A railway car hopper outlet structure for discharging particulate material pneumatically includes a unitary discharge assembly mounted under the discharge opening of the outlet. A discharge tube extends from the housing longitudinally of the car, and an air inlet conduit adapted to be connected to an air pressure hose has one branch supplying air to the interior of the outlet for fluidizing the lading therein and pressurizing the car and another branch connected to the discharge tube for moving the lading therethrough. Manually actuated valves are adapted to close the discharge tube and the air inlet branch connected thereto, and check valves are provided in said branch and in the main portion of the air inlet conduit for preventing the back flow of air and lading.

6 Claims, 8 Drawing Figures
PNEUMATIC HOPPER OUTLET FOR RAILWAY CARS

BACKGROUND OF THE INVENTION

Hopper discharge structures have been employed heretofore beneath hoppers for unloading pneumatically finely divided materials. Such structures, however, are generally complicated and expensive to fabricate. The present invention is designed to improve and simplify a discharge outlet structure such as that shown in the patent to C. K. Stein, et al. No. 3,403,943.

SUMMARY OF THE INVENTION

The invention relates to a covered hopper car in which each bottom outlet has a single discharge opening. The bottom of the outlet is formed by permeable sheets through which air is forced to fluidize the lading and pressurize the car. A unitary discharge assembly is connected under the discharge opening of each outlet. The discharge assembly includes a housing having a removable cover directly under the opening of the hopper outlet. A pneumatic discharge conduit extends from the housing longitudinally of the car and is adapted to be connected to any suitable housing or conduit for conducting the lading to a desired discharge point. An air inlet conduit adapted to be connected to an air pressure supply source has one branch extending into the pneumatic discharge conduit and another branch extending to the bottom of the outlet to feed air through the permeable sheets thereof. The air inlet conduit is provided with a check valve in its main portion and in the branch connected to the pneumatic discharge tube for preventing a back flow of air and lading. In addition, manually actuated valves are provided in the pneumatic discharge tube and in the portion of the air inlet conduit connected thereto. Pneumatic discharge of the lading is obtained by opening both manually actuated valves and connecting the air inlet conduit to a source of air pressure.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side elevation of a covered railway hopper car having a plurality of bottom outlet structures comprising the present invention.

FIG. 2 is an enlarged side elevation of the outlet structure taken along the line 2—2 of FIG. 1.

FIG. 3 is an enlarged top plan of a bottom outlet structure shown in FIG. 2 removed from the railway car.

FIG. 4 is an partial section taken on line 4—4 of FIG. 2.

FIG. 5 is a section taken on line 5—5 of FIG. 3.

FIG. 6 is a section taken on line 6—6 of FIG. 3.

FIG. 7 is a section taken on line 7—7 of FIG. 3.

FIG. 8 is a section taken on line 8—8 of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing, and particularly to FIG. 1, a covered hopper railway car generally indicated 26. Each bottom outlet 26 has an upper peripheral flange 28 secured by suitable fastening means (not shown) to flange 30 about hopper opening 24. Each outlet 26 includes a pair of sides 32 having generally horizontal lower portions 34 and a pair of sides 36. Secured to flange 28 is a permeable load-bearing fluidizing member 40 forming with the bottom of the outlet a plenum chamber 42. Permeable member 40 includes end sections 44 spaced above walls 32 and side sections 46 spaced above walls 36 by supporting ribs 43, 45, and 47. Permeable sections 44 are positioned at a relatively small slope, while sections 46 are positioned at a greater slope. Sections 44 and 46 are joined to each other along lines 48 and funnel down to rim 50 and bottom outlet discharge opening 52. Permeable member 40 is disclosed in application Ser. No. 21,127, filed Mar. 19, 1970 by John L. Carney, et al.

The lower portion of outlet 26 is a unitary discharge assembly 54 including a housing 56 connected by bolts 58 to rim 50. Housing 56 is directly beneath discharge opening 52 and is provided with removable cover 60 held in place by a bolt and nut combination 62. Pneumatic discharge conduit 64 extends longitudinally from the housing and is provided with removable cover 66 held in place by wing screws 68. Conduit 64 is provided with a butterfly valve 70 adapted to be opened and closed by handle 72. A fixed disc 74 having notches 76 is adapted to be engaged by a spring biased lever 78 to hold handle 72 in a fixed position. The handle may be released by raising lever 78 and thereby disengaging it from the notches in disc 74. The particular type of handle and locating means herein shown is not a part of this invention, and is disclosed in above-mentioned application, Ser. No. 21,127.

Air inlet conduit 80 has a removable cover 82, and, when the cover is removed, is adapted to be connected to a suitable air hose in order to supply air under pressure. Check valve 84 in conduit 80 is opened by the air pressure supplied by the air hose. Conduit 80 has a branch extending to the bottom of outlet 26 for communicating with plenum chamber 42 via opening 88. Air inlet conduit 80 also has another branch extending into discharge tube 64. Branch 90 is provided with butterfly valve 92 on shaft 93 connected to and adapted to be actuated by handle 94, which is also provided with a lever 95 and notched disc 96. Adjacent valve 92 is check valve 98, biased closed by springs 100 so that it is adapted to be opened by the application of air pressure to air inlet conduit 80.

To provide access to the interior of the outlet, such as desirable for cleanout and the like, the bolt and nut combination 62 is loosened and cover 60 is removed from the bottom of housing 56. If desirable to have the outlet discharge as a gravity outlet, a butterfly valve or other control should be provided within opening 52 to control the flow of lading upon removal of cover 60. To unload pneumatically, cover 60 of housing 56 is kept closed, and cover 82 is removed from air inlet conduit 80 and a hose from a source of air pressure is connected to the end of conduit 80. Check valve 84 is then opened by the applied air pressure and air passes through branch 86 and opening 88 into plenum chamber 42. The air is then forced through permeable member 40 to fluidize the lading and pressurize the in-
interior of the car. Also, butterfly valves 70 and 92 are opened by means of handles 72 and 94, respectively, and cover 66 on pneumatic discharge tube 64 is removed. The lading then moves downward into housing 56 and out through discharge tube 64 under the influence of the stream of air from the interior of the car and the stream of air entering discharge tube 64 through branch 90. The movement of air and lading from tube 64 back into branches 90 and 86 is prevented by check valve 98 and any passage of air and lading through air inlet 80 is prevented by check valve 84. A back flow of lading through air inlet branches 90 and 86 into plenum chamber 42 might clog permeable plates 44 and 46, and would be very undesirable. Such back flow might possibly occur when the car is pressurized and the pressure applied to conduit 80 drops off for any reason. Check valve 98 insures against back flow of lading to plenum chamber 42.

What is claimed is:

1. In an outlet structure adapted to be mounted beneath a railway car hopper for unloading particulate material pneumatically, the bottom outlet structure having a plurality of connected permeable walls funneling downwardly to a discharge opening;

   the improvement comprising a unitary pneumatic discharge assembly having a housing fastened to the outlet structure beneath the discharge opening and communicating therewith;

   a removable cover on the bottom of said housing in vertical alignment with said discharge opening;

   a pneumatic discharge conduit secured to said housing and extending therefrom horizontally and longitudinally of the car; an air inlet conduit adapted to be connected to an air pressure source, said air inlet conduit having a first branch connected to said outlet for supplying air to the interior thereof and through said permeable walls above the discharge opening and a second branch communicating with the pneumatic discharge conduit;

   a manually operated metering valve in said discharge conduit, and a manually operated metering valve in said second branch;

   and valve means in said second branch for preventing back flow from the pneumatic discharge conduit into the air inlet conduit automatically in the event said second branch ceases supplying air to said pneumatic discharge conduit.

2. An outlet according to claim 1 wherein said valve means comprises resilient means urging at least one closure member into a closed position and which closure member is maintained in the open position by air being applied to said discharge conduit.

3. An outlet according to claim 2 wherein said valve means is a check valve.

4. An outlet according to claim 3 including a second check valve in said air inlet upstream from the joining point of said first and second branches.

5. An outlet structure adapted to be mounted beneath a railway car hopper for unloading particulate material selectively either by gravity or pneumatically comprising:

   a bottom outlet structure having a plurality of connected permeable fluidizing walls funneling downwardly to a rim defining a discharge opening;

   a plenum chamber beneath the permeable walls;

   a unitary pneumatic discharge assembly having a housing fastened to the outlet structure beneath the discharge opening and communicating therewith;

   a removable cover on the bottom of said housing in vertical alignment with said discharge opening;

   a pneumatic discharge conduit secured to said housing and extending therefrom horizontally and longitudinally of the car;

   an air inlet conduit adapted to be connected to an air pressure source, said air inlet conduit having a first branch connected to said plenum chamber for supplying air to the interior thereof above the discharge opening and a second branch communicating with the pneumatic discharge conduit;

   a manually operated metering valve in said discharge conduit, and a manually operated metering valve in said second branch;

   first check valve means in said second branch for preventing back flow from the pneumatic discharge conduit into said plenum chamber automatically in the event said second branch ceases supplying air to said pneumatic discharge conduit;

   and second check valve means located in said air inlet upstream from the joining point of said first and second branches.

6. A bottom outlet structure adapted to be mounted beneath a railway car hopper for unloading particulate material selectively either by gravity or pneumatically, the bottom outlet structure having a plurality of connected permeable fluidizing walls funneling downwardly to a discharge opening;

   a plenum chamber beneath said permeable walls;

   a unitary pneumatic discharge assembly having a housing fastened to the outlet structure beneath the discharge opening and communicating therewith;

   a removable cover on the bottom of said housing in vertical alignment with said discharge opening;

   a pneumatic discharge conduit secured to said housing and extending therefrom horizontally and longitudinally of the car;

   an air inlet conduit adapted to be connected to an air pressure source, said air inlet conduit having a first branch connected to the outlet for supplying air to said plenum chamber above the discharge opening and a second branch communicating with the pneumatic discharge conduit;

   a manually operated butterfly valve in said discharge conduit, and a manually operated butterfly valve in said second branch;

   first check valve means in said second branch for preventing back flow from the pneumatic discharge conduit into said plenum chamber automatically in the event said second branch ceases supplying air to said pneumatic discharge conduit;

   and second check valve means mounted in said air inlet upstream from the joining point of said first and second branches.