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DRAIN HOLE SEAL

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FIG. 1

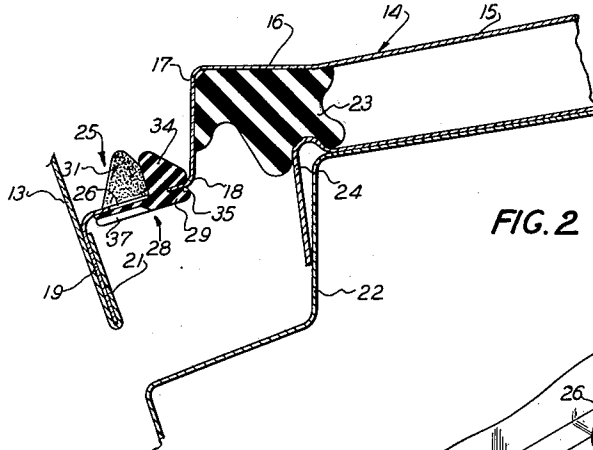
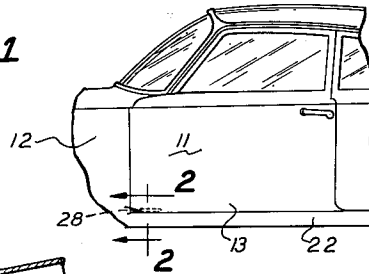


FIG. 2

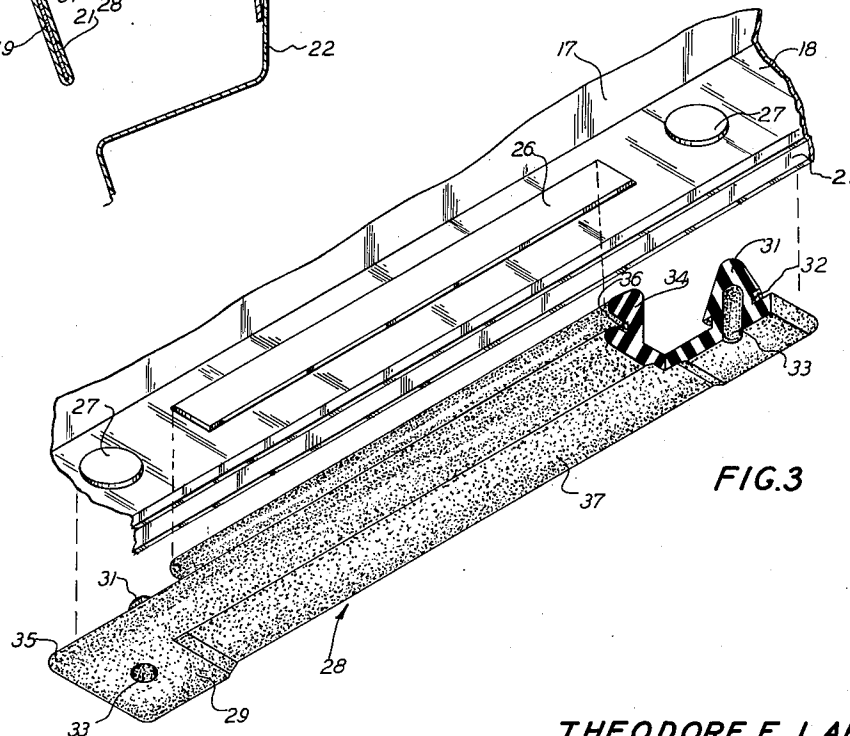


FIG. 3

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DRAIN HOLE SEAL

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This invention relates to an improved valve device for sealing drain holes located at the bottom of vehicle doors or the like.

Most vehicle doors are provided with a window which may be lowered or raised through an elongated opening or slot into or out of a window well between the inner and outer panels covering the door frame structure. The space or gap between the window and the opening or slot edges cannot effectively be sealed to prevent the entry of water into the window well. A tight enough seal would not be exerted through the ordinary window regulator mechanism to lower or raise the window.

Since water cannot be kept out, it is necessary to provide drain holes at the bottom of the door structure. The provision of the drain holes results in an undesirable after-effect. As the vehicle is driven about, the flow of air over the vehicle body creates a low pressure condition across any body openings, such as the window well opening. The window well is thus placed under a slight vacuum. The drain hole or holes then become an undesirable port of entry for road dust or other foreign matter. Under extreme conditions, the dust drawn into the window well space may be drawn through the door structure into the passenger compartment. In any event, after a period of time the dust drawn through the drain holes coats the various mechanism within the door structure causing an abrasive action between moving parts. It also has been found that the dust will build up around the drain holes eventually causing them to become clogged.

It is an object of the present invention to provide a flap type valve which will inhibit the entry of dust into the space between the inner and outer panels of the door structure while permitting the drain holes to function in a normal manner in draining the water from this space. It is a further object of the present invention to provide a flap valve which is relatively inexpensive to manufacture, easily installed and highly efficient in its operation.

The flap valve embodying the present invention comprises an elongated resilient member adapted to cover a preferably rectangularly shaped drain hole in a bottom sheet metal trough section of a door frame structure. The resilient member is somewhat longer than the drain hole and is provided at each of its ends with an upwardly projecting snap-in type stud. The sheet metal trough section of the door frame structure is provided with suitable stud receiving apertures positioned to receive the snap-in studs to retain the resilient member in drain hole spanning position. Intermediate its ends the resilient member is provided along one of its longitudinal edges with a slotted lip portion adapted to fit over one longitudinal edge of the drain hole. The engagement of the slotted lip portion with the drain hole edge provides support for the intermediate portion of the resilient member and also provides a hinge about which the resilient member is able to swing or flex in drain hole opening direction.

Other objects and features of construction of the valve device embodying the present invention will become more apparent from the following description and accompanying drawings in which:

FIG. 1 is a fragmentary side elevational view of a vehicle body incorporating the present invention;

FIG. 2 is a sectional view taken substantially on the

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line 2—2 of FIG. 1 looking in the direction of the arrows; and

FIG. 3 is a fragmentary isometric view showing the flap valve disassembled.

Referring now to the drawings, the flap valve device embodying the present invention is illustrated as applied to the door 11 of a vehicle body 12. The door 11 comprises an outer panel, of which the bottom portion 13 is seen in FIG. 2, and a substantially parallel inner panel (not shown) which is in spaced relation to the outer panel to provide the usual window well receiving the door window and containing the usual mechanisms, such as the window regulator mechanism and the latch mechanism and its operators. The inner and outer panels are joined at the bottom edges by a transverse jamb member, generally designated 14.

In the door section, a fragmentary portion of which is illustrated in FIG. 2, the jamb member 14 comprises an outwardly turned stepped flange or integral extension of the inner panel. The jamb member 14 is provided with a slightly downwardly inclined section 15 which levels off into a substantially horizontal shelf portion 16. The shelf portion 16 is provided with a downwardly bent flange 17 terminating in an outwardly bent and slightly downwardly inclined flange forming a jamb rail 18. The flange or jamb rail 18 terminates in a pinch weld flange 19 over which the edge portion 21 of the outer panel bottom portion 13 is crimped to secure the inner and outer door panels together.

In closed position of the vehicle door the jamb member 14 overlies a complementary formed rocker panel or body rail section 22. A suitable weatherstrip 23 is carried by the jamb member 14 at the juncture of shelf portion 16 and flange 17. The weatherstrip 23 engages the opposed corner 24 of the rocker panel 22 in door closed position.

Although the construction and arrangement of the bottom portion of the vehicle door may take other forms than that illustrated in the drawing and described hereinabove, it is preferable that a place be provided for water to accumulate. In the illustrated structure this is the trough, generally designated 25, formed by the bottom portion 13 of the outer door panel, the flange or jamb rail 18 and the flange 17. Any water finding its way into the interior of the door frame structure will accumulate in the trough 25. One or more drain holes are provided in the jamb rail 18 to permit the water to drain out of the trough.

In accordance with the preferred embodiment of the invention, the drain hole, herein designated 26, is preferably an elongated rectangular opening having its longitudinal axis extending longitudinally of the door. It will be noted that the jamb rail 18 is provided with two additional apertures 27. The apertures 27 are preferably small circular holes, each of which is located in spaced relationship to a respective end of the drain hole 26.

To prevent road dust or other foreign matter from being drawn up into the door frame structure by a vacuum condition which may be created by air stream movement across the window opening in the door, a flap valve, generally designated 28, is provided. The flap valve 28 comprises an elongated strip-like flexible member or main body portion 29 preferably molded of butyl rubber or material of similar characteristics.

The flexible member 29 is somewhat longer and slightly wider than the drain hole 26, as best seen in FIG. 3. At each end it is provided with snap-in type studs 31 projecting upwardly from the face of the flexible member which is to lie in contact with the exterior surface of the jamb rail 18. The snap-in studs are preferably integrally molded to the flexible member 29 and are substantially conical in shape. The base of each stud 31 is

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somewhat greater in diameter than a circular aperture 27 and is undercut at 32 to provide a retention shoulder. As will be understood, the studs 31 are adapted to be pushed through respective apertures 27 to retain the flexible member 29 in drain hole spanning position.

The studs 31 may be cored out, as at 33, to make them partially hollow and therefore more easily collapsible as they are forced through the apertures 27.

Between the studs 31, the flexible member 29 is provided with an upstanding flange or lip 34 along one of its longitudinal edges 35. The flange or lip 34 is provided with a longitudinally extending outwardly facing slot 36.

The center distance between studs 31 is slightly less than the center distance between apertures 27. When the flexible member is assembled to the jamb rail 18, the flexible member 29 will be slightly stretched so as to be placed under slight tension. Accordingly, the length of the lip or the flange 34 is such that it does not, in the stretched condition of the flexible member 29, exceed the length of the drain hole 26. The width of the slot 36 is such that it will slip freely over a longitudinal edge of the drain hole when being placed in position. Upon the flexible member 29 being stretched slightly as the studs 31 are engaged in the respective apertures 27, the width of the slot 36 will decrease slightly causing the side walls of the slot to grip the abutting surfaces of the sheet metal at the drain hole edge.

As best seen in FIGS. 2 and 3, it will be noticed that the flexible member 29 is provided with a substantial section thereof of less thickness than the remainder of the flexible member. This thinner section is formed by recessing the bottom face of the flexible member. The length and width of the recess section 37 correspond substantially to the length and width of the drain slot beneath which it lies when the flap valve 28 is assembled or mounted on the underface of the jamb rail 18.

The interengagement of the slot 35 in the flange or lip 34 with the sheet material at the edge of the drain hole is effective to provide a hinge about which the flexible body 29 may swing or flex slightly under the weight of any water which might be accumulated in the trough to permit the water to escape through the drain hole. The recessed section 37 of the body member provides an area of increased flexibility ensuring sufficient deflection to permit the escape of such water. The area of increased flexibility also ensures that whenever a vacuum condition is created within the door frame structure, the flap valve 28 will be drawn tightly up against the underside of the jamb rail 18 to close off the drain hole 26.

It will be understood that the invention is not to be limited to the exact construction shown and described, but that various changes and modifications may be made without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. A flap valve for attachment to a sheet metal trough structure having a drain hole in a wall thereof, said valve comprising an elongated resilient member having end portions overlapping the sheet metal surfaces adjacent the drain hole edges, fastening means securing each overlapping end of said resilient member to an exterior surface of said wall to retain said resilient member in drain hole spanning position, and flange means extending along one longitudinal edge of said resilient member projecting through said drain hole, said flange means being provided with a longitudinally extending receiving means along one longitudinal edge of said drain hole, said flange means hingedly supporting said resilient member at said one longitudinal edge of said drain hole.

2. A flap valve for attachment to a sheet metal trough structure having a drain hole in a wall thereof, said valve comprising an elongated resilient member having end portions overlapping the sheet metal surfaces adjacent the drain hole edges, integral stud means carried on each

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overlapping end of said resilient member securing the latter to an exterior surface of said wall in drain hole spanning position, and integral flange means extending along one longitudinal edge of said resilient member and terminating at each end thereof inwardly of said stud means, said flange means projecting through said drain hole, said flange means being provided with a longitudinal slot receiving the sheet metal along one longitudinal edge of said hole to hingedly support said resilient member between said overlapping ends thereof at said one longitudinal edge of said hole.

3. A flap valve for attachment to a sheet metal trough structure having a drain hole in a wall thereof and stud receiving apertures spaced from each end thereof, said valve comprising an elongated resilient member having end portions overlapping said apertures, integral stud means projecting through said apertures carried on each overlapping end of said resilient member securing the same to said exterior surface in drain hole spanning position, the distance between said stud means being less than the distance between said stud receiving apertures whereby said resilient member is under tension when in said position, and integral flange means extending along one longitudinal edge of said resilient member and terminating at each end thereof inwardly of said stud means, said flange means projecting through said drain hole, said flange means being provided with a longitudinal slot receiving the sheet metal along one longitudinal edge of said hole to hingedly support said resilient member between said overlapping ends thereof at said one longitudinal edge of said hole.

4. In combination, an automobile door having sheet metal panel members forming a trough structure, said trough structure having a bottom wall provided with a drain hole and apertures spaced from each end of said drain hole, a flap valve attached to the exterior surface of said bottom wall, said flap valve comprising an elongated resilient member having end portions overlapping said apertures, fastening means carried on each overlapping end projecting through said apertures to retain said resilient member in drain hole spanning position, and flange means extending along one longitudinal edge of said resilient member and projecting through said drain hole, said flange means being provided with a longitudinally extending receiving means receiving a longitudinal edge of said drain hole, said flange means thereby hingedly supporting said resilient member between said fastening means.

5. In combination, an automobile door having sheet metal panel members forming a trough structure, said trough structure having a bottom wall provided with a drain hole and apertures spaced from each end of said drain hole, a flap valve attached to the exterior surface of said bottom wall, said flap valve comprising an elongated resilient member having end portions overlapping said apertures, fastening means projecting through said apertures connecting each overlapping end to said bottom wall to retain said resilient member in drain hole spanning position, and flange means extending along one longitudinal edge of said resilient member and projecting through said drain hole, said flange means being provided with a longitudinally extending receiving means receiving a longitudinal edge of said drain hole, said flange means thereby hingedly supporting said resilient member between said fastening means.

6. In combination, an automobile door having sheet metal panel members forming a trough structure at the bottom thereof, said trough structure having a bottom wall provided with a drain hole and apertures spaced from each end of said drain hole, a flap valve attached to the exterior surface of said bottom wall, said flap valve comprising an elongated resilient member having end portions overlapping said apertures, integral fastening means carried on each overlapping end projecting through said apertures to retain said resilient member in

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drain hole spanning position, the distance between said fastening means being less than the distance between said apertures whereby said resilient member is under tension when in said position, and integral flange means extending along one longitudinal edge and projecting through said drain hole, said flange means being provided with a longitudinal slot receiving the adjacent longitudinal edge of said drain hole, said flange means thereby hingedly supporting said resilient member between said fastening means.

7. In combination, an automobile door having sheet metal panel members forming a trough structure at the bottom thereof, said trough structure having a bottom wall provided with a drain hole and apertures spaced from each end of said drain hole, a flap valve attached to the exterior surface of said bottom wall, said flap valve comprising an elongated resilient member having end portions overlapping said apertures, integral fastening means carried on each overlapping end projecting through said apertures to retain said resilient member in drain hole spanning position, the distance between said

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fastening means being less than the distance between said apertures whereby said resilient member is under tension when in said position, and integral flange means extending along one longitudinal edge and projecting through said drain hole, said flange means being provided with a longitudinal slot receiving the adjacent longitudinal edge of said drain hole, said flange means thereby hingedly supporting said resilient member between said fastening means, said resilient member being provided with a recessed portion to provide an area of increased flexibility underlying the drain hole.

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