

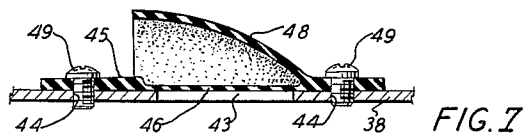
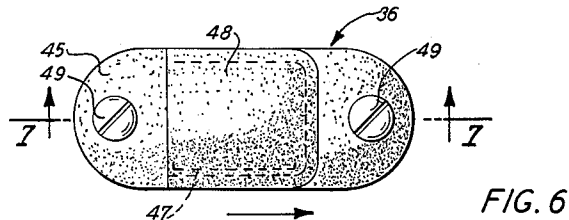
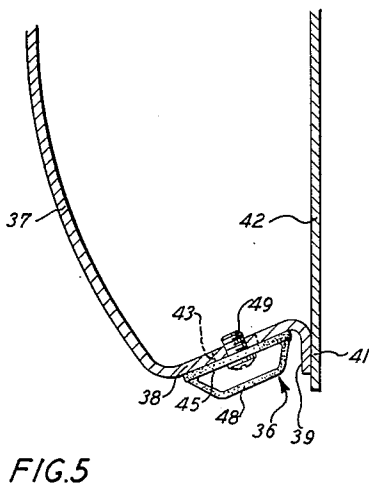
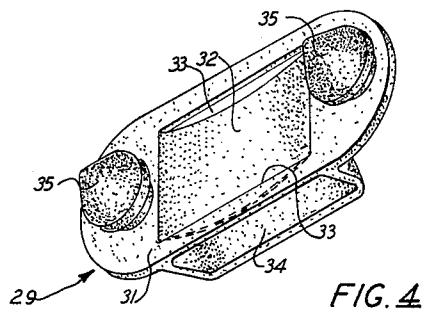
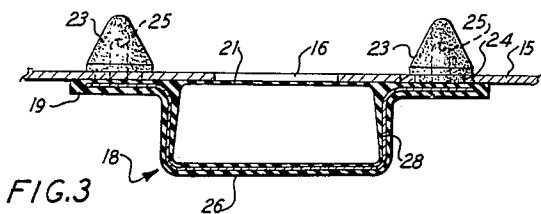
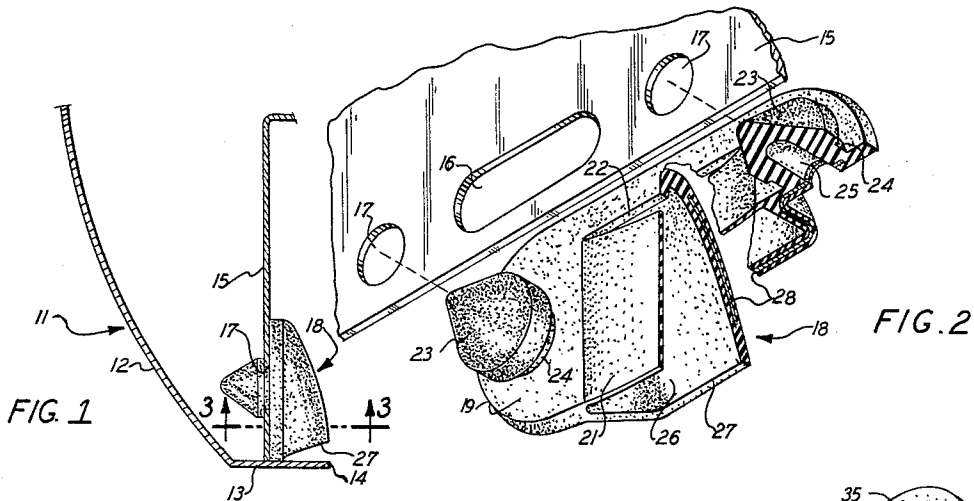
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SEALING MEANS FOR A DRAIN OPENING

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SEALING MEANS FOR A DRAIN OPENING

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This invention relates to an improvement in sealing means for drain openings and more particularly to a valve-type device for sealing drain holes located near the bottom of vehicle bodies.

In current automotive vehicle construction, sheet metal panels or members are seam welded together resulting in the creation of interior spaces between the panels which are very frequently troughlike in form. At times, these spaces are provided with openings to permit the retraction of windows therein or to provide accessibility to mechanisms housed between the panels. Since water cannot be prevented from entering these openings, there is a tendency for it to accumulate within these troughlike spaces and, therefore, drain openings have to be provided near the bottom of the panels to allow for the drainage of the accumulated water.

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 to place the interior spaces under a slight vacuum. Dust and other foreign matter may be drawn in through the drain hole and eventually enter the vehicle body to cause discomfort to the passengers or settle on mechanisms mounted between the body panels so as to interfere with their operation.

Various drain valves and sealing devices that will allow for drainage of water from interior spaces and inhibit the entry of dust into the vehicle body are known in the art. But it has been found that mud will adhere to the drain valves, thereby interfering with their operation. Thus, current drain valves for vehicle bodies become useless for their intended purpose within a relatively brief period of time.

Accordingly, it is an object of the present invention to provide a novel valve and sealing means wherein provision is made so that water may drain through drain holes from the troughlike interior structures while maintaining the drain hole closed against the entry of foreign matter from the exterior thereof and also to shield the valve portion of the valve and sealing means to prevent interference with its intended function.

A further object is to provide an inexpensive, readily installable drain valve and sealing means for motor vehicles which prevents mud or other foreign matter from accumulating on the valve portion.

The sealing device embodying the present invention is attachable to the exterior surface of a troughlike structure having a drain hole therein. The sealing device comprises a body having a flexible valve portion which overlaps the surface adjacent the drain hole edges. The valve portion is designed to maintain the drain hole closed against entry of foreign matter into the troughlike structure from the exterior thereof but permits the opening of the valve in response to pressure thereagainst exerted from the interior of the troughlike structure. Shielding means is provided which projects outwardly from the body to substantially prevent interference with the opening of the valve portion and to further protect it from damage to assure its proper functioning.

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:

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FIGURE 1 is a fragmentary vertical transverse sectional view through the rear quarter panel of an automobile body depicting the sealing device attached to the exterior surface of a portion of the floor pan member which is joined to the rear quarter panel to form a troughlike structure therebetween;

FIGURE 2 is a three dimensional exploded view, partially in section, of the sealing device shown in FIGURE 1 and also shows a portion of the floor pan flange with the position of the drain openings and fastening apertures therein;

FIGURE 3 is a sectional view taken along line 3-3 of FIGURE 1;

FIGURE 4 is a three dimensional view of a second embodiment of the sealing device of this invention;

FIGURE 5 is a vertical transverse section of a rear quarter panel of an automobile body depicting a slightly different vehicle construction with the sealing device of a third embodiment attached to a bottom surface between the rear quarter panel and a portion of the floor pan;

FIGURE 6 is a plan view of the third embodiment shown in FIGURE 5; and,

FIGURE 7 is a sectional view of the embodiment shown in FIGURE 6 taken along line 7-7 and looking in the direction of the arrows.

While it will be apparent from the following description of the invention that the sealing device of this invention may be used in many places in an automotive vehicle body, the disclosed embodiments are shown attached, for illustrative purposes only, to the external surface of a troughlike structure formed by the assembly of the rear quarter panel to an upwardly extending portion of the floor panel in the trunk portion of the vehicle body.

Referring now to the drawings, especially to FIGURE 1, there is seen in section a substantially vertically extending rear quarter panel 11 of a vehicle body comprising an outer panel 12 having an inwardly extending flange 13 terminating in an edge 14. The vertically extending flange portion of a floor pan 15 of the vehicle body is welded to the flange 13 intermediate the edge 14 and the rear quarter panel 11 to form a troughlike structure therebetween.

A drain hole 16 is provided in the vertically extending portion of the floor pan 15 above the flange 13. The drain hole 16 is preferably an elongated oval-shaped opening having its principal axis extending longitudinally of the vehicle body as seen in FIGURE 2. Two additional apertures 17 are provided in the floor pan 15, each of which is located in spaced relationship to the respective end of the drain hole 16.

In accordance with this invention, the sealing device of the first embodiment, generally designated as 18, is attached to the inwardly facing external surface of the vertically extending portion of the floor pan 15 above the flange 13. The sealing device 18 is constructed to maintain the drain hole closed against entry of foreign matter into the troughlike structure from the exterior thereof but will open outwardly in response to pressure thereagainst exerted by water accumulated in the interior of the troughlike structure as hereinafter discussed. The troughlike structure is usually in communication with other interior areas of the vehicle body such as, in this instance, the trunk of the vehicle.

The sealing device 18 of the first embodiment illustrated in FIGURES 1 through 3 comprises an oval-shaped main body 19 preferably molded from butyl rubber or similar flexible material. A generally rectangular-shaped diaphragm valve portion 21 is integrally molded with the body 19 and is located in the center portion thereof. The diaphragm valve portion 21 is substantially thinner in cross section than the remainder of the body 19 and

separated in part therefrom by a longitudinally extending slit 22 as seen in FIGURE 3.

The body 19 is provided with snap-in-type studs 23 projecting inwardly from the face of the body 19 which is placed in contact with the external surface of the upwardly extending portion of the floor pan 15 upon assembly of the sealing device 18 to the vehicle body. The snap-in studs 23 are preferably integrally molded with the body 19 and are substantially conical in shape. The base of each stud 23 is somewhat greater in diameter than the circular apertures 17 and also has an undercut 24 to provide a retention means. The studs 23 are adapted to be pushed through the respective apertures 17 to attach the sealing device 18 to the floor pan 15. 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 17.

A shield 26 projects outwardly from the body 19 of the sealing device 18. The shield 26, which also may be integrally molded with the body 19, is triangular in cross section with three of its sides encompassing the diaphragm valve portion 21 and with the one remaining open side facing in a generally downward direction. The outwardly projecting side of the shield 26 terminates in an edge 27 which is spaced from the flange 13 to allow the water draining through the drain holes to continue flowing to the exterior of the vehicle body. In the illustrated embodiment, the edge 27 terminates above the flange 13 but it may extend further inwardly of the vehicle and below the flange 13 if desired.

A metal reinforcement member 28 may be integrally molded within the body 19 and shield 26 to maintain the diaphragm valve portion 21 in a taut position, thereby assuring sealing contact of the diaphragm with the edges of the drain hole 16 as best seen in FIGURE 3. This may also be achieved by having the center distance between the studs 23 slightly less than the distance between the apertures 17. Thus, upon the assembly of the sealing device 18 to the vertically extending portion of the floor pan 15, the diaphragm valve portion 21 will be slightly stretched so as to place it under tension.

In FIGURE 4 is seen an alternate embodiment of a sealing device, generally designated as 29, which has a body 31 and a centrally located diaphragm valve portion 32. The diaphragm valve portion 32 is separated from the body 31 by two longitudinally extending slits 33 vertically spaced from each other and adjacent to the upper and lower edges of the body 31. The diaphragm valve portion 32, which is of a flexible material, is molded integrally with the body 31 and has a relatively thinner cross section than the remainder of the body 31.

A shield 34 projects outwardly from the body 31 to enclose three sides of the diaphragm valve portion 32. A pair of studs 35 project inwardly from the body 31 as in the sealing device 18 heretofore discussed. The center distance between the apertures 17 may be slightly less than the center distance between the studs 35 if no reinforcement member 28 is provided as in the first embodiment.

A third embodiment of the sealing device, generally designated as 36, is seen in FIGURES 5 through 7 which is attachable to a vehicle body of a construction that is slightly different from the structure shown in FIGURE 1. As seen in FIGURE 5, a rear quarter panel 37 is provided with a bottom surface 38 which makes a slight angle with the longitudinal plane. The surface 38 terminates in a downwardly extending flange portion 39 which is welded to a terminal end portion 41 of a substantially upright floor panel 42. The sealing device 36 is mounted in a substantially horizontal plane on the exterior surface of the bottom surface 38 which is provided with a drain hole 43 and a pair of apertures 44.

As best seen in FIGURES 6 and 7 the sealing device 36 comprises a body 45 with an integrally molded, centrally positioned, diaphragm valve portion 46 separated

in part from the body 45 by at least one longitudinally extending slit 47. The diaphragm valve portion 46 is substantially thinner in cross section than the remainder of the body 45. A shield 48 projects outwardly from the body 45 with three sides of the shield 48 encompassing the diaphragm valve portion 46. Preferably, the open side of the shield 48 faces the rear of the vehicle to prevent dust and other foreign matter from being drawn into the shield 48 when the vehicle travels in a forward direction, the front of the vehicle in relationship to the sealing device 36 being in the direction of the arrow seen in FIGURE 6.

Fastening means, such as sheet metal screws 49, are provided to attach the sealing device 36 to the vehicle body. The apertures 44, in this instance, are adapted to receive the sheet metal screws 49 to secure the sealing device 36 in a drain hole spanning position to the bottom flange 38.

From the foregoing description it can be seen that the diaphragm valve portion of each of the various illustrated sealing devices is held in a tight sealing relationship with the external surface of the troughlike structure adjacent the edges of the drain hole 16. As, for instance, in the first embodiment of this invention the diaphragm valve portion 21 is maintained in a taut position by the location of the studs 23 with respect to the apertures 17 or by the metal reinforcement member 28. Sealing contact is further enhanced when a vacuum condition is created within the interior portion of the vehicle body during the movement of the vehicle.

An additional advantage is obtained by the use of the metal reinforcement member 28 as it assists in protecting the sealing device 18 from damage due to tearing or cutting of the molded rubber material.

As the diaphragm valve portion 21 is formed from a relatively thin flexible membrane separated in part from the body 19, it will bow or flex slightly as seen in FIGURE 3 under the pressure exerted by the water accumulated in the troughlike structure. This will permit the water to drain through the drain hole 16 to the exterior of the vehicle body. When there is no water in the troughlike structure, the diaphragm valve portion 21 normally maintains the drain hole 16 closed to prevent the entry of foreign matter into the troughlike structure from the exterior of the vehicle body.

The outwardly projecting shield 26 prevents dirt, mud and other foreign matter from settling on the diaphragm valve portion 21, thereby preventing any interference with the bowing or flexing of the latter. Otherwise, the accumulation of dirt and mud on the diaphragm valve portion 21 would result in the containment of accumulated water within the vehicle body to accelerate corrosion of the sheet metal panels and to effect "swishing" noises. The shield 26 further protects the diaphragm valve portion 21 from being damaged by stones and sticks thrown up by the tires to maintain the valve portion 21 in operating condition.

It will be understood that the various structural features of the three illustrated embodiments of the sealing device of this invention can be readily interchanged between the various embodiments to suit operating conditions and vehicle body construction. Further, it will be understood that other 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. In combination, a sheet metal troughlike structure having a drain hole and apertures spaced from each end of said drain hole in a wall thereof, a sealing device attached to one surface of said wall, said device having a body, a shield, and a diaphragm valve portion, said shield and said valve portion being integrally molded with said body from a flexible resilient material, said diaphragm valve portion being separated in part from said body by at least one longitudinally extending slit, said diaphragm valve portion being thinner in cross section than said body,

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said flexible valve portion overlapping the surface adjacent the drain hole edges and normally maintaining said drain hole closed against entry of foreign matter into said troughlike structure from the exterior thereof, said valve portion being adapted to be flexed away from said 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, fastening means carried by said body projecting through said apertures in said wall to maintain said diaphragm valve portion in a drain hole spanning position, the distance between said fastening means being less than the distance between said apertures to place said diaphragm valve portion under tension, and said shield projecting outwardly from said body and encompassing three sides of said diaphragm valve portion, said shield being generally triangular in cross section.

2. In combination, a sheet metal troughlike structure having a drain hole and apertures spaced from each end of said drain hole in a vertical wall thereof, a sealing device attached to one surface of said wall, said device having a body, a flexible diaphragm valve portion integrally molded with said body and located substantially centrally thereof, said diaphragm valve portion being separated in part from said body by at least one longitudinally extending slit and being substantially thinner in cross section than said body, a shield projecting outwardly from said body and encompassing said diaphragm valve portion on three sides, said shield being substantially triangular in cross section with its open side facing downwardly, a reinforcing member affixed to said body and said shield to maintain said diaphragm valve portion in a taut position, fastening means extending through said apertures to secure said body to the exterior surface of said wall, said diaphragm valve portion upon said body being secured to said wall overlapping the surface adjacent the drain hole edges and normally maintaining said drain hole closed against the entry of foreign matter into said troughlike structure from the exterior thereof, said valve portion being flexed away from said 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.

3. In combination, a sheet metal troughlike structure having a drain hole spaced from each end of said drain hole in a vertical wall thereof, a sealing device attached to one surface of said wall, said device having a body, a shield and a flexible diaphragm valve portion integrally molded from a resilient flexible material with the diaphragm valve portion being located substantially centrally of said body, said diaphragm valve portion being separated in part from said body by at least one longitudinally extending slit and being substantially thinner in cross section than said body, said shield projecting outwardly from said body and encompassing said diaphragm valve portion on three sides, said shield being substantially triangular in cross section with its open side facing downwardly, a metal

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reinforcing member integrally molded within said body and said shield and maintaining said diaphragm valve portion in a taut position, fastening means attached to said body and being received by said apertures to secure said sealing device to the exterior surface of said wall, said diaphragm valve portion upon being secured to said wall overlapping the surface adjacent the drain hole edges and normally maintaining said drain hole closed against entry of foreign matter into said troughlike structure from the exterior thereof, said valve portion being flexed away from said 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.

4. In a motor vehicle, in combination, a sheet metal troughlike structure having a drain hole and apertures spaced from each end of said drain hole in a bottom wall thereof, a sealing device attached to said bottom wall, said device having a body, a shield, and a diaphragm valve portion integrally molded from a resilient flexible material, said diaphragm valve portion being separated in part from said body by at least one longitudinally extending slit and being thinner in cross section than said body, a pair of fastening members, each fastening member integrally molded with said body and positioned on opposite ends of said diaphragm valve portion, said pair of fastening members securing said sealing device to the exterior surface of said bottom wall, the distance between said fastening members being less than the distance between said apertures to place said diaphragm valve portion under tension, said fastening members projecting through said apertures in said bottom wall to maintain said diaphragm valve portion in a drain hole spanning position, said shield projecting outwardly from said body and being substantially triangular in cross section, said shield encompassing three sides of said diaphragm valve portion with the open side of said shield facing in the direction opposite to the forward direction of said vehicle, said diaphragm valve portion upon said sealing device being secured to said bottom wall overlapping the metal surface adjacent said drain hole edges and normally maintaining the drain hole closed against entry of foreign matter into said troughlike structure from the exterior thereof, said diaphragm valve portion being flexed away from said metal 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.

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