element therebetween, folding the window opening edges each against the internal face of the corresponding flange of a channel section by a crimping operation, folding the peripheral edges of the first and second elements on each other by a crimping operation, folding the peripheral edge of said second element outwardly in a plane substantially parallel to the general plane of said second element, folding the peripheral edge of said first element inwardly of the door in the same direction as the edge of the window opening, and simultaneously folding said peripheral edges and the edges of the window openings on said first and second elements by a single pressing operation.

2. A method of manufacturing vehicle doors comprising a window and consisting of three stamped sheet metal elements forming the external door panel in which the window opening is formed, the internal box-sectioned door panel in which the window opening is also formed, and inbetween said panels a window frame in which the channel sections have their side flanges directed towards the middle of the opening, including the steps of assembling the frame and the panels so that the frame element is engaged, along each flange of the channel section, between corresponding peripheral flanges of the window opening of the outer and inner panels, the opposite flange of said panels being directly applied against each other, crimping the flanges of said channel section in the corner portions of the frame element while performing the preliminary bending of one of the peripheral edges on the other element in one single pressing operation, and crimping the flanges of the remaining portion of the frame element while completing the folding of one of the peripheral edges on the other element in one single pressing operation.

3. A method of manufacturing vehicle doors as set forth in claim 2, in which the two crimping stages in the assembly of the three superposed elements include the steps of clamping the assembly between a movable block rigid with a folding member, said block and said member being disposed on the same side of the box-sectioned element, and a movable die disposed on the side of said external panel element and having mounted thereon a punch adapted to slide in a direction parallel to the plane of said window frame element, moving said elements with said movable block, said die and said punch in a direction at right angles to said frame element with a movement of translation relative to a cam provided with an oblique working surface in relation to the direction of said relative movement, said oblique cam surface engaging a corresponding slide member rigid with the punch, folding the edges of said window opening against the inner faces of the channel section during said movement of translation by causing said punch to slide in the direction of the opening of said channel section element and engage said last-named opening while during said first stage the peripheral edge of said external panel element is prefolded as said movable block and said die are moved towards each other as a consequence of the action exerted by a working face provided on said folding member, and folding completely during said second stage said prefolded peripheral edge on the edge of said box-sectioned element by using tool means in which said folding member formed with an oblique working face is replaced by a folding tool having its working face disposed at right angles to the direction of said relative movement.

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