June 20, 1967 E. S. STEVENS 3,326,111

VENT STRUCTURE FOR COVERED HOPPER RAILWAY CARS

Filed Nov. 15, 1965 3 Sheets-Sheet 1

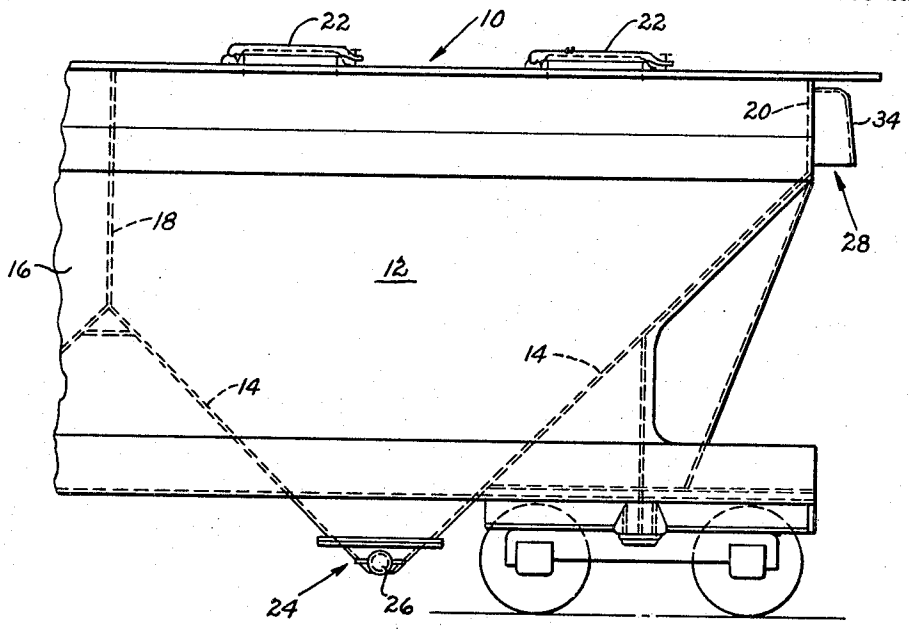


FIG. 1.

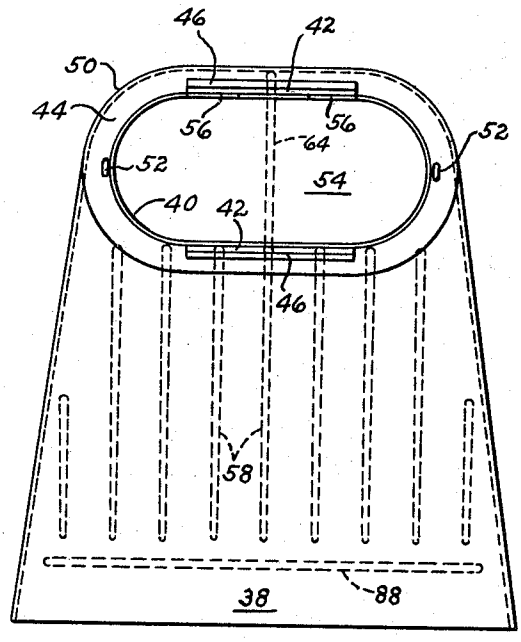


FIG. 4.

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VENT STRUCTURE FOR COVERED HOPPER RAILWAY CARS

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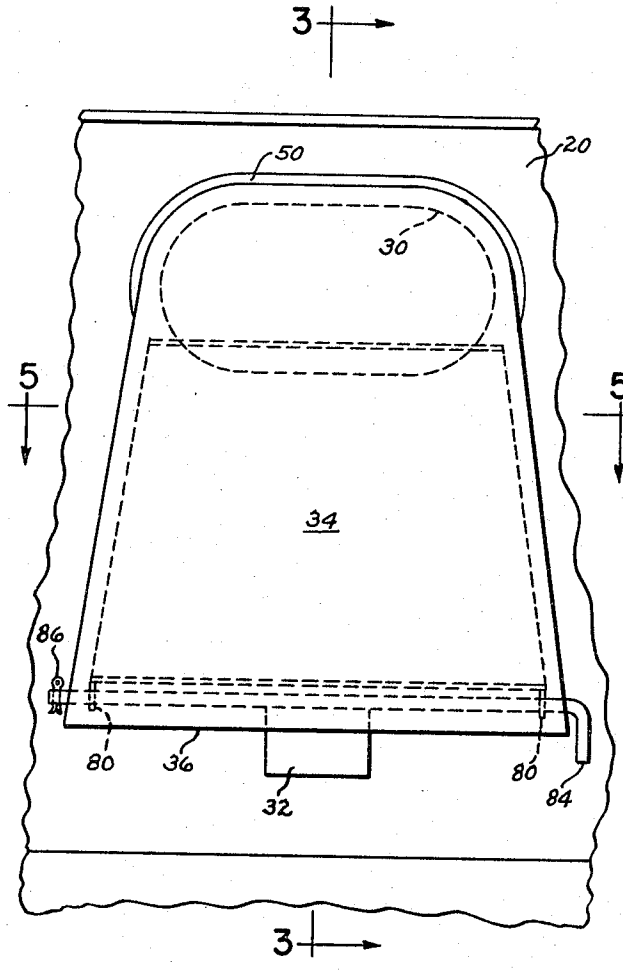


FIG. 2.

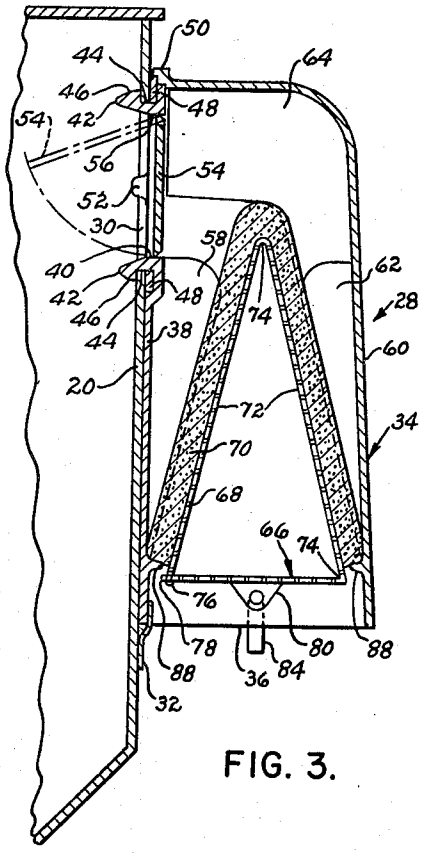


FIG. 3.

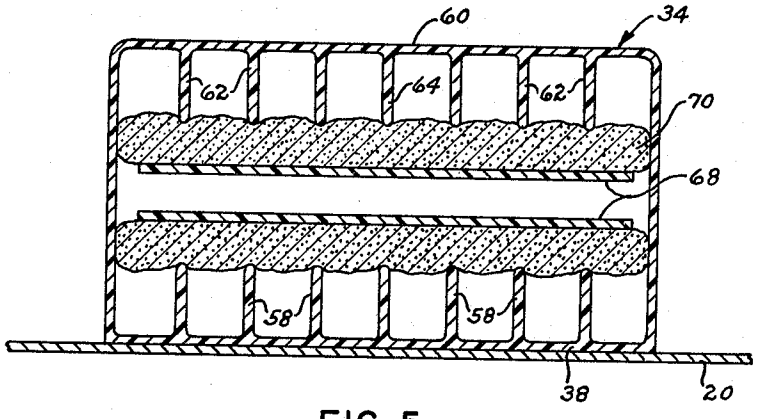


FIG. 5.

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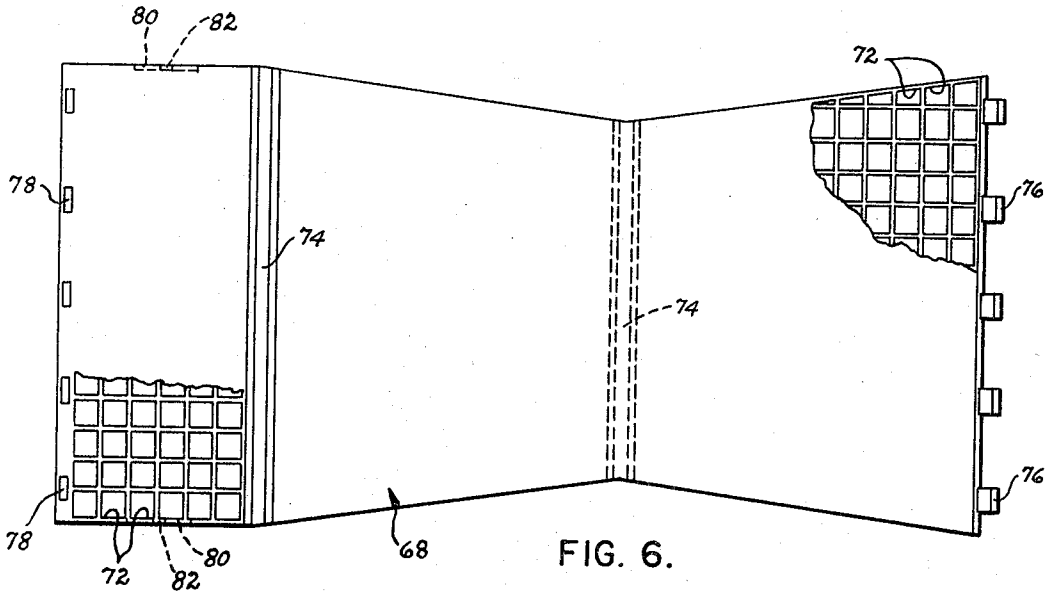


FIG. 6.

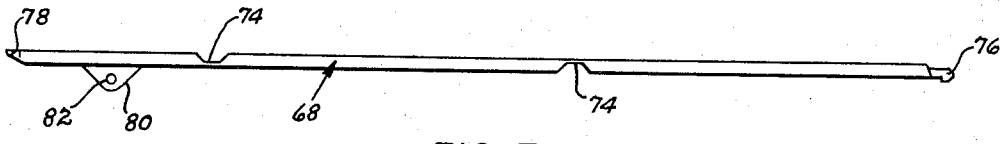


FIG. 7.

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VENT STRUCTURE FOR COVERED HOPPER RAILWAY CARS

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7 Claims. (Cl. 98—6)

ABSTRACT OF THE DISCLOSURE

A vent structure for an enclosed railway car to permit a flow of air into the interior of the car. A removable filter structure is easily positioned and removed from the open end of a housing forming the vent structure.

Background and description of the invention

Covered hopper railway cars which are unloaded pneumatically are usually unloaded from bottom hopper structures. The lading, which is usually comprised of pulverulent or particulate material, is drawn from the bottom hopper structure by a vacuum created by a pressure differential between the lading discharge conduit and the interior of the bottom outlet structure. When the hatch covers are closed and the lading is removed pneumatically from the interior of the car, a vacuum or negative pressure is created within the car which might possibly result in structural damage to the car, such as a partial collapsing of the sides of the car. The present invention provides means to permit the entry of air within the car when such a vacuum condition exists.

It is an object of the present invention to provide a vent structure to permit a flow of air into a covered hopper car when a covered hopper car is unloaded pneumatically while the hatch covers remain closed.

An additional object of this invention is the provision of such a vent structure which prevents the exit of air and entrained lading from the hopper car through the vent structure.

A further object of the inveniton is the provision of such a vent structure in which a replaceable filter is positioned which may be easily inserted and removed.

Briefly described, the invention comprises a hood removably secured to an end bulkhead of a covered hopper railway car and having an open bottom exposed to atmosphere and communicating with an opening in the bulkhead, a removable filter positioned within the hood adjacent the open bottom to filter air drawn in the open bottom, and valve means adjacent the opening in the bulkhead to prevent the exit of air from the covered hopper car.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated,

FIGURE 1 is a fragmentary side elevation of a covered hopper railway car illustrating the vent structure comprising the present invention mounted on an end bulkhead;

FIGURE 2 is an enlarged front elevation of the vent structure of FIGURE 1 in position on the end bulkhead of the covered hopper railway car;

FIGURE 3 is a section taken generally along line 3—3 of FIGURE 2 and showing the filter structure in position within the hood or housing of the vent structure;

FIGURE 4 is an enlarged rear elevation of the vent structure of FIGURE 1 shown removed from the end bulkhead of the covered hopper railway car;

FIGURE 5 is a section taken generally along line 5—5 of FIGURE 2;

FIGURE 6 is a plan of the filter frame for supporting the filter; and

FIGURE 7 is an elevation of the filter frame shown in FIGURE 6.

Corresponding reference characters represent corresponding parts throughout the several views of the drawings.

Referring now to the drawings for a better understanding of the invention, a covered hopper railway car is indicated generally at **10** and includes a hopper **12** between slope sheets **14** and side sheets **16**. An intermediate bulkhead **18** and an end bulkhead **20** are positioned adjacent slope sheets **14** to form the ends of hopper **12**. Hatch covers **22** permit hopper **12** to be loaded with lading.

A bottom outlet structure indicated generally at **24** is secured beneath hopper **12** and has a pneumatic discharge conduit **26**. Discharge conduit **26** may, for example, be a rotatable tube adapted to be connected to an air source (not shown) for the pneumatic discharge of particles from hopper **12** into a suitable storage facility. Tube **26** has a longitudinally extending slot and when a vacuum is exerted on the particles within bottom outlet structure **24**, the tube may be rotated to permit the entry of particles through the slot for pneumatic discharge. As the particles are drawn from discharge outlet **24** and hopper **12**, a vacuum is created within hopper **12** if hatch covers **22** are not opened to permit entry of air, thereby creating a pressure differential between the interior of car **10** and atmosphere. When such a vacuum condition exists, possible damage may result to the sides and bulkheads of railway car **10**, such as the folding-in of the sides of bulkheads.

The present invention comprising a vent structure **28** is positioned on end bulkhead **20** and may be placed on existing covered hopper cars as well as new cars. The only changes or modifications in car **10** necessary for the attachment of vent structure **28** are the cutting of an elongate slit or opening **30** in bulkhead **20** and the welding of a clip **32** on the outer face of bulkhead **20** to retain the vent structure **28** in position as shown in FIGURE 3.

Vent structure **28** comprises a hood-shaped housing **34** with an open bottom **36**. Housing **34** includes a generally flat base **38** disposed in face-to-face contact with the outer face of end bulkhead **20** and having an elongate opening **40**. Positioned adjacent the upper and lower sides of opening **40** are inwardly projecting flanges **42**. Each flange **42** has an outer groove **44** defined by an outwardly extending lip **46** adapted to snap over the adjacent edge of bulkhead **20** to hold the vent structure in position. A soft rubber seal or gasket **48** is positioned within groove **44** and provides a tight seal between bulkhead **20** and vent structure **28**. An outer circumferential rim **50** aids in retaining seal **48** in position. To aid in initially positioning vent structure **28** properly, a projecting stud **52** adjacent each end of elongate opening **40** is adapted to fit against the adjacent edge of end bulkhead **20** defining opening **30**.

A flap **54** is hinged to base **38** along spaced hinge lines **56** thereby permitting flap **54** to act as a check valve to

permit entry of air into the interior of car **10** but preventing any exit of air and lading from car **10** as will be explained. Extending from the inner surface of base **38** are spaced ribs **58** tapering downwardly from opening **40**. Secured to base **38** and forming an integral part of hood **34** is outer housing **60**. Spaced ribs **62** extend inwardly from the inner surface of housing **60**. A central rib **64** on housing **60** extends upwardly beyond ribs **62** and is disposed in abutting contact with flap **54**. Rib **64** thus provides a stop for flap **54** and prevents flap **54** from swinging outwardly such as might occur when a positive pressure develops within the interior of car **10**.

To filter air being drawn in hopper **12**, a filter structure generally indicated **66** is removably positioned within housing **34** and includes a filter frame **68** and a filter **70** supported on frame **68**. Frame **68** is preferably formed of a plastic material, such as polyethylene, and has perforations **72** as shown in FIGURES 6 and 7. Hinges **74** permit frame **68** to be folded into a general V-shape with lips **76** on one end edge of frame **68** adapted to fit and to be locked within complementary sockets **78**. Filter **70** may be formed of any suitable material, such as a polyurethane foam material, and is positioned housing **34** between frame **68** and ribs **58**, **62**, **64** as shown in FIGURES 3 and 5.

To hold filter structure in position within housing **34**, a lug **80** adjacent each side of frame **68** has an opening **82** receiving a locking pin **84**. Suitable openings in the adjacent sides of housing **34** are aligned with openings **82** and receive pin **84** as shown in FIGURE 2. A cotter key **86** permits the releasable locking of pin **84**. A ledge **88** on base **38** and outer housing **60** provides a support for the lower edge of filter **70** as shown in FIGURE 3.

When a negative pressure or vacuum exists within hopper **12** as might occur during pneumatic unloading with hatch covers **22** closed, flap **54** is swung inwardly to the broken line indication thereof in FIGURE 3 and air is drawn in from bottom **36** through filter structure **66**. When pressure within the car returns to atmospheric pressure, flap **54** returns to closed position in abutting contact with the adjacent end of rib **64**. Upon pressure within hopper **12** exceeding atmospheric, flap **54** will remain in closed position.

While housing **34** has been indicated as an integral structure, it is to be understood that base **38** and outer housing **60** could be formed separately and then interlocked to each other to form housing **34**. Housing **34** may be formed of any suitable material, such as polyethylene. Flanges **42** are preferably formed of a resilient material since flanges **42** snap in position over an adjacent edge of bulkhead **20**.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. In a covered hopper railway car having a plurality of connected sheets and an opening in one of said sheets communicating with the interior of the car, a vacuum relief device adjacent said sheet opening to permit entry of air into the car when a subatmospheric pressure exists within the car, said device comprising an open-ended hood on the outer surface of said one sheet fitting about the sheet opening and forming an enclosure about said opening, said hood having an opening therethrough aligned with the sheet opening and disposed immediately adjacent said sheet opening, the interior of the car being exposed to atmosphere through the open end of said hood and said adjacent aligned openings, a removable filter structure positioned within said hood adjacent said open end to filter air drawn in said open end when a subatmospheric pressure exists within the car, said filter structure having a generally V-shaped support and a filter mounted on the support, said support being perforated to permit a flow of air from the open end of the hood, the sides of the support being movable toward and away from each other about a hinge formed at the apex of the V-shaped support, and a plurality of ribs on the interior of said hood to guide the filter structure in position within the hood and to engage the filter for holding the filter in position.

2. In a covered hopper railway car as set forth in claim **1**, said hood having a flange adjacent the hood opening projecting inwardly through the aligned sheet opening and releasably engaging the inner surface of said one sheet for retaining the vacuum relief device in position on the outer surface of said sheet.

3. In a covered hopper railway car as set forth in claim **1**, a flap on said hood mounted within the hood opening for hinged movement outwardly of the hood from a closed position to an open position when a subatmospheric pressure exists within the car thereby to permit entry of air, and means restraining movement of the flap inwardly of the hood when a superatmospheric pressure exists within the car thereby to prevent the exit of lading from the car through the sheet opening.

4. A vacuum relief structure adapted to fit about an opening in the bulkhead or the like of a covered hopper railway car, said vacuum relief structure comprising a hood-shaped housing having a generally flat base adapted to fit in face-to-face contact with the bulkhead and an open end adjacent an end of said base, said base having an opening therein adapted to be aligned with the bulkhead opening, filter structure insertable within said open end and removably positioned within the hood-shaped housing adjacent the open end of the housing for filtering air drawn in the open end, said filter structure comprising a filter support and a filter mounted on the support, the support being perforated to permit a flow of air from the open end of the housing, and means on said housing to releasably hold the filter structure in position after being inserted within said open end.

5. A vacuum relief device as set forth in claim **4** wherein said base includes a flap mounted within said base opening for hinged movement in a direction outwardly of the housing from a closed position to an open position relative to said base opening, and means restraining movement of said flap in a direction inwardly of the housing from closed position.

6. In a covered hopper car having an end bulkhead with an opening therethrough, a vent structure communicating with said opening, said vent structure comprising a hood-shaped housing having a generally flat vertical base in face-to-face contact with said bulkhead and an open bottom adjacent the lower end of said base, said base having a lateral opening adjacent its upper end aligned with the bulkhead opening, a filter structure removably positioned within the hood-shaped housing adjacent the open bottom thereof, said filter structure comprising a perforated filter support having opposed sides forming a generally V-shape and a filter material covering the opposed sides of the filter support, and a plurality of tapered ribs on the interior of said housing adjacent the open bottom thereof to engage the filter material for guiding and holding the filter structure in position.

7. A vacuum relief structure adapted to fit about an opening in the bulkhead or the like of a covered hopper railway car, said vacuum relief structure comprising a hood-shaped housing having a generally flat base adapted to fit in face-to-face contact with the bulkhead and an open end adjacent an end of said base, said base having an opening therein adapted to be aligned with the bulkhead opening, a removable filter structure positioned within the hood-shaped housing adjacent the open end of the housing for filtering air drawn in the open end, said filter structure comprising a generally V-shaped support and a filter mounted on the support, said support being perfo-

rated to permit a flow of air from the open end of the housing, the sides of the filter support being movable toward and away from each other about a hinge formed at the apex of the V-shaped support, and a plurality of ribs on the interior of said housing to guide the filter structure in position within the housing and to engage the filter for holding the filter in position.

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MEYER PERLIN, *Primary Examiner.*