Sept. 11, 1962 L. DE SAINT-MARTIN 3,053,420

STATIC DISTRIBUTOR FOR PULVERULENT MATERIAL

Filed March 8, 1960

Fig. 2

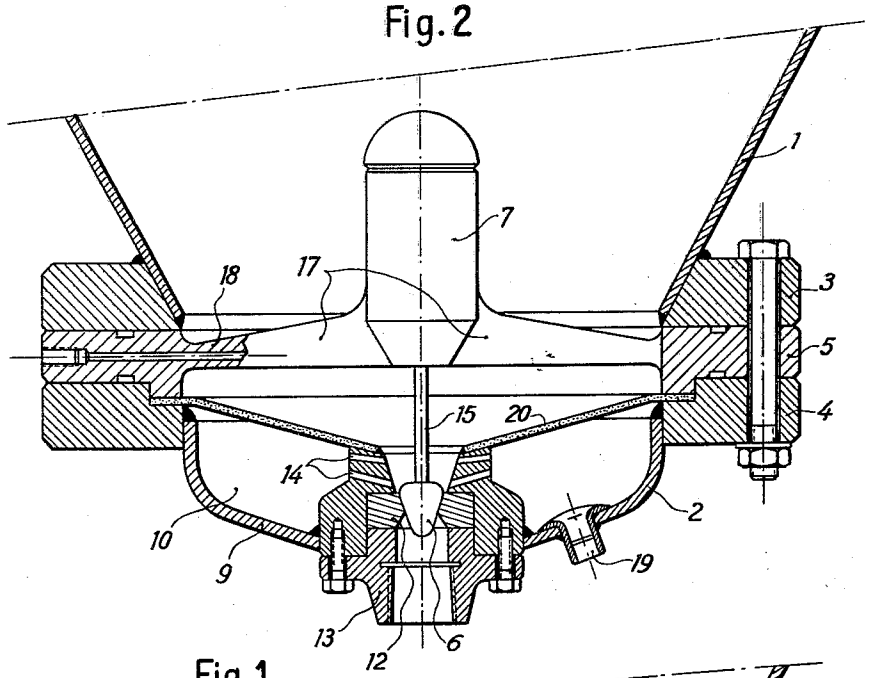
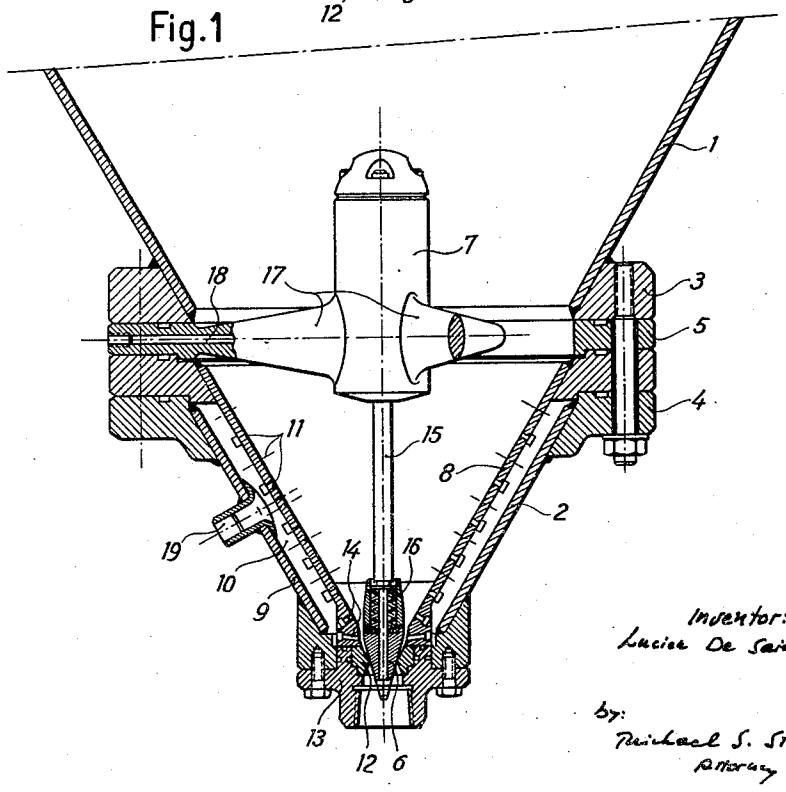



Fig. 1




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3,053,420

Patented Sept. 11, 1962



3,053,420

# STATIC DISTRIBUTOR FOR PULVERULENT MATERIAL

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Filed Mar. 8, 1960, Ser. No. 13,551
Claims priority, application France Mar. 11, 1959
4 Claims. (Cl. 222—195)

The present invention relates to a static distributor for pulverulent material and, more particularly, for pulverulent lime.

It is a well-known fact that it is a difficult matter to distribute pulverulent lime, by reason of the somewhat adhesive property of the latter.

On the other hand, it is important, in the case of certain steel-producing methods, to convey lime suspended in a gas such as oxygen and to control accurately the throughput of the suspension of lime. To reach such a result, it is necessary to fluidize pulverulent lime.

A number of distributors for pulverulent materials are known, wherein the container is provided at its lower end with a fluidizing bottom. In order to govern perfectly such a throughput of pulverulent powder, it is essential that said throughput may be interrupted suddenly and perfectly and, to this end, it has already been proposed to resort to a needle valve cooperating with a seat. However, in the embodiments proposed hitherto, the fluidization is not continued down to the lowermost section of the arrangement corresponding to the opening of the conveying pipe. Furthermore, in certain known apparatus, the needle valve is fitted outside the container and its closing movement is opposed to the direction of exhaust of the pulverulent products out of the apparatus.

These different arrangements show drawbacks inherent to the difficulty of producing and keeping a suspension of a large amount of pulverulent lime inside a gasiform carrier stream. As a matter of fact, any disturbance in the flow of the mixture risks producing deposits of material and more or less localized fouled areas in the pipes, together with an irregular operation.

The present invention has for its object to remove the above drawbacks by proceeding with a continuous homogeneous fluidization, extending down to the seat of the closing needle valve, while cutting out any risk of a deposit of pulverulent material on the seat or in the vicinity thereof and allowing a reliable and uniform operation, together with a speedy and perfectly fluidtight closing through the needle valve.

A further object of the invention consists in providing a disconnectable fluidizing and closing arrangement of an easy operation and which is readily removed and replaced.

To this end, the present invention has for its object a static distributor of pulverulent material providing for the fluidization of the latter, said distributor including a disconnectable fluidizing bottom, the size of which is independent of the capacity of the container, a closing needle valve being provided at the lower end of the container.

According to the invention, said bottom is constituted by a cone pervious to the fluidizing gases and located inside the container at the lower end of the latter, so as to form with said lower end a pressure-distributing chamber extending down to said lower end of the container, a plurality of suitably directed vents being located at the lower end of this pressure-distributing chamber, so as to produce a permanent sweeping of the seat of the needle valve ensuring a fluidtight closing of the pressure-distributing chamber, together with a uniform flow of pulverulent material out of the latter.



Further optional features of the invention are as follows: The fluidizing bottom is in the shape of a cone, the apical angle of which is substantially equal to 60° with nozzles distributed throughout its surface; the fluidizing bottom is made of a porous material such as sintered bronze and appears in the shape of a cone, the apical angle of which has a value ranging between 60 and 160°.

To allow a better understanding of the invention and also by way of examples given out without any restrictive sense being attached thereto, two embodiments of said invention are described hereinafter, reference being made to the accompanying drawings, wherein:

FIG. 1 is an axial sectional view of a static distributor improved in accordance with the invention and provided with a fluidizing bottom having an apical angle equal to 60° and carrying nozzles.

FIG. 2 is an axial cross-section of a distributor with a fluidizing bottom forming a 150° cone and made of sintered bronze.

The static distributor illustrated in FIG. 1 includes chiefly a container extending downwardly, so as to form a frusto-conical section **1**, the apical angle of which is equal to 60°, said section being illustrated alone without any further depart of the container.

Said frusto-conical section is carried over a disconnectable fluidizing bottom **2** secured to the frusto-conical section **1**, through the agency of two flanges **3** and **4** holding between them an intermediate flange **5** carrying the closing needle valve **6** and its pneumatic control jack **7**.

Starting from this structure, it is possible to insert a series of identical fluidizing bottoms over containers of widely different sizes. Similarly, the dismantling of the system is a very easy matter and the replacement of the bottom can be executed speedily. Each bottom **2** is constituted by two coaxial frusto-cones having a apical angle equal to 60°, to wit: an inner cone **8** and an outer cone **9**, so as to form between said cones a pressure-distributing chamber **10**.

The inner or fluidizing cone carries a large number of nozzles, said number of nozzles being generally larger than 100, which nozzles are illustrated diagrammatically at **11** and are distributed throughout the surface of the cone down to proximity with the lower end of the latter, which lower end is formed by a seat **12** fitted inside a cover **13** at the lower end of the fluidizing cone; above the seat is formed a series of vents **14** directed so as to provide for a permanent sweeping of the exhaust port formed in the seat.

The above-mentioned needle valve of plastic material **6** cooperates with the seat **12** and is controlled by the pneumatic jack **7**, so as to control the flow of pulverulent material. Between the needle valve and the rod **15** of the jack is inserted a damping spring **16** adapted to absorb the shocks and to protect the needle valve.

Said needle valve and jacket arrangement is positioned and held axially of the apparatus, through the agency of three arms **17** rigid with the flange **5** held fast, as mentioned hereinabove, between the flanges **3** and **4**.

The body of the jack **7**, the three arms **17** and the flange

5 form a unitary cast member which makes its mounting an easy matter. The jack is fed with compressed air, through the agency of two pipes bored in the arms 17 and in the flange 5.

The fluidizing gas is admitted at 19 into the distributing chamber 10 for the feeding of the nozzles. A further admission of conveying gases is provided at the upper end of the container above the pulverulent mass, at a point which is not illustrated.

The operation of the apparatus is as follows:

The pulverulent lime or the like powder to be injected is fed into the container and it is then fluidized through the introduction at 19 of a compressed gas such as oxygen. Said gas flowing out of the chamber 10 through the nozzles 11 produces a sufficient aeration of the pulverulent material, which reduces its apparent specific weight and fluidizes it to an extent such that it may flow out of the bottom of the apparatus through the output port of the latter, as allowed by the angle of 60° formed by the adjacent walls.

Furthermore, the introduction of the same gas above the pulverulent mass, which raises the pressure inside the container above the pressure inside the output pipe, conveying the material out of the apparatus and which is not illustrated, furthers the flow of the mixture of fluid and pulverulent material into said output pipe and thereby cuts out the risk of an irregular pulsatory output flow.

Since an intimate mixture is obtained between the pulverulent material and the gas conveying it, it will be assumed that said mixture behaves in the manner of a heavy compressible fluid raised to the pressure prevailing in the upper section of the apparatus. Consequently, the opening, controlled by the needle valve operated by the jack, of the lower port connecting two volumes containing compressible fluids under different pressures allows an emptying of the static distributor into the output pipe, the throughput of pulverulent material increasing and decreasing with the increase and decrease of the diameter of said port and of the difference in pressure between the inside of the apparatus and the output pipe.

In the modification illustrated in FIG. 2, the apparatus is generally similar to that which has just been described and it is secured in the same manner to the lower frusto-conical section of the container 1. The same reference numbers are applied as in the case of FIG. 1 to the parts common to these apparatus. In the case illustrated in FIG. 2, the fluidizing conical bottom 20 is made of stamped porous and sintered bronze. A limited number of nozzles is thus replaced by a very large number of small ports. The apical angle of said cone is equal to 150°. The porosity of the fluidizing cone is such that the input of compressed gas at the upper end of the container may be cut out, the conveying gases being the same as the fluidizing gases.

As in the preceding example illustrated in FIG. 1, the throughput may be cut off through a needle valve 6 of plastic material engaging its seat 12 and controlled, as precedingly, by a pneumatic jack 7, while suitably directed vents 14 distributed round the seat provide for a permanent sweeping of the output port at 12.

Obviously, it is possible, without unduly widening the scope of the invention as defined in the accompanying claims, to imagine various detail modifications and also to substitute equivalent means for those disclosed and, generally speaking, many other embodiments may be provided for the invention thus defined.

What I claim is:

1. A static distributor for pulverulent material, comprising a container adapted to be filled with said material, a substantially conical fluidizing bottom permitting passage of fluidizing gases in upward direction therethrough and positioned over the lower end of the container at a small distance from the latter to form therewith an independent chamber extending down to the lower most point of the container, a passage provided with a valve seat extending through the fluidizing bottom at the lower end of the container to allow the exhaust of the fluidized material out of the container, a needle valve cooperating with the valve seat in the passage, means for introducing the fluidizing gases into said independent chamber through the outside of the container, and a plurality of downwardly directed vents extending between the independent chamber and said passage and terminating in the latter closely adjacent to and upstream of said valve seat formed therein to make the fluidizing gases sweep over the valve seat in said passage to ensure thereby fluidtightness for the needle valve when engaging the valve seat and a uniform flow of fluidized material through the passage upon disengagement of the needle valve.

2. A static distributor for pulverulent material comprising a container adapted to be filled with said material, a disconnectable substantially conical fluidizing bottom positioned over the lower end of the container at a small distance from the latter to form therewith an independent chamber, said conical fluidizing bottom having an upwardly flaring apical angle equal to about 60°, a plurality of upwardly directed nozzles distributed throughout the surface of the fluidizing bottom and connecting the independent chamber with the remainder of the container, a passage provided with a valve seat extending through the fluidizing bottom and the lower end of the container to allow the exhaust of the fluidized material out of the container, a needle valve cooperating with the valve seat in the passage, means for introducing fluidizing gases into said independent chamber through the outside of the container, and a plurality of downwardly directed vents extending between the independent chamber and said passage and terminating in the latter closely adjacent to and upstream of said valve seat formed therein to make the fluidizing gases sweep over the valve seat in said passage to ensure thereby fluidtightness for the needle valve when engaging the valve seat and a uniform flow of fluidized material through the passage upon disengagement of the needle valve.

3. A static distributor for pulverulent material comprising a container adapted to be filled with said material, a disconnectable substantially conical fluidizing bottom positioned over the lower end of the container at a small distance from the latter to form therewith an independent chamber, said substantially conical fluidizing bottom made of porous material having an upwardly flaring apical angle of a value comprised between about 60° and 160°, a passage provided with a valve seat extending through the fluidizing bottom and the lower end of the container to allow the exhaust of the fluidized material out of the container, a needle valve cooperating with the valve seat in the passage, means for introducing fluidizing gases into said independent chamber through the outside of the container, and a plurality of downwardly directed vents extending between the independent chamber and said passage and terminating in the latter closely adjacent to and upstream of said valve seat form therein to make the fluidizing gases sweep over the valve seat in said passage to ensure thereby fluidtightness for the needle valve when engaging the valve seat and a uniform flow of fluidized material through the passage upon disengagement of the needle valve.

4. A static distributor for pulverulent material, comprising a container adapted to be filled with said material, a disconnectable substantially conical fluidizing bottom positioned over the lower end of the container at a small distance from the latter to form therewith an independent chamber, said substantially conical fluidizing bottom made of porous sintered bronze having an upwardly flaring apical angle of a value comprised between about 60° and 160°, a passage provided with a valve seat extending through the fluidizing bottom and the lower end of the container to allow the exhaust of the fluidized material out of the container, a needle valve cooperating with the valve seat in the passage, means for introducing fluidizing gases

into said independent chamber through the outside of the container, and a plurality of downwardly directed vents extending between the independent chamber and said passage and terminating in the latter closely adjacent to and upstream of said valve seat formed therein to make the fluidizing gases sweep over the valve seat in said passage to ensure thereby fluidtightness for the needle valve when engaging the valve seat and a uniform flow of fluidized material through the passage upon disengagement of the needle valve.



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