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SEALING MEANS FOR A DRAIN OPENING

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FIG. 2

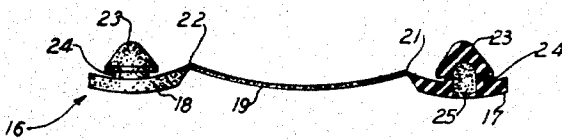
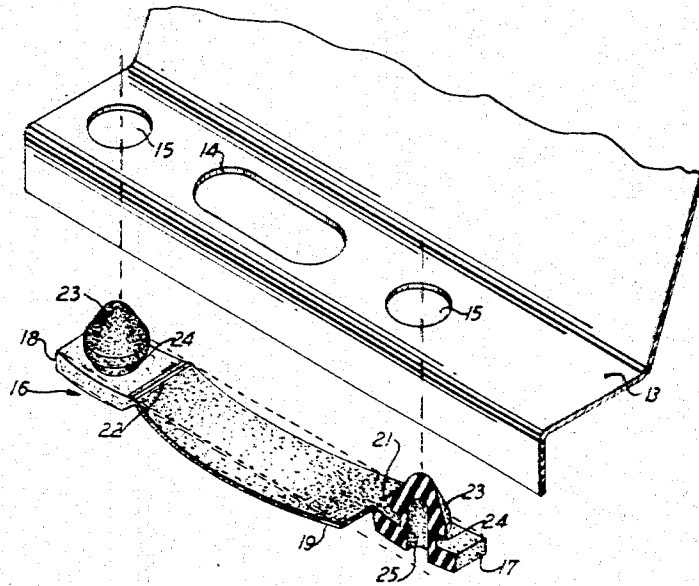


FIG. 3

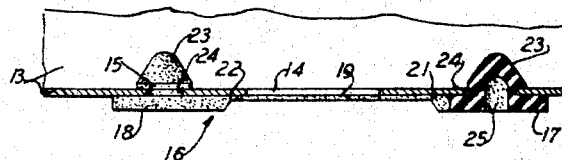


FIG. 4

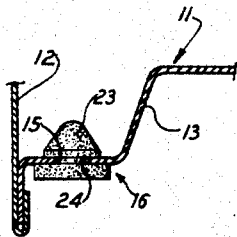


FIG. 1

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SEALING MEANS FOR A DRAIN OPENING

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This invention relates to an improved sealing means for drain openings, and more particularly to a valve-type sealing device for sealing a drain hole located near the bottom of a vehicle body structure.

In current automotive vehicle construction, the doors and body wall structures comprise outer and inner sheet metal panels or members, one or both of which may be provided with a peripheral flange to which the peripheral edge or flange of the other is seam welded. This results in the creation of interior spaces between the panels which at the bottom are very frequently troughlike in form. At times, these interior spaces are provided with openings to permit the retraction of windows therein or to provide accessibility to mechanisms housed between the panels. Water cannot be prevented from entering these openings. Since the water cannot be kept out, it is necessary to provide drain openings at the troughlike bottom of the interior spaces to prevent the accumulation of water between the panels.

The provision of drain holes results in an undesirable condition. When the motor vehicle is being driven, the flow of air passing over the vehicle body creates a low pressure condition across the openings and places the interior spaces under a slight vacuum. Dust and other foreign matter may be drawn in through the drain holes to eventually enter the vehicle body and cause discomfort to the passengers or to settle on mechanisms mounted between the panels so as to interfere with their operation.

Various drain valves and sealing devices are known in the art. These usually include a resilient diaphragm portion that is placed in sealing engagement with the surfaces adjacent the edges of the drain hole. Such devices act as check valves that allow the drainage of water from the interior spaces but inhibit the entry of dust into the vehicle body.

In most sealing devices of this type, it has been found that their sealing effectiveness is substantially diminished after a few months of use, thus requiring their replacement. The diaphragm portion loses its resiliency and assumes an elongated, stretched condition so that it is no longer in sealing engagement with the wall surface adjacent the drain holes. Further, when the resilient diaphragm portion has become elongated so that it extends below the wall surface of the vehicle body, it can be easily damaged by rocks or stones kicked up by the wheels of the vehicle.

Accordingly, it is an object of the present invention to provide a novel valve-type sealing means wherein provision is made so that the water may drain through a drain hole from the trough-like interior of the body structure while maintaining the drain hole closed against the entry of foreign matter from the exterior thereof.

A further object is to provide an inexpensive, durable, readily installable valve for motor vehicles which will remain effective as a seal for an extended period of time.

The sealing device embodying the present invention is attachable to an exterior wall surface of a troughlike structure having a drain hole therein. The sealing device comprises a flexible valve portion and a bowed mounting portion contiguous to each end of the flexible valve portion. The flexible valve portion is adapted to overlap the wall surfaces adjacent the edges of the drain hole and maintain the drain hole closed against entry of foreign

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matter into the troughlike structure from the exterior thereof, but permits the opening of the drain hole in response to pressure exerted from the interior of the troughlike structure against the flexible valve portion. The bowed mounting portions are straightened when the sealing device of this invention is attached to the exterior surface. The resistance to this straightening action results in the entire contact face of the flexible valve portion being forced towards the wall surfaces adjacent the edges of the drain hole to effect sealing engagement therebetween.

Other objects and features of the present invention will be made more apparent as this description proceeds, particularly when considered in connection with the accompanying drawings, wherein:

FIGURE 1 is a fragmentary, vertical transverse section of a door panel of a vehicle body depicting the sealing device of this invention attached to the bottom surface of a door jamb member;

FIGURE 2 is an exploded perspective view, partially in section, of the sealing device of FIGURE 1, and also shows a door jamb member provided with a drain opening and fastening apertures;

FIGURE 3 is a side elevational view, partially in section, of the sealing device of FIGURE 1 shown before it is mounted to the door jamb member; and,

FIGURE 4 is a sectional view showing the sealing device installed in the door jamb member of the motor vehicle.

While it will be apparent from the following description that the sealing device of this invention may be used in many places in an automotive vehicle body, the disclosed embodiments are shown mounted, for illustrative purposes only, on the exterior bottom surface of a troughlike structure formed by the assembly of a door jamb member to an upwardly extending portion of a door panel of an automotive vehicle.

Referring now to the drawings, especially to FIGURES 1 and 2, there is seen a portion of a door panel assembly 11 of a vehicle body having a substantially vertically extending outer panel 12 and an inwardly extending stepped door jamb member 13 welded thereto to define a troughlike structure. The lower horizontally extending surface of the door jamb member 13 is provided with an elongated oval-shaped drain hole 14 having its main axis extending longitudinally of the vehicle body as best seen in FIGURE 2. Two apertures 15 are provided in the door jamb member 13, each of which is located in a spaced, longitudinal relationship to each end of the drain hole 14.

A sealing device of this invention, generally designated 16, is readily attachable to the downwardly facing external surface of the door jamb member 13. The sealing device 16, upon being attached, is constructed to maintain the drain hole 14 closed against entry of foreign matter into the troughlike structure from the exterior thereof but adapted to open outwardly in response to pressure thereagainst exerted by water accumulated in the interior of the troughlike structure, as hereinafter discussed.

The sealing device 16 comprises a pair of mounting portions 17 and 18 having a rectangular-shaped flexible diaphragm portion 19 disposed therebetween and integrally formed therewith. The diaphragm portion 19 is substantially thinner in cross section than the mounting portions 17 and 18 and covers an area larger than the area of the drain hole 14.

The mounting portions 17 and 18 are of a bowed or concavo-convex configuration when not attached to the vehicle body, as best seen in FIGURE 3. The concave surface of the concavo-convex mounting portion 17 has a laterally extending edge 21 which adjoins one end of the diaphragm portion 19. The other end of the diaphragm portion 19 is contiguous to the laterally extending edge 22

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of the concave surface of the other mounting portion 18. The convex surfaces of mounting portions 17 and 18 taper down towards the edges 21 and 22 of their respective concave surfaces.

Snap-in studs 23 are provided which are preferably integrally molded with each mounting portion 17 and 18. The studs 23 are substantially conical in shape with the base of each stud 23 being somewhat greater in diameter than the apertures 15. Each stud 23 has an undercut 24 to provide a retention means for the sealing device 16. The studs 23 are adapted to be projected through the respective apertures 15 to attach the sealing device 16 to the door jamb member 13. A core 25 in each stud 23 makes them partially hollow and, therefore, more easily collapsible when the studs 23 are forced through the apertures 15. The apertures 15 in the door jamb member 13 are a greater distance apart than the distance between the studs 23 when the sealing device 16 is in its noninstalled position as seen in FIGURES 2 and 3.

Upon projecting the base of each stud 23 through the respective apertures 15, the diaphragm portion 19 will be stretched so as to place it under tension in a drain hole spanning position. Also, as the undercut 24 of each stud 23 is positioned within the apertures 15, the concave surfaces of the mounting portions 17 and 18 abut the bottom exterior wall surface of the door jamb member 13. This will cause the bowed mounting portions 17 and 18 to be straightened or placed in a flattened condition. This establishes a substantial coplanar relationship between the concave surfaces of the bowed mounting portions 17 and 18 and the surface of the diaphragm portion 19 in contact with the exterior wall surface. This causes the sealing surface of the diaphragm portion 19 to be held in a flush or sealing abutment relationship with the bottom wall surface adjacent the drain hole edges, as best seen in FIGURE 4.

The relatively heavy thickness of the resilient mounting portion assures that the pressure exerted on the diaphragm portion 19 will not be substantially diminished even after an extended period of time.

From the foregoing description it can be seen that the diaphragm valve portion 19 of the sealing device 16 will be held in a tight sealing relationship with the external surface of the troughlike structure adjacent the edges of the drain hole while the vehicle is in motion or standing still. Also, as the diaphragm valve portion 19 is formed from a relatively thin, flexible membrane, it will flex slightly intermediate the edges 21 and 22 as seen in FIGURE 2 to drain under pressure exerted by water accumulated in the troughlike structure. This will permit accumulated water to drain from the troughlike structure through the drain hole 14 to the exterior of the vehicle body. When there is no water in the troughlike structure, the drain hole spanning diaphragm portion 19 is maintained in sealing abutment with the exterior surface to prevent the entry of foreign matter into the troughlike structure from the exterior of the vehicle body.

It will be understood that this 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.

I claim:

1. A sealing means in combination with a flat wall of a troughlike structure with a drain hole in said wall, said means comprising a flexible valve portion and at least one bowed mounting portion adjoining an edge of said flexible valve portion, said flexible valve portion adapted to overlap the wall surfaces adjacent the edges of said drain hole, said bowed mounting portion being straightened when said sealing device is mounted on said wall thereby causing pressure to be exerted on said edge of the flexible valve portion to normally maintain the valve portion in a flush relationship with the wall surface adjacent the edges of said drain hole to maintain the latter closed against entry

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of foreign matter into said troughlike structure from the exterior thereof, said flexible valve portion being adapted to be flexed away from the wall surfaces adjacent the edges of said drain hole in response to pressure thereagainst exerted from the interior of said troughlike structure.

2. A sealing device in combination with a flat wall of a troughlike structure with a drain hole in said wall, said device comprising a flexible valve portion and bowed mounting portions contiguous to each end of said flexible valve portion, said bowed mounting portions being substantially thicker than said flexible valve portion, said flexible valve portion having a contact face adapted to overlap the wall surfaces adjacent the edges of said drain hole, said bowed mounting portions being straightened upon mounting said sealing device on said wall, the resistance to said straightening action forcing the contact face of said flexible valve portion towards the wall surfaces adjacent the edges of the drain hole to maintain the flexible valve portion in sealing abutment therewith, said flexible valve portion being adapted to be flexed away from the wall surfaces adjacent the edges of said drain hole in response to pressure thereagainst exerted from the interior of said troughlike structure.

3. A sealing valve in combination with a flat wall of a troughlike structure with a drain hole in said wall, said valve comprising a flexible diaphragm portion having a sealing face and a pair of bowed mounting portions with said diaphragm portion disposed therebetween, each bowed mounting portion having one edge in common with each end of said flexible diaphragm portion, said sealing face of the flexible diaphragm portion being adapted to overlap the wall surfaces adjacent the edges of said drain hole, said pair of bowed mounting portions being straightened upon mounting said valve on said wall thereby exerting a pressure on each end of said diaphragm portion to force said sealing face of said flexible diaphragm portion towards said wall surfaces adjacent the edges of the drain hole to maintain the flexible diaphragm portion in sealing abutment therewith, the surfaces of said pair of bowed mounting portions and the sealing face of said flexible diaphragm portion in abutment with said wall being in a substantially coplanar relationship, said diaphragm portion being adapted to be flexed away from the wall surfaces adjacent the edges of said drain hole in response to pressure thereagainst exerted from the interior of said troughlike structure.

4. A sealing valve in combination with a flat wall of a troughlike structure with a drain hole in said wall, said valve comprising a flexible diaphragm portion adapted to contact said wall in a plane, a pair of resilient mounting portions integrally formed with said diaphragm portion, one edge of each mounting portion being contiguous to each end of said diaphragm portion, said flexible diaphragm portion being adapted to overlap the wall surfaces adjacent the edges of said drain hole, fastening means for securing the valve to said wall, said pair of mounting portions being bowed and having a substantially uniform cross section, said pair of mounting portions being straightened upon securing said valve to said wall to place said mounting portions in a coplanar relationship with said diaphragm portion, the resistance to said straightening action forcing the plane of contact of said diaphragm valve portion towards the wall surfaces adjacent the edges of the drain hole to maintain the diaphragm valve portion in sealing abutment therewith, said diaphragm portion being adapted to be flexed away from said wall surface adjacent at least one of said drain hole edges in response to pressure thereagainst exerted by water in the interior of said troughlike structure.

5. A sealing device in combination with a flat wall of a troughlike structure with a drain hole in said wall, said device comprising a thin flexible diaphragm portion having a sealing surface and a pair of bowed mounting portions having a thickness greater than said diaphragm

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portion, each bowed mounting portion adjoining one end of and integrally formed with said diaphragm portion, said sealing surface of the diaphragm portion being adapted to overlap the wall surfaces adjacent the edges of said drain hole, fastening means for securing said pair of mounting portions to said wall surfaces and maintaining said diaphragm portion in the drain hole spanning position, said bowed mounting portions being straightened upon securing the latter to said wall surface, the resistance to said straightening action forcing the sealing surface of said diaphragm portion into sealing abutment with the wall surfaces adjacent the edges of said drain hole, said diaphragm portion being adapted to be flexed away from said wall surface adjacent at least one of said drain hole edges in response to pressure thereagainst exerted by water in the interior of said troughlike structure.

6. A sealing valve in combination with a troughlike structure having a drain hole and a pair of apertures in a flat wall thereof, one aperture spaced from each end of said drain hole, said valve comprising a flexible diaphragm portion integrally formed with a pair of resilient concavo-convex shaped mounting portions, one edge of the concave surface of each of said mounting portions being in common with one end of one surface of said flexible diaphragm portion, said one surface of the flexible diaphragm portion being adapted to overlap the wall surfaces adjacent the edges of said drain hole, fastening means carried by said concavo-convex mounting portions, the distance between said fastening means being less

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than the distance between said pair of apertures, said fastening means upon projecting through said apertures mounting said valve to said wall and maintaining said diaphragm portion under tension in a drain hole spanning position, said concavo-convex mounting portions being resiliently straightened upon projecting said fastening means through said apertures to effect a substantial coplanar relationship between said concave surfaces of said mounting portions and said one surface of the diaphragm portion thereby forcing the latter into sealing abutment with the wall surfaces adjacent the edges of said drain hole, said diaphragm portion being flexed away from the wall surface adjacent at least one of said drain hole edges in response to pressure thereagainst exerted by water in the interior of said troughlike structure.

7. The sealing valve as described in claim 6 and which is further characterized in that said fastening means is integrally formed with said concavo-convex mounting portion and extends outwardly from the concave surface of said mounting portions.

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