PATENT SPECIFICATION (11) 1 589 514

1 589 514

(21) Application No. 32849/76 (22) Filed 6 Aug. 1976 (19)

(23) Complete Specification filed 26 July 1977

(44) Complete Specification published 13 May 1981

(51) INT. CL.³ B65G 53/36

(52) Index at acceptance

B8A 3AW

(72) Inventor FREDERICK JOHN HIORNS

(54) BULK CONTAINER EQUIPPED WITH DISCHARGE MEANS

(71) We, THE ASSOCIATED PORTLAND CEMENT MANUFACTURERS LIMITED, a Company organised under the laws of Great Britain, of Portland House, Stag Place, London SW1E 5BJ, England, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to the discharge of fine particulate material such as cement which is liable to form airborne dust, from a container such as a cement railcar.

In discharging cement from a bulk container on a railcar, truck or lorry adapted to carry such material and discharge it through an outlet pipe it is common practice to employ air to fluidise the cement in the container to assist discharge. For instance by means of a pump which may be mounted on the vehicle, primary air is supplied through a porous pad into the bottom of the container, to fluidise the contents of the container and cause them to flow out of the discharge pipe, while secondaray air branched off from the primary air supply is fed through another porous pad in the bottom of the discharge pipe to keep the contents of the pipe fluidised.

The cement is normally discharged to a silo for storage at the site where it is to be used eventually. One aim of such an arrangement is to unload the container as quickly as possible.

On the other hand, in underground locations or confined spaces generally where storage as in a silo is not practicable, where cement is being used and is supplied for example by means of railcar bulk containers, it is desired to provide for a relatively slow by constant discharge with the minimum of raised dust.

It is an object of the present invention to provide a mobile bulk container equipped with means for the discharging of fine particulate material such as cement, suitable for use underground or in a confined space, employing a minimum amount of air.

The present invention provides a bulk container for particulate solid matter, equipped with means for discharge of such matter therefrom in a confined space, said means comprising: at least one gas permeable internal floor element for the transmission of air therethrough within the container, to fluidise particulate matter resting on the floor, said element sloping down towards one side of the container; a bottom discharge pipe for such particulate matter from the container; means for supplying air upwardly through said floor element; an air conduit leading from adjacent the top of the space within the container to said discharge pipe for transmission of air from the container to said pipe; and a mechanical conveyor mounted within and along the bottom of the container at the side thereof below the lower end of the sloping gas permeable floor element, ending at the discharge pipe, for conveying the particulate matter out of the container while effectively providing therewith an air seal between the container and the discharge pipe.

Preferably, a plurality of parallel gas-permeable floor elements slope down towards one side of the container.

Preferably, the conveyor is a screw conveyor; this is mounted, for instance, in a channel or gully along the side of the container below the lower end of the sloping gas-permeable floor element or elements.

The container of this invention is preferably mobile (which term includes 'transportable"), as in the case of bulk cement rail cars.

The air supplied to the container for fluidising is thus used twice, first to fluidise the cement on the floor in the container to cause it to slide or flow down to the conveyer, and secondly by way of the air discharge pipe from the top of the container to the solids discharge pipe, to move the discharge cement trough the pipe to its outlet. The secondary air may be directed for instance axially straight into the dis-

charge pipe, thus carrying the discharged particulate material with it, or upwardly through a gas-permeable portion of the underside of the discharge pipe to fluidise the particulate material expelled through the pipe by the conveyer. Although the pressure of the secondary air is relatively low it can be enough to keep cement flowing in the pipe. The total air used is kept to the minimum necessary to operate the discharge and is less than in prior methods and constructions. The dust problem is lessened and more readily controlled.

The discharge rate can be controlled by regulating the conveyor, because the cement powder settles onto the conveyor out of the fluidised state and provides an air seal between the container and the discharge pipe.

The invention is illustrated in the accompanying drawings, in which:

Figure 1 is a cross-sectional side elevation of a bulk cement railcar embodying a container according to the invention; and

Figure 2 is a cross-sectional end elevation of the railcar of Figure 1 on the line II—II in Figure 1.

In Figures 1 and 2 there is shown mounted on a railcar base 1 a bulk container 2 for cement. The railcar is intended for the delivery of cement underground to the area of an advancing coal face. Along the length of the lower part of the container 2 there is a floor 3 which slopes downwardly from one side of the container to the inner top edge 4 of a channel 5 along the other side and near the bottom of the container.

The floor 3 supports a series of parallel, transverse, laterally sloping floor elements 6 each formed of a length of gas-permeable aerating hose detachably secured by clips 7 to an air manifold 8 fed from an air supply at 9, and closed at their lower ends under a clamp bar 23. The air serves to fluidise powdered cement resting on the floor 3 and floor elements 6; the object of such fluidisation is to encourage flow of the material down the shallow slope of the floor; the purpose of the shallow slope, as opposed to a steep slope such as would be needed for gravity discharge, is to provide increased capacity in a restricted volume. The powdered cement which slides off the floor elements 6 descends to the side of the container and into the channel 5 in which a screw conveyor 10 is mounted to rotate so as to convey the fallen powdered cement into the space 11 for discharge through pipe 12. The powdered cement temporarily present in the channel 5 is in general not fluidised and thus serves to provide a seal between the air in the container and the air in the discharge pipe. Further positive sealing is provided when required by slide valve 13 operable by rod 14 from outside the railcar.

Air which has served to fluidise the cement on the floor of the container is allowed to leave the container as shown by arrows 15 near the top of the container by way of a pipe 16 and is delivered by pipe 16 to a point in space 11 under the conveyer 10 opposite the discharge pipe 12, where pipe 16 is shaped and directed to assist cement discharge through pipe 12.

In practice the air supply is controlled so as to exert the minimum pressure needed to obtain discharge of the cement powder through discharge pipe 12, so that production of airborne dust at the outlet is minimised or even eliminated.

Air-return pipe 16 has a flared inlet to reduce air velocity and a deflector plate 17 is provided above the air manifold 8 to deflect cement onto the aerated floor area. The ends of the floor 3 are likewise angled as at 18, 19, to provide downward slopes from the ends of the container.

An auxiliary air supply pipe 20 fitted with a valve 21 permits adjustment of the air stream in pipe 16 without having to alter the fluidising effect on the floor. A flush fitting inspection cover 22 is fitted in the roof. All joints are made air-tight.

The air supply to the railcar may be derived from the coal mine pit compressed air supply, or an electrically or hydraulically driven compressor mounted locally or on the car itself. Electric or hydraulic motive power will normally be available to drive the conveyor. The railcar may be typically associated with a grout pump or slurry line to which it discharges, so that the water employed effectively cleans the air used before its discharge to the atmosphere.

It will be appreciated that although the invention has been described largely in terms of cement powder as the particulate solid matter in question, the invention can be readily applied to the discharge from bulk containers, whether mobile or not, of any fluidisable particulate solid material.

WHAT WE CLAIM IS:—

1. A bulk container for particulate solid matter, equipped with means for discharge of such matter therefrom in a confined space, said means comprising: at least one gas permeable internal floor element for the transmission of air therethrough within the container, to fluidise particulate matter resting on the floor, said element sloping down towards one side of the container; a bottom discharge pipe for such particulate matter from the container; means for supplying air upwardly through said floor element; an air conduit leading from adjacent the top of the space within the container to said discharge pipe for transmission of air from the con-

tainer to said pipe; and a mechanical conveyer mounted within and along the bottom of the container at the side thereof below the lower end of the sloping gas permeable floor element, ending at the discharge pipe, for conveying the particulate matter out of the container while effectively providing therewith an air seal between the container and the discharge pipe.

2. A container according to claim 1, wherein a plurality of parallel gas permeable floor elements slope down towards one side of the container.

3. A container according to claim 2, wherein the gas permeable floor elements are formed of lengths of permeable hose closed at the lower end and detachably secured to an air supply manifold pipe at the upper end.

4. A container according to claim 1, 2 or 3, wherein the mechanical conveyor is a screw conveyor.

5. A container according to any of claims 1 to 4, wherein the air conduit is arranged to direct air axially into the discharge pipe.

6. A container according to any of claims 1 to 5, wherein the underside of the discharge pipe is provided with a gas permeable portion and the air conduit is arranged to direct air upwardly through said gas permeable portion.

7. A container according to any of claims 1 to 6, wherein a valve is provided that is capable of sealing the discharge pipe.

8. A container according to any of claims 1 to 7, wherein a pipe, fitted with a valve, is connected to the said air conduit for adjustment of the air stream in the conduit.

9. A container according to any of claims 1 to 8 that is mobile.

10. A mobile bulk container according to claim 9, which is a bulk cement rail car.

11. A container equipped with means for discharging fluidisable particulate matter therefrom, being a container substantially as described and shown in the accompanying drawings.

For the Applicants,
CARPMAELS & RANSFORD,
Chartered Patent Agents,
43 Bloomsbury Square,
London WC1A 2RA.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1981.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.

1589514 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

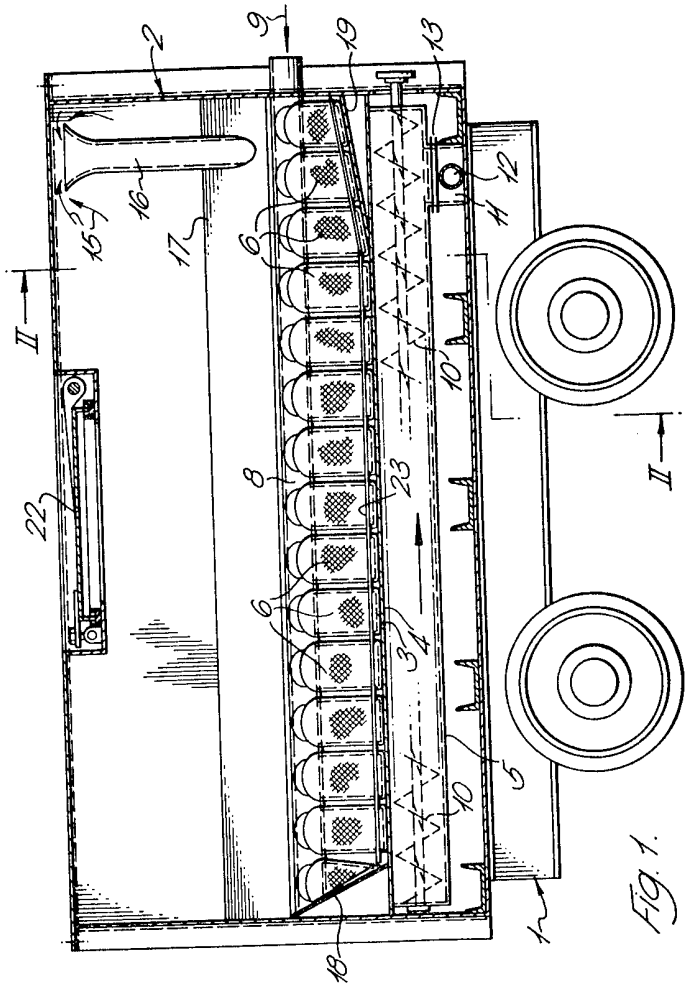

Fig. 1.

1589514 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 2

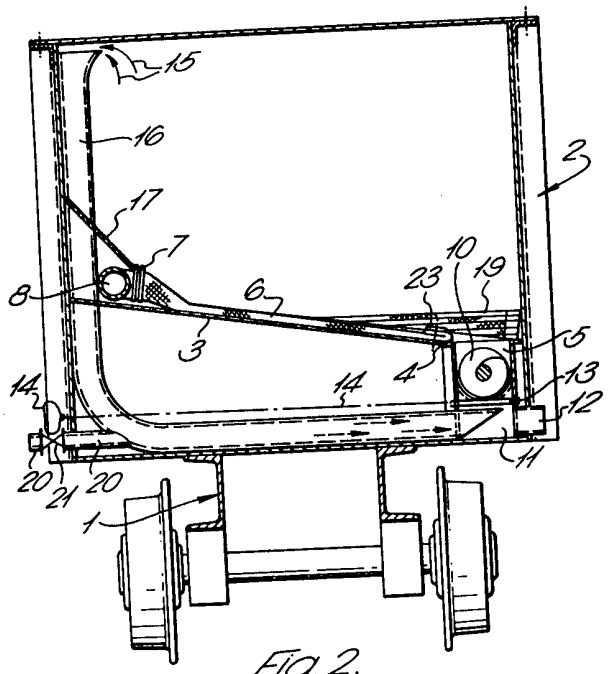

Fig. 2.