The specification discloses a portable container for receiving and storing dry cement in powder form and which may be unloaded manually. The container has a first inlet located at the top region for receiving the cement from a pneumatic charging device. A vent is provided at the top of the container for relieving gas pressure from the container. A second inlet is formed through the sidewall structure of the container for manually allowing a person to remove cement from the container. Plate structure interior of the container surrounds the second inlet forming a passageway extending toward the bottom of the container. The lower edge of the passageway is above the bottom of the container but below the lower edge of the second inlet. The passageway has a top wall which slopes downwardly from the top of the second inlet toward the interior of the container. A door has one end pivotally coupled to the sloping top wall of the passageway at a level intermediate the lower and top edges of the second inlet. The other end of the door may be moved upward to open the passageway and downward to an inclined closed position adjacent to the lower edge of second inlet.

13 Claims, 9 Drawing Figures
CEMENT HANDLING CONTAINER

BACKGROUND OF THE INVENTION

This invention relates to a portable container for receiving and storing flowable particulate material and more particularly to a receiving and storage container which may be unloaded manually by way of an inlet formed through the sidewall structure between the top and bottom of the container.

At construction job sites, a need has existed for a container system for receiving, safely storing, and dispensing bulk cement in powder form, as needed, and which is inexpensive, efficient in operation, and which does not tie up expensive hauling or material handling vehicles.

SUMMARY OF THE INVENTION

In accordance with the present invention there is provided a portable container which meets the above needs and which may be unloaded manually from the container by way of a side door.

In one aspect, the container has a first inlet for receiving particulate material to be conveyed pneumatically by gas under pressure. This inlet is located to allow the material to be introduced into the container from the top region thereof whereby the material may fall to the bottom to fill the container from the bottom up. A vent is provided for relieving gas pressure from the container as well as a means for opening and closing the vent. A second inlet, formed through the sidewall structure of the container, is provided for allowing a person to remove the material from the container. A door also is provided for closing this second inlet when the container is being charged or when material is not being removed from the container.

In a further aspect, structure located interiorly of the container surrounds the second inlet forming a passageway extending toward the bottom of the container and having its lower end open to and in communication with the interior of the container by way of the bottom region. The passageway has a lower edge above the bottom of the container but below the lower edge of the second inlet. The passageway has a top wall which slopes downwardly from the top of the second inlet toward the interior of the container. The door has one end pivotally coupled to the sloping top wall of the passageway at a level intermediate the lower and top edges of the second inlet. The other end of the door may be moved upward to open the passageway and downward to an inclined position adjacent the lower edge of the second inlet to close the passageway.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates the portable container of the present invention supported on a trailer;
FIG. 2 is a partial perspective of the container with certain elements removed for clarity;
FIG. 3 is an enlarged front view of the container;
FIG. 4 is a cross-section of the container taken through the lines 4—4 of FIG. 3;
FIG. 5 is a cross-section of FIG. 4 taken through the lines 5—5 thereof;
FIG. 6 is a cross-section of FIG. 4 taken through the lines 6—6 thereof;
FIG. 7 illustrates a vent in a closed and open position;
FIG. 8 is an enlarged view of the container door in its closed and open positions; and
FIG. 9 illustrates a drain surrounding the side inlet of the container.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, the portable container is illustrated at 11 as supported on a trailer 13 which may be towed to a construction site by a truck and left there on the trailer for use by the workmen. As an alternative the container 11 may be loaded and transported on a truck having a fork-lift and unloaded to rest upon the ground at a desired work site.

As can be seen in FIGS. 2–6, the container has a bottom 15, a sloping top 17, two sides 19 and 21, a front 23 and a back end 25 formed of sheet metal which may be of 12 gauge steel. In one embodiment the maximum cross-section of the container, as illustrated in FIG. 5, is a rectangle having dimension of 5 feet and 7 feet. The height of the front wall of the container is 9 feet and the height of its rear or back wall is 8 1/2 feet. The total weight of the container, empty, is about 1,500–1,600 pounds. Thus, the container is relatively light in weight and small in dimensions whereby it may be readily transported to a job site for its intended use.

The container 11 is employed to receive, store and dispense dry particulate materials which are flowable. Of interest is use of the container for receiving and storing dry cement in powder form and for allowing the cement to be removed or unloaded manually as needed by the workers on a construction job. Typical cement which may be stored and dispensed are Portland cement and Masonry cement.

Preferably the container 11 is charged pneumatically from a pneumatic type tank truck the latter of which is loaded from an overhead silo at a central location and then driven to the job site to charge the container where it is located. This procedure has been found to be time saving and moreover it allows one to obtain a new charge of cement promptly when it is needed and without interruption by calling for the charging truck, for example, before the container is emptied.

An inlet or opening 27 is provided for receiving the cement or other type of particulate material to be conveyed pneumatically. As illustrated, this inlet is located at the top region of the container 11 whereby the material will fall to the bottom and fill the container from the bottom up. Extending to the inlet 27 on the outside is a tube or conduit 29 having at its lower end a connector 31.

The pneumatic tank of the charging truck has an outlet whereby a flexible hose may be coupled from its outlet to the connector 31 of the conduit 29. A blower unit is employed on the truck which pulls air into its tank and which is directed through the dry cement therein. This loosens the cement and also pressurizes the tank to a level which may be of the order of 15 psi. After the hose is coupled from the outlet of the tank to the conduit 29, the tank outlet is opened by actuating a valving arrangement. The dry cement in the tank then is forced by the pressurized air through the coupling hose and conduit 29 and into the container 11 by way of the inlet 27.

As seen in FIGS. 1–4, the conduit 29 and inlet 27 are located at the top of the front wall of the container and on the lefthand side. Extending through the top wall 17
3,814,149

3

is a vent 33 which is located in the front of the container and on the right hand side as seen from the front. As seen in FIG. 7 the vent is formed by an opening 35 formed through the top wall 17 and surrounded by extending sidewall structure 37. A door 39 is provided for closing and opening the vent. When the container 11 is being charged pneumatically, the door 39 is moved to an open position as illustrated in dotted form in FIG. 7. This relieves the pressure from the container whereby the cement may separate from the air and drop to the bottom of the container. Since the vent is on an opposite side of the inlet 27, there is no direct flow of cement to the vent and very little cement escapes by way of the vent 33. After the container 11 has been charged with cement, the door 39 is moved to close the vent. The door 39 has extending side edges 41 which surround the sidewall structure 37 when the door is closed thereby preventing water from entering the container. A handle 43 is provided for moving the door 39 to its open and closed position. A latch 45 is provided for locking the door 39 in its closed position when the container is not being used.

Provision is made for unloading or removing the cement manually, by a workman, from the bottom region of the container by way of an inlet or opening 51 formed through the front wall 23 of the container. Extending from the inlet 51 is a recessed passageway illustrated by dotted line 53 in FIG. 4. This passageway is formed by baffle plates comprising two side panels 55 and 57, a sloping top wall panel 59 and a rear wall panel 61. The two side panels 55 and 57 (FIG. 6) extend from both sides of the inlet 51 to the interior of the container. The top wall panel 59 extends from the top edge 51A of the inlet 51 and slopes downward toward the rear of the container. Rear panel 61 joins the sidewall panels 55 and 57 and the top wall panel 59.

The lower edges 55A, 57A, and 61A of the panels 55, 57, and 61 respectively are above the bottom of the container but below the lower edge 51B of the inlet 51. In the preferred embodiment, the lower edge 51B of the inlet 51 is about 30 inches above the bottom wall 15 of the container, while the lower edges 55A, 57A, and 61A of the passageway are about 18 inches above the bottom wall 15. Thus the lower edges 55A, 57A, and 61A are about 12 inches below the lower edge 51B of the inlet 51.

A door 63 is provided for opening and closing the passageway 53 and hence the inlet 51. Its rear end 63A (FIG. 8) is pivotally coupled by hinges 65, to the sloping top wall 59 at a level intermediate the top edge 51A and lower edge 51B of the inlet 51. The door 63 is opened by moving its other end 63B in an upward position as illustrated by the dotted position in FIG. 8. In this position the inlet and hence the passageway is in communication with the interior of the container by way of the bottom region thereof. The door 63 is closed by lowering it to an inclined position with end 63B adjacent the lower edge 51B of the inlet 51.

When the container 11 is being charged with cement through inlet 27, the cement falls to the bottom of the container and the sloping rear wall 71 as well as the sloping sidewall portions 73 and 75 direct the cement under the passageway 53. Thus, as the container is filled from the bottom up, the passageway 53 also will be filled. The door 63 is moved to its closed position when the container is being charged with cement. This prevents the cement from going up through the passageway 53 and out of the inlet or opening 51 which it would otherwise do if the door 63 were open. The closed door 63 limits the height to which the passageway may be filled. Charging of the container continues until the level of the cement within the container reaches near the top portion of the container but below the inlet 27.

After the container has been filled, charging is terminated and the door 63 opened to allow workmen to remove the cement with small measured containers or buckets. The cement is removed from the passageway and as it is removed, the cement will be replenished within or below the passageway due to the pressure of the column of the cement within the container portion surrounding the passageway, as the container is emptied, the sloping walls 71, 73, and 75 will direct substantially all of the cement below the passageway whereby all of the cement may be removed from the container.

The purpose of the baffle plates forming the recessed passageway and having their lower edges extending below the lower edge 51B of the opening 51, is to prevent the cement from flowing out through the opening 51 after the container has been charged and the door 63 opened to allow workmen to remove the cement. In this respect, immediately after charging, the cement is extremely flowable since it has been loosened by the air employed for charging. Even after the powdered cement has settled, after charging, it is still very flowable and will remain in this condition for a long period of time as long as it is dry. If the lower edges 55A, 57A, and 61A of the baffle plates did not extend below the lower edge 51B of the opening, the dry, powdered cement in its flowable condition would flow out of the opening 51 when the door 63 was opened. This would occur not only immediately after charging but for long periods of time thereafter. Thus the baffle plates forming the extending passageway allows workmen to unload the container without waste or loss of cement. Moreover, unloading may be carried out immediately after charging which is desirable in many instances in order to meet or coordinate working schedules or other conditions. In addition expensive unloading equipment is avoided since only the small measured containers or buckets are required.

By having the door 63 hinged to the sloping top wall 59 at a level intermediate the top and bottom edges of the opening 51, rather than, for example, at the top edge of 51A of the opening, the door 63 may be opened, after the container 11 has been charged, without having cement fall out on the ground. Thus it can be now understood that there is provided a relatively simple container for receiving and storing cement and which may be manually unloaded simply and effectively by workmen employing small containers or buckets.

Other details of the container 11 now will be described. Referring to FIGS. 3-5, the wall panels forming the passageway are supported by side braces 81 and 83 extending from the sidewalls 55 and 57 to the sidewalls of the container 19 and 21 respectively. Also provided are rearwardly extending braces 85 and 87 extending from the backwall panel 61 to the rear wall of the container 21. These braces help support the baffle plates and also help strengthen the container to keep the inward pressure and weight from warping the container. These braces have their flat surfaces in a verticle
plane whereby they do not resist the downward flow of the material.

As can be seen in Figs. 3 and 4, the flat bottom wall structure 15 has smaller dimensions than the maximum cross-section of the container illustrated in FIG. 5. Extending sidewalls 19A and 21A and lateral walls or shoulders 89 and 91 couple the bottom wall 15 to the sidewalls 19 and 21 respectively. When transporting the container by trailer, the narrower bottom portion is supported by the frame of the trailer and the lateral walls 89 and 91 extend outward and over the wheels of the trailer. The sloping wall structure 71, 73, and 75 are provided to direct the flow of cement under the passageway as indicated above.

Provision also is made for protecting the interior of the container and hence the cement stored therein from rain. The top 17 of the container slopes away from the front toward the rear as indicated above. This prevents water from draining from the top into the inlet 51. The lower end of the conduit 29 also extends downward whereby rain water cannot enter the container by way of the connector 31 and inlet 27. If desired, the connector 31 may be closed with a suitable cap, not shown.

As illustrated in Figs. 2 and 8, channel members 93, 95, and 97, U-shaped in cross-section, are coupled to the sidewalls 55 and 57 and the top wall 59 of the passageway in the inclined plane in which the door is located when in its closed position. These channel members have their open ends located in an upward position as illustrated more clearly in FIG. 9. Water which may enter or be blown into the inlet 51 when the door is closed, is channeled toward the front of the container and out on the ground by these channel members.

Coupled to the lower edge 51B of the opening is an angle iron 99. The door 63 has extending around its edge a small wall portion or lip 101 whereby the door is in the form of a lid or pan. Its lip is supported within the channel 93, 95, 97 and over the edge of the angle member 99 when the door is in its closed position.

Surrounding the underside of the door next to its extending edge or lip is a weather strip 103 formed of a flexible material such as plastic or foam rubber type of material. This weather strip presses against the inner edge of the channel members 93, 95, 97 and the inner edge of the angle member 99 when the door is closed to form a seal to prevent the cement from flowing out through cracks which it would otherwise do when the container is being charged.

The door 63, when fabricated, is cross bent to give it more strength. A latch 105, coupled to the door, and latches 107, coupled to the front wall 23, are provided for holding or locking the door in its closed or open positions.

In one embodiment, the inlet or opening 51 is 3 feet in width and 3½ feet in height. The door 63 has dimensions of about 34 inches by 29 inches. The passageway 53 at its lower edge has interior dimensions of about 30 inches by 36 inches.

It is to be understood that the container 11 could be charged through the opening of the vent 33 by a mechanical conveying system. When charged in this manner, the cement will still be very flowable since it is loosened by motion. Thus the baffle plates are still needed to perform their flow restricting function when unloading the container as described above.

What is claimed is:

1. A portable container for receiving and storing material in dry powder form and for allowing said material to be removed manually comprising:
   a container formed by bottom, top, and sidewall structure,
   a first inlet for receiving said material in dry powder form from a pneumatic charging means,
   a vent for relieving gas pressure from said container,
   means for opening and closing said vent,
   a second inlet formed through said sidewall structure for allowing a person manually to remove said material from said container,
   a door for opening and closing said second inlet, and
   seal means for forming a seal between said door and said second inlet when said door is in a closed position for preventing said material from flowing through said second inlet when said container is being charged.

2. A portable container for receiving and storing dry, flowable material in powder form and for allowing said material to be removed manually comprising:
   a container formed by bottom, top, and sidewall structure,
   a first inlet for receiving said material,
   said first inlet being located to allow said material to be introduced into said container from a top region thereof whereby said material may fall to the bottom to fill said container from the bottom up, a second inlet formed through a given sidewall for allowing a person manually to remove said material from said container, and
   a door for opening and closing said second inlet, said door having one end pivotally connected to structure of said container at a position spaced inward from said given sidewall at a level intermediate the lower and top edges of said second inlet, the other end of said door being movable upward to an open position to open said second inlet and downward to an inclined closed position adjacent the lower edge of said second inlet for closing said second inlet.

3. The container of claim 2 comprising:
   seal means for forming a seal between said door and said second inlet when said door is in a closed position for preventing said material from flowing through said second inlet when said container is being filled.

4. A container for receiving and storing dry cement in powder form and for allowing said material to be removed manually comprising:
   a container formed by bottom, top, and sidewall structure,
   an opening for receiving cement in dry powder form, said opening being located to allow said cement to be introduced into said container from a top region thereof whereby said cement may fall to the bottom to fill said container from the bottom up, an inlet formed through a given sidewall between the top and bottom thereof for allowing a person to manually remove cement from said container, wall structure located within the confines of said sidewall structure forming said container and surrounding said inlet forming a passageway extending from said inlet toward the bottom of said container.
and having its lower end open to and in communica
tion with the interior of said container by way of the bot-

7 tom region thereof to allow an operator to remove cement from said container by way of said passageway, and

door means for opening and closing said passageway,
said wall structure forming said passageway having its
lower edge above the bottom of said container but
below the lower edge of said inlet at a level suffi-
cient to prevent the cement from flowing upward and
out of said inlet after said container has been
charged with cement and said door opened,
said door having one end pivotally connected to
structure of said container at a position spaced in-
ward from said given sidewall at a level intermediate
the lower and top edges of said inlet,
the other end of said door being moveable upward to
an open position to open said inlet and downward to
an inclined closed position adjacent the lower
edge of said inlet for closing said inlet.
5. A container for receiving and storing dry cement in
powdered form and for allowing the cement to be re-
moved manually comprising:

3,814,149 a container formed by bottom, top, and sidewall
structure,
opening means for receiving cement in dry powdered
form,
said opening means being located to allow the ce-
ment to be introduced into said container from a
top region thereof whereby the cement may fall to
the bottom to fill said container from the bottom
up,
an inlet formed through a given sidewall of said con-
tainer between the top and bottom thereof for al-
lowing a person to manually remove cement from
said container,
interior wall structure located within the confines of
said sidewall structure forming said container and
surrounding said inlet forming a passageway ex-
tending from said inlet toward the bottom of said con-
tainer and having its lower end open to and in
communication with the interior of said container
by way of the bottom region thereof to allow an op-
erator to remove cement from said container by way of said passageway,
door means for opening and closing said passageway,
said wall structure forming said passageway having its
lower edge above the bottom of said container but
below the lower edge of said inlet at a level suffi-
cient to prevent the cement from flowing upward and
out of said inlet after said container has been
charged with cement and said door means opened,
the wall structure forming the bottom of said con-
tainer sloping downward toward a position gener-
ally below said passageway,
said door means having one end pivotally connected
to said interior wall structure forming said passage-
way at a position spaced inward from said given
sidewall and at a level intermediate the lower and
top edges of said inlet,
the other end of said means being moveable upward
to an open position to open said passageway and
downward to an inclined closed position adja-
cent the lower edge of said inlet for closing said passageway, and

8 seal means for forming a seal between said door and
said passageway when said door is in a closed posi-
tion for preventing cement from flowing through
said inlet when said container is being filled.
6. The container of claim 5 wherein said interior wall
structure forming said passageway comprises:
a top wall which slopes downwardly from the top of
said inlet inwardly of said container,
said one end of said door means being pivotally con-
nected to said sloping top wall of said passageway
at a level intermediate the lower and top edges of
said inlet.
7. The container of claim 6 wherein:
said opening means is adapted to receive cement in
dry powdered form from a pneumatic charging
means,
a vent located in the top region of said container for
relieving gas pressure from said container, and
means for opening and closing said vent.
8. The container of claim 6 wherein said interior wall
structure forming said passageway comprises:
sidewall structure located on both sides of said inlet
extending from said given sidewall of said con-
tainer inwardly and which joins said sloping top
wall structure of said passageway, and
back wall structure which joins said sidewall and top
wall structure of said passageway.
9. The container of claim 8 comprising:
channel means coupled to said wall structure sur-
rounding said inlet and forming said passageway
and located in the plane of said inclined position,
said channel means having an open side facing up-
ward to form a drain for channeling water down

8 toward the front of said container,
said door means comprising a plate member having
lower edges extending therefrom which fit into said
channel means when said door is closed.
10. The container of claim 9 wherein:
said seal means is coupled to said door means on the
under side thereof within and adjacent said lower
drives of said door means to form a seal between
the under side of said door means and said channel
means and the lower edge of said inlet when said
door is in a closed position.
11. The container of claim 9 wherein:
the sidewall of said container opposite said given
sidewall has a height less than that of said given
sidewall of said container,
said top wall structure of said container sloping
downwardly from said given sidewall to the side-

12 wall opposite said given sidewall.
12. The container of claim 11 wherein:
said opening means is adapted to receive cement in
dry powdered form from a pneumatic charging
means,
a vent located in the top region of said container for
relieving gas pressure from said container, and
means for opening and closing said vent.
13. The container of claim 12 wherein:
said seal means is coupled to said door means on the
under side thereof within and adjacent said lower
drives of said door means to form a seal between
the under side of said door means and said channel
means and the lower edge of said inlet when said
door is in a closed position.