United States Patent

Dare et al.

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[54] FLUIDIZING HOPPER SLOPE SHEET PAD ASSEMBLY

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[21] Appl. No.: **16,276**

[52] **U.S. Cl.** **302/52**, 29/455, 105/247, 105/280, 214/83.28, 222/189, 259/4, 302/53

[51] **Int. Cl.** **B60p 1/62**, B61d 7/28, B65q 3/14

[58] **Field of Search** 105/247, 248, 280; 259/4; 302/52, 53; 29/455; 214/83.28; 222/189

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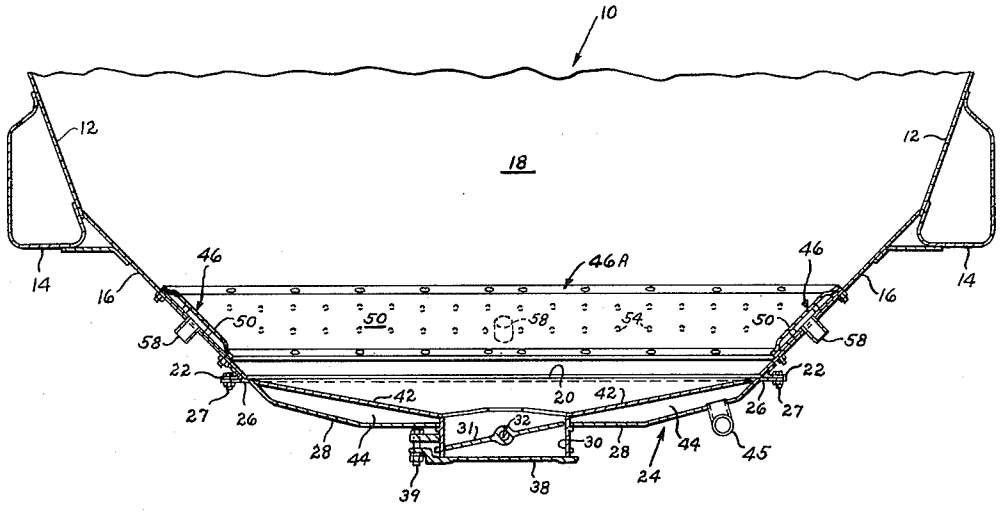
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[57] **ABSTRACT**

A fluidizing or aerating pad for a covered hopper railway car mounted on a hopper slope sheet immediately above a bottom outlet structure. The fluidizing pad extends across substantially the entire width of individual slope sheets and comprises a flat base sheet in face-to-face contact with the associated slope sheet and a fluid permeable outer member having a peripheral flange secured to the base sheet. The fluid permeable member is formed of a woven wire mesh and is additionally secured to the base sheet at predetermined positions inwardly from the peripheral flange.

7 Claims, 6 Drawing Figures



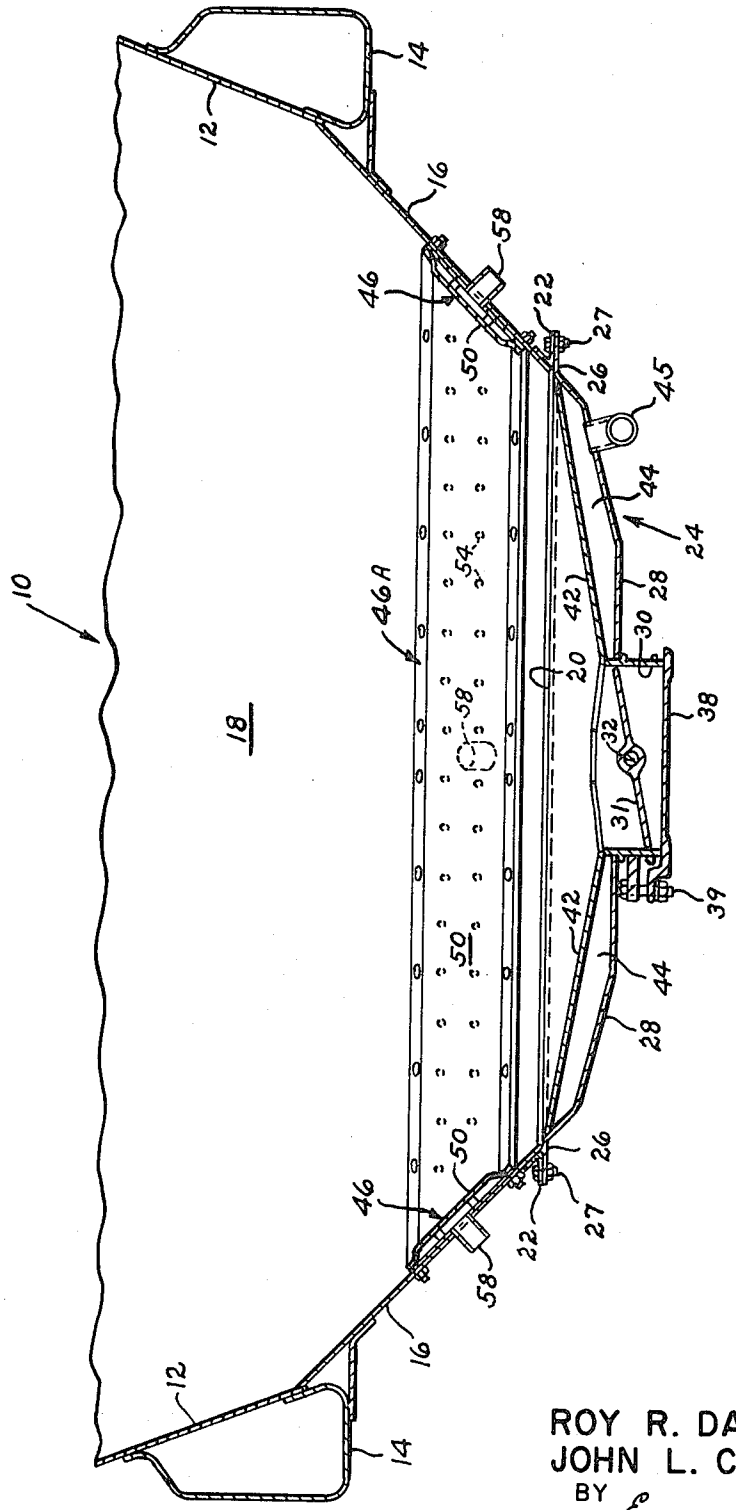


FIG. 1.

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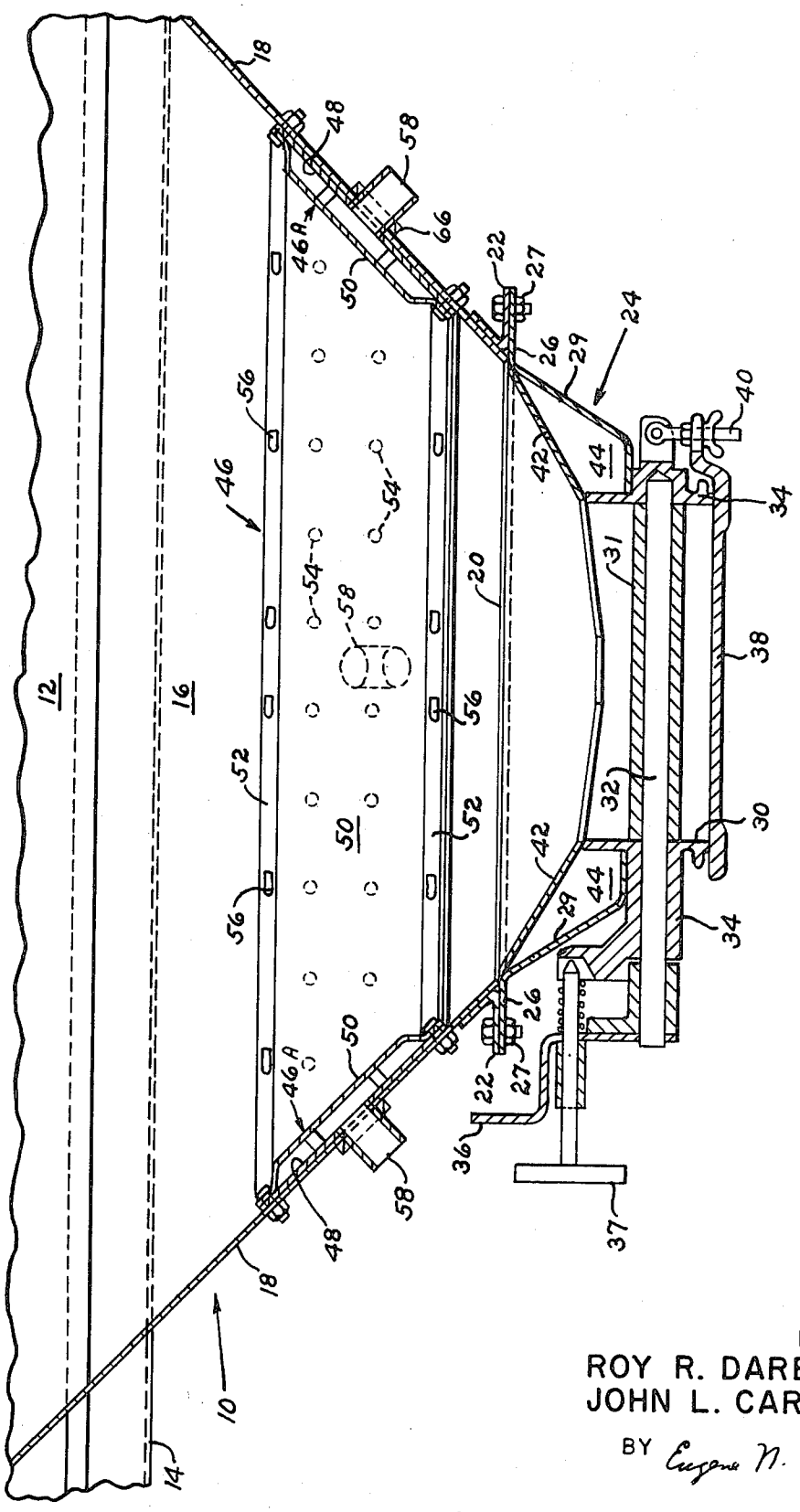


FIG. 2.

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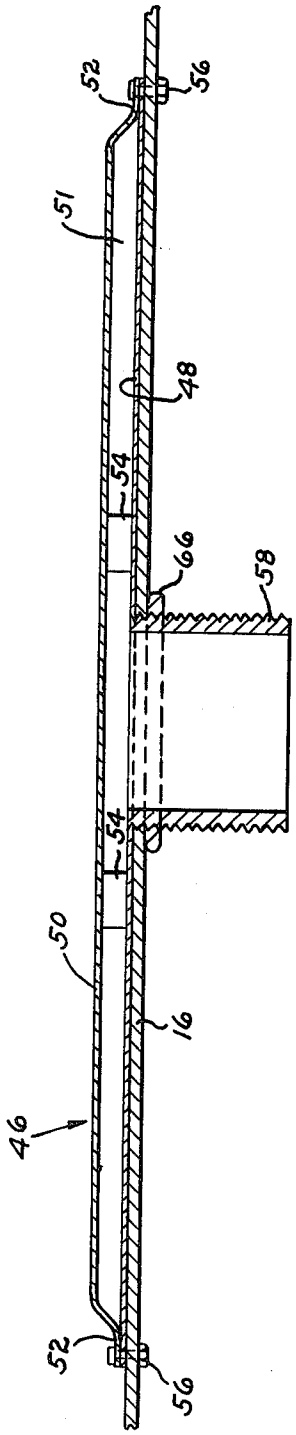


FIG. 4.

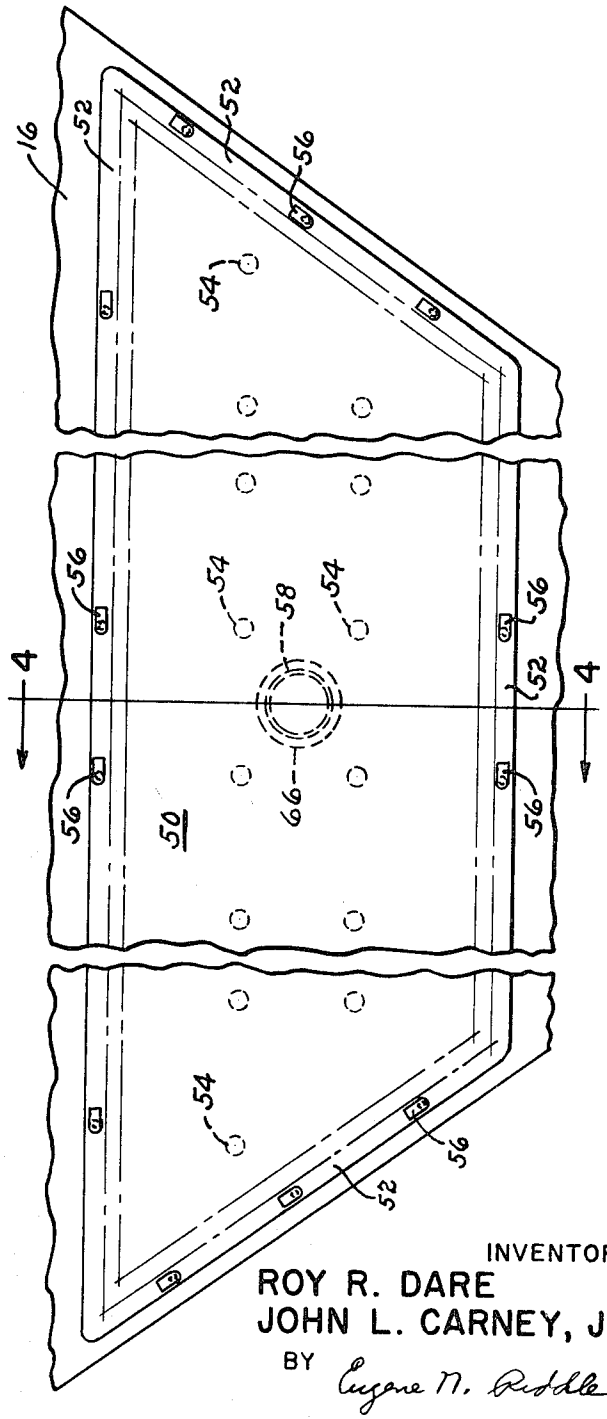


FIG. 3.

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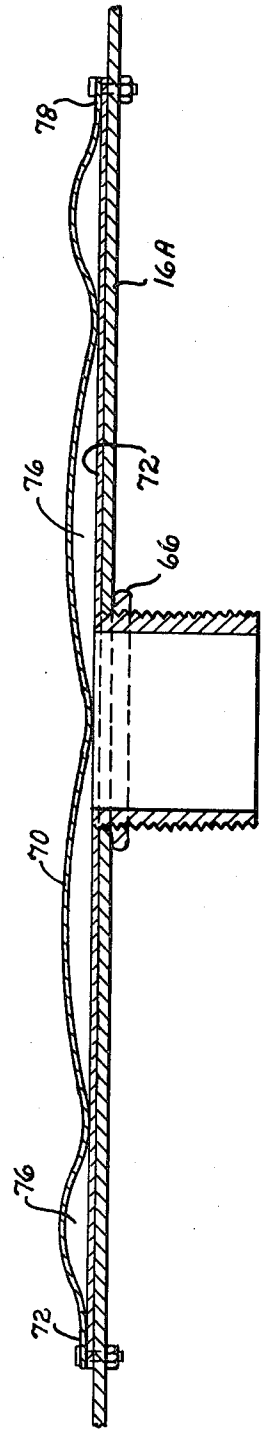


FIG. 6.

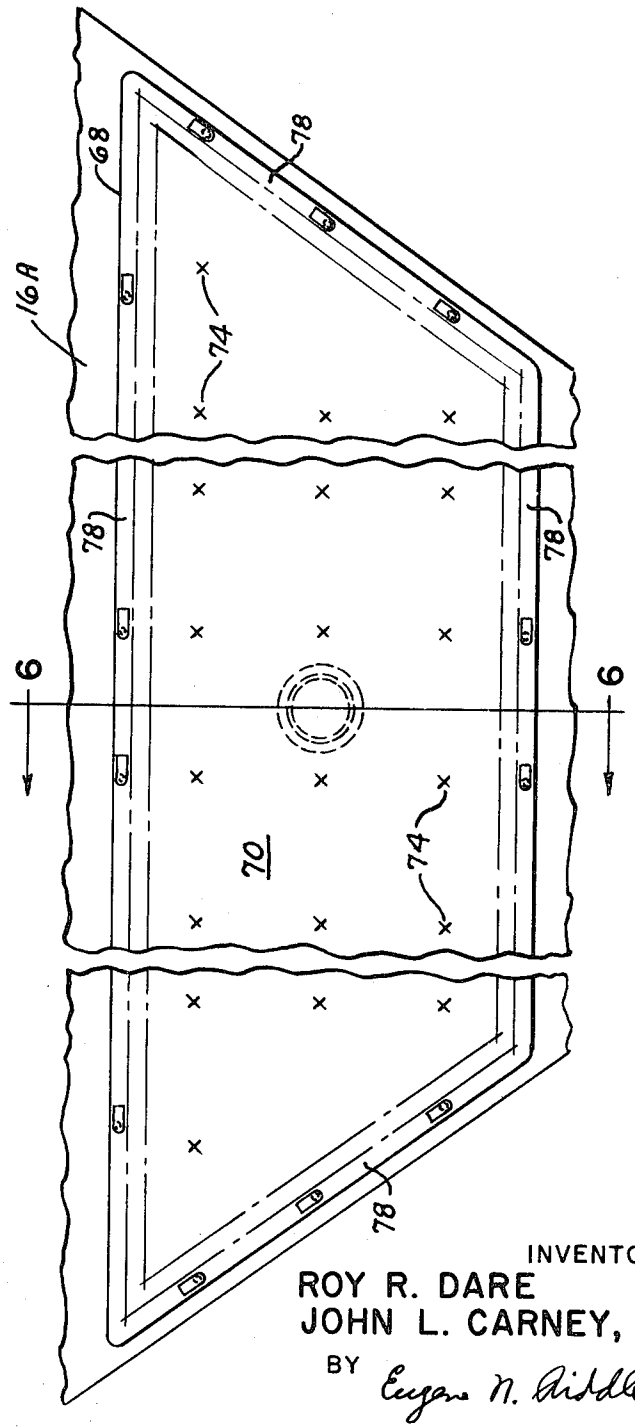


FIG. 5.

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FLUIDIZING HOPPER SLOPE SHEET PAD ASSEMBLY

BACKGROUND OF THE INVENTION

The use of fluidizing structures in covered hopper cars to fluidize powdered material being unloaded has been employed heretofore. However, such fluidizing structures have normally been employed within the bottom outlet structures or within the corners of the hoppers to aid or assist in the unloading. The permeable member heretofore has normally been formed of a fabric material or of sintered metallic fibers.

BRIEF DESCRIPTION OF THE INVENTION

The present fluidizing or aerating pad is primarily employed as an auxiliary pad to assist in fluidizing or aerating finely divided material being unloaded from a bottom outlet structure of a covered hopper railway car. While it is to be employed primarily in conjunction with a fluidized bottom outlet structure, it may be employed separately, if desired. The fluidizing pad may be easily attached to the slope sheet of an existing covered hopper car by suitable nut and bolt combinations.

The fluidizing pad preferably extends across the entire width of the slope sheet from corner to corner of the associated hopper and comprises a flat base sheet in face-to-face contact with the associated slope sheet, and a fluid permeable upper member having a peripheral flange secured to the base sheet. The fluid permeable member is formed of a woven wire mesh and is additionally secured to the base sheet at predetermined positions inwardly of the peripheral flange. Suitable nut and bolt combinations secure the fluidizing pad at its peripheral flange to the subjacent slope sheet and a suitable opening may be drilled or cut in the slope sheet to receive the nut and bolt combinations. A suitable air inlet extends through an opening in the slope sheet and forms a fluidtight connection therewith. The permeable material may be formed by the bonding of several wire mesh layers and preferably has a permeability of around 5 to 10.

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 two of various possible embodiments of the invention are illustrated,

FIG. 1 is a transverse section of a portion of a hopper of a covered hopper railway car indicating the fluidizing pad comprising the present invention secured to the hopper slope sheet immediately above an associated bottom outlet structure;

FIG. 2 is a longitudinal section of the hopper portion illustrated in FIG. 1;

FIG. 3 is a plan view of the fluidizing pad of FIGS. 1 and 2 shown secured to the adjacent hopper slope sheet;

FIG. 4 is a section taken generally along line 4—4 of FIG. 3;

FIG. 5 is a plan of a modified embodiment of the invention in which a permeable membrane has dimples formed therein which contact the base at intervals; and

FIG. 6 is a section taken generally along line 6—6 of FIG. 5.

Referring now to the drawings for a better understanding of the invention, a hopper of a covered hopper railway car is indicated generally **10** and has a pair of spaced sides **12**. Side sills **14** extend along the sides of the railway car and hopper side slope sheets **16** extend downwardly from side sills **14**. Opposed hopper end slope sheets **18** are secured between side slope sheets **16** and form junctures or corners with slope sheets **16**. Sheets **16** and **18** slope downwardly to a hopper discharge opening **20** defined by an outwardly extending mounting flange **22**.

A bottom outlet structure generally indicated **24** has an upper flange **26** mating with hopper flange **22** and secured thereto by suitable bolt and nut combinations **27** for attaching bottom outlet structure **24** beneath the associated hopper **10**. Outlet slope sheets **28** and **29** of bottom outlet structure **24** slope downwardly and terminate at a tubular discharge outlet **30** having a butterfly valve **31** mounted therein on a shaft **32**. Bearings **34** support shaft **32** for rotation on outlet **30**. A handle **36** on an end of shaft **32** permits manual actuation of butterfly valve **31** and a releasable catch **37** retains handle **36** in position.

A lower cover **38** is pivotally mounted at **39** to outlet **30**. Releasable swing bolts **40** retain cover **38** in position and when released permit swinging of cover **38** about pivot **39** to an open position for the discharge of lading upon actuation of butterfly valve **31**.

A fluid permeable member **42** is secured in spaced relation to outlet slope sheets **28**, **29** to form a plenum chamber **44** between permeable member **42** and slope sheets **28**, **29**. A suitable source of air may be connected to inlet **45** to supply air to plenum chamber **44** for fluidizing the material in bottom outlet structure **24**.

Fluidizing pads generally indicated **46** and **46A** which comprise the present invention are secured to respective slope sheets **16** and **18** immediately above bottom outlet structure **24**. While fluidizing pads **46** and **46A** are shown on all four slope sheets **16** and **18**, it is understood that the pad may be secured to one or more of selected slope sheets as desired. Fluidizing pads **46** and **46A** are generally identical except in regard to length as slope sheets **16** and **18** are of different dimensions. Fluidizing pad **46** only is to be described in detail, it being understood that fluidizing pad **46A** is similar.

Fluidizing pad **46** includes a base flat sheet **48** and a fluid permeable member or membrane **50** having a peripheral flange **52** welded to base **48** about its entire periphery. Generally cylindrical spacers **54** are positioned at intervals between sheet **48** and permeable member **50** and a plenum chamber **51** is formed between sheet **48** and permeable member **50**. Permeable member **50** is spot welded to spacers **54** for additional securement of permeable member **50** to base **48**.

Permeable member **50** may be formed from a plurality of stainless steel wire mesh layers bonded to each other at contact points by sintering and then calendering. As a specific example, three stainless steel wire mesh layers may be bonded together for a thickness of 0.052 inch with a permeability of between around 6 to 13. A membrane **50** which has been found to be satisfactory is sold under the trademark "-Dynapore" by Michigan Dynamics Division of Ambac Industries, Inc., 1565 Oakman Blvd., Detroit, Mich.

For securing fluidizing pad **46**, suitable bolt and nut combinations **56** are extended through openings in flange **52** and base sheet **48** for securing pad **46** to the adjacent slope sheet **16**. To provide air, an externally threaded pipe forms an air inlet **58** and is threaded within a suitable opening in slope sheet **16** and base **48** as shown in FIG. **4**. An internally threaded retainer **66** may be threaded about inlet **58** for drawing inlet **58** tight against base **48**. A suitable source of air may be connected to inlet **58** to provide air to plenum chamber **51** between base **48** and permeable member **50**.

Referring now to FIGS. **5** and **6**, a separate embodiment of the invention is disclosed in which a fluidizing pad **68** secured to a slope sheet **16A** has a fluid permeable member **70** with dimples or bulges formed therein. Permeable member **70** is spot welded to a base **72** at selected positions **74** and a plenum chamber **76** is formed between base **72** and permeable member **70**. A peripheral flange **78** about permeable member **70** is secured to lower base **72**. A plenum chamber **76** formed between base **72** and permeable member **70** receives air from means similar to that of the embodiment shown in FIGS. **1–4**. Permeable member **70** is formed of a stainless steel wire mesh material.

What is claimed is:

1. In a hopper structure, opposed hopper side slope sheets and opposed hopper end slope sheets funneling downwardly to a bottom discharge hopper opening, a mounting flange extending about the bottom discharge hopper opening, a bottom outlet structure mounted beneath the hopper and secured to the mounting flange, a separate independent fluidizing structure mounted on at least one of the hopper slope sheets above the bottom outlet structure and extending across a substantial width of the associated slope sheet, said fluidizing structure

comprising a generally flat base sheet in face-to-face contact with the subjacent associated slope sheet and a fluid permeable sheet mounted on the base sheet to form a plenum chamber therebetween, a peripheral flange extending about the entire periphery of said separate fluidizing structure, means securing said peripheral flange to the inner surface of the slope sheet for mounting said fluidizing structure on the slope sheet, and means to supply air to the plenum chamber.

2. In a covered hopper railway car as set forth in claim 1, a plurality of separate spacers within the plenum chamber secured between the fluid permeable sheet and said generally flat base sheet to space the fluid permeable sheet from the base sheet for forming the plenum chamber.

3. In a covered hopper railway car as set forth in claim 1, said fluid permeable sheet being dimpled and contacting the base sheet at spaced intervals, the fluid permeable sheet being secured to said base sheet at the dimpled contact areas.

4. In a covered hopper railway car, opposed hopper side slope sheets and opposed hopper end slope sheets funneling downwardly to a bottom discharge hopper opening, a mounting flange extending about the bottom discharge hopper opening, a bottom outlet structure mounted beneath each hopper and secured to the mounting flange, a separate independent fluidizing pad mounted on at least one of the hopper slope sheets immediately above the bottom outlet structure and extending across a substantial width of the associated slope sheet, said fluidizing pad comprising a generally flat base sheet in face-to-face contact with the subjacent associated slope sheet and a stainless steel fluid permeable sheet mounted on the base sheet, said fluid permeable sheet being formed of a stainless steel wire mesh and secured to the base sheet to form a plenum chamber therebetween, a peripheral flange extending about the entire periphery of said separate fluidizing structure, means securing said peripheral flange to the inner surface of the slope sheet for mounting said fluidizing structure on the slope sheet, and means to supply air to the plenum chamber.

5. In a covered hopper railway car as set forth in claim 4, a plurality of separate spacers within the plenum chamber secured between the fluid permeable sheet and said generally flat base sheet to space the fluid permeable sheet from the base sheet to form the plenum chamber.

6. In a covered hopper railway car as set forth in claim 4, said fluid permeable sheet being dimpled and contacting the base sheet at spaced intervals, the fluid permeable sheet being secured to said base sheet at the dimpled contact areas.

7. In a covered hopper railway car as set forth in claim 4, said fluid permeable sheet having a permeability over around six and being of a thickness less than around 0.10 inch.

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