

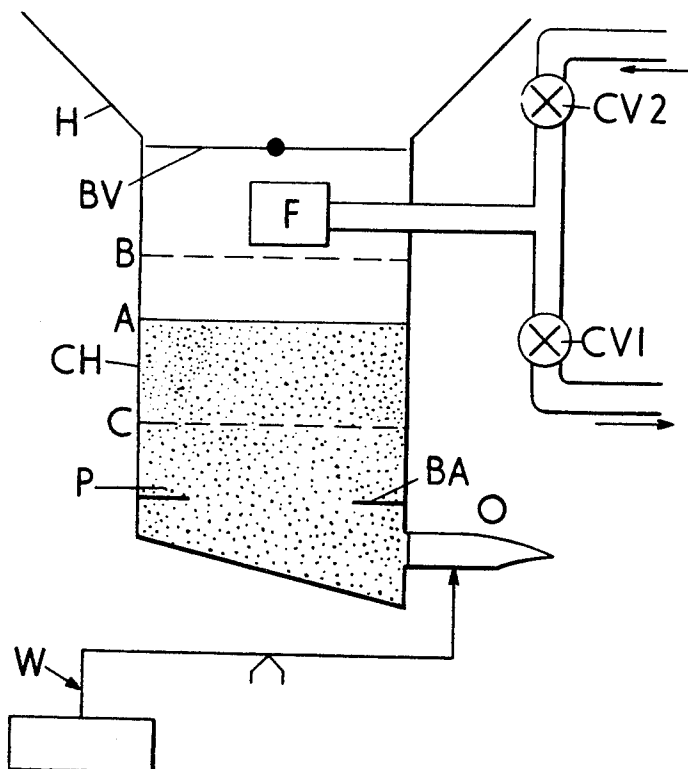
[72]	Inventor	Han-Jorgen Bye-Jorgensen Gravesend, Kent, England
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[73]	Assignee	Sack Fillers Limited, Northfleet, Gravesend, Kent, England
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<i>Primary Examiner</i> —Houston S. Bell, Jr.		
<i>Attorney</i> —Holman & Stern		

[54] METHOD AND APPARATUS FOR FILLING CONTAINERS
1 Claim, 1 Drawing Fig.

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ABSTRACT: This invention relates to a method and apparatus for densifying or compacting powder in a chamber and then transferring it to a container such as a sack, the method being that the powder is fed to a chamber where it is first subjected to a pressure below ambient pressure and then rapidly increasing the pressure, the increase of pressure may be used to feed the densified powder to the container, the apparatus comprises a chamber having a charging opening, an evacuating and pressurizing connection, and a connection for transferring the treated powder to the container.



METHOD AND APPARATUS FOR FILLING CONTAINERS

This invention relates to a method and apparatus for the purpose of densifying or compacting powders, that is to say the removal of at least some of the air or other gas entrapped in the powder, and filling containers with the powder.

During the normal course of the manufacture of powders, and their subsequent handling, e.g. pouring, a gas, usually air, becomes entrapped within the powder, which can cause difficulties in the subsequent handling of the powder. For example, when the powder is introduced into a flexible bag or sack, if no means are provided for permitting the entrapped air to escape, such as by using a gas-permeable material for the sack, the air will remain within the sack rendering it awkward to handle.

Therefore, when using sacks of a material which is not gas-permeable, e.g. when using plastics sacks, then it is highly desirable to densify or compact the powder before filling it into the sack. Moreover, when a powder containing air or other gas as a consequence of its manufacture and subsequent handling is introduced into any rigid or flexible container, whether it be composed of gas-permeable material or not, the powder will occupy an unnecessarily large volume thereby increasing the size of container needed for a given mass of powder or reducing the mass which can be filled into a given volume.

One method of densifying or compacting powder consists of allowing the powder to fall through a chamber maintained at less than atmospheric pressure and then discharging the powder into a sack taking care not to allow significant reaeration of the powder.

However, it has been found that when such a method is not used and an attempt is made to remove entrapped air from a powder merely by subjecting the mass of powder to less than atmospheric pressure, then most powders will increase in volume to a greater or less extent instead of densifying or compacting, gas thereby remaining entrapped in the powder. Milled china clay (kaolin) is one powder in which this characteristic is particularly noticeable.

It is an object of the present invention to provide an improved method and apparatus in which the above difficulty is effectively overcome.

The present invention consists in a method of providing a container with densified or compacted powder, in which the powder is first subjected to an air or other gas pressure of less than its ambient pressure and then the pressure is increased rapidly to densify or compact the powder after which the thus treated powder is then transferred to the container.

The invention further consists in apparatus for densifying or compacting powders, which includes a chamber having means for subjecting a powder within the chamber first to a pressure of less than its ambient pressure and then to a rapidly increased pressure. In carrying the invention into effect according to one convenient mode by way of example, the accompanying drawing shows diagrammatically apparatus for densifying or compacting powders such as milled china clay. The apparatus includes a chamber CH into which a batch of the powder P is introduced from a hopper H via a butterfly valve BV, the powder reaching a level A.

With the valve BV closed control valve CV1 is opened to connect the interior of the chamber in a filter F to a source of

vacuum, say of the order of 25 inches of mercury.

As a consequence of the characteristics of milled china clay, as explained above, the level of the powder will rise to level B.

Valve CV1 is then closed and control valve CV2 opened to connect the interior of the chamber to a source of compressed air say up to 100 to 150 p.s.i., causing a rapid increase in pressure over a period of a number of seconds. This causes the level of the powder to fall to level C, i.e. more dense than its original state, and the compressed air will also clear the filter F.

Powder is taken via an outlet O connected to the chamber by a flexible coupling and having a weighing mechanism W, for weighing the powder passing through the outlet. The increased pressure above the powder assists in expelling the powder, almost in the manner of an extrusion process due to the physical characteristics of the densified or compacted powder and effect of the pressure.

Some difficulty may be experienced in expelling the powder in this manner due to the fact that on densifying or compacting not only does the level of the powder fall but it also contracts away from the walls of the chamber leaving a gap through which pressure can escape to the outlet O without assisting in expelling the powder. If necessary, this escape of pressure can be prevented by an annular baffle BA secured to the wall of the chamber to block the gap created upon or densifying or compacting.

Although a batch process has been described, it may be possible to operate the method as a continuous process, e.g. by passing the powder first through a region of reduced pressure and then passing it rapidly into a region of higher pressure.

It is preferred to apply a pressure of greater than atmospheric pressure after the reduced pressure, but in some cases it may be found adequate merely to return the pressure to atmospheric pressure or to a pressure between the reduced pressure and atmosphere, the change being effected rapidly. Where the pressure is increased from a vacuum of 25 inches of mercury to atmospheric pressure, it has been found that if this is achieved in a period of the order of a few seconds, say, 3 seconds, then this is sufficiently rapid to achieve the desired densifying or compacting.

It can be appreciated that the present invention, although directed towards the filling of sacks and the like, considers the feasibility of applying the invention to the filling of larger containers such as road or rail bulk carriers and to filling the holds of ships.

We claim:

1. A method of filling a container with densified powder, which includes the steps of:

reducing the gas pressure upon a powder in a container to less than atmospheric pressure;

thereafter rapidly increasing the pressure upon the powder to a pressure greater than atmospheric pressure whereby the powder is densified; and

expelling the densified powder from the chamber, under the influence of said pressure greater than atmospheric pressure, into a container until the container is filled to its capacity, without significant reaeration of the densified powder.