

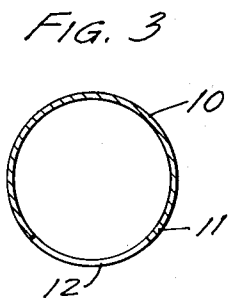
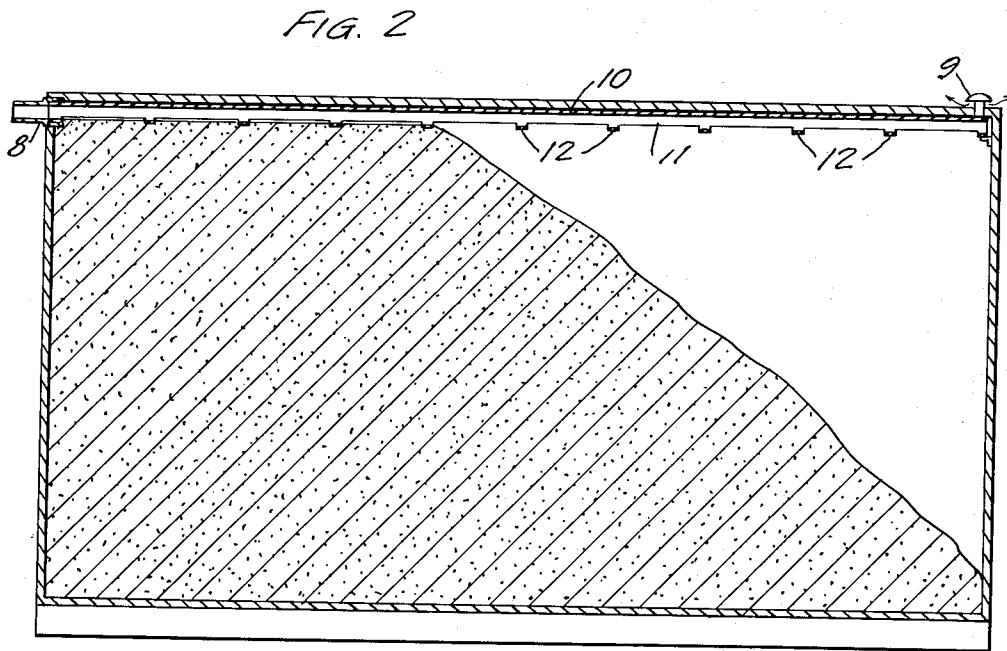
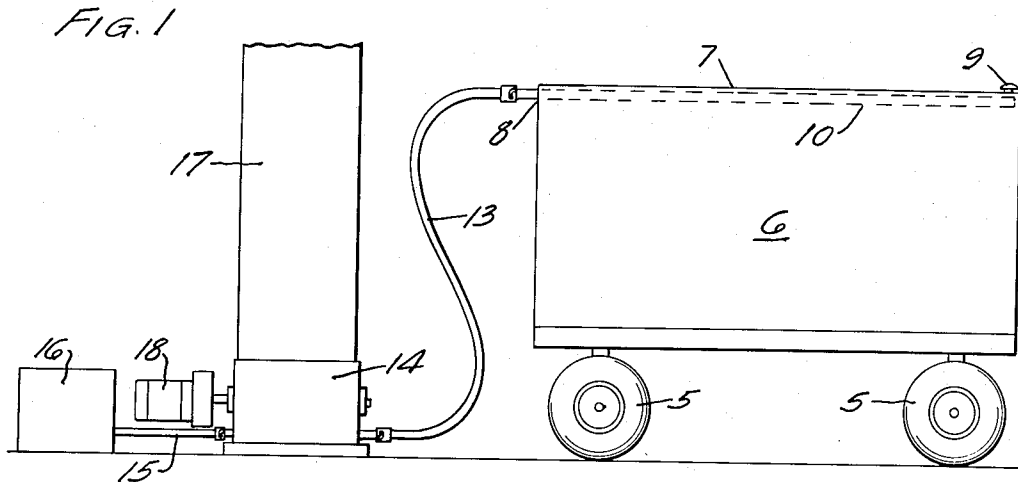
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BIN FILLING APPARATUS

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1

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BIN FILLING APPARATUS

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9 Claims. (Cl. 302—59)

This invention relates to bin filling apparatus. More particularly, it relates to apparatus for filling a bin completely with fluidized pulverulent material regardless of whether its shape cross-sectionally is rectangular or circular.

In recent years, methods of filling bins with pulverulent material in less time than has heretofore been possible have become known. Some of such methods introduce the pulverulent material such as flour into the bin in a fluidized state so that a relatively large volume of the pulverulent material relative to the volume of air used as a carrier is introduced into the bin with the net result that the bin is filled very rapidly. The pulverulent material in such instances flows like water and completely fills the conduit through which it is conveyed to the bin. One disadvantage experienced in using such methods as well as with other methods has been that it has not been possible to completely fill the bin to the top thereof. This has been especially true where a bin of rectangular cross section has been used, for in such instances the longitudinal central and upper portions of the bin frequently will fill up while the more lateral upper portions will remain unfilled. Our invention is directed toward overcoming this disadvantage.

It is a general object of our invention to provide a novel and improved bin filling apparatus of inexpensive and simple construction and operation.

A more specific object of our invention is to provide novel and improved bin filling apparatus capable of completely filling a substantially closed bin to such an extent that there will remain no appreciable unfilled areas therein.

Another object is to provide novel and improved bin filling apparatus which, without adjustment or regulation, will completely fill a substantially closed bin so as to leave no appreciable unfilled areas therein.

Another object is to provide improved bin filling apparatus which, without adjustment or regulation, will completely fill a substantially closed bin and which is, at the same time, extremely simple and inexpensive in construction.

Another object is to provide improved bin filling apparatus which will utilize a portion of the pulverulent material transferred thereby into the interior of the bin to accomplish the complete filling of a substantially closed bin with such fluidized pulverulent material.

These and other objects and advantages will more fully appear from the following description made in connection with the accompanying drawings wherein like reference characters refer to the same parts throughout the several views and in which:

Fig. 1 is a diagrammatic view of our bin filling apparatus being utilized in conjunction with a trailer having a bin mounted thereupon;

Fig. 2 is a vertical sectional view through such a trailer and bin as shown in Fig. 1 and through the type of conduit utilized in the preferred form of our invention;

Fig. 3 is a vertical sectional view taken along line 3—3 of Fig. 2.

2

One embodiment of our invention may include, as shown in Figs. 1—3, a trailer indicated generally as 5 upon which is carried an elongated bin 6. As shown, this bin 6 has a top 7, an inlet 8 and an air outlet 9 across which a conventional air filter is mounted. Extending along the longitudinal central portions of the top 7 throughout essentially the entire length of the bin 6 is a conduit indicated generally as 10. As shown, this conduit 10 is connected to the inlet 8 and receives pulverulent material therefrom.

The conduit 10 as shown is essentially an inverted channel member of arcuate shape, as best shown in Fig. 3. This channel member need not necessarily be inverted but this is the preferred form. It may have its channel facing upwardly or laterally as desired. In fact, that channel member could, if desired, be arranged vertically and the channel thereof could face any direction desired. The conduit 10 shown in the drawing was formed by securing a metal pipe of approximately 4 inches in diameter adjacent the top of the bin and by cutting sections of the lower wall structure thereof away to open the pipe at regular intervals along the length thereof. The lower wall structure could, if desired, be cut away completely along the length of the pipe. Fig. 3 shows the conduit 10 having arcuately shaped wall structure, the lower portions 11 of which are cut away along an arc of approximately 90° as illustrated. At periodic intervals along the length of the conduit 10, sections 12 thereof have been permitted to remain.

Connected to the inlet 8 from the outside of the bin 6 is a delivery conduit 13 which is connected to an actuator 14 which, in turn, is connected by a pipe 15 to a conventional air compressor 16. The actuator 14 is constructed in accordance with the actuator disclosed and claimed in the patent application filed in the United States Patent Office jointly by one of the inventors of the instant invention, namely, David F. Mattson, with Fred M. Atkinson on March 2, 1953, and entitled "Actuator for Fluidized Conveying System," Serial Number 339,801. This actuator 14, as disclosed in said application for patent, serves, in combination with the compressor 16, to fluidize the pulverulent material such as flour received from above, as shown, and to propel the same through the delivery conduit 13 and into the interior of the distributing conduit 10.

In use, the flour or other pulverulent material is fed to the actuator 14 via the chute 17. The motor 18 drives the actuator so as to carry the pulverulent material around to a position where it may be acted upon by the compressed air passing from the compressor 16 through the pipe 15. Approximately 8 to 10 pounds of pressure is provided by the compressor 16, and this is sufficient to fluidize the flour and carry it upwardly through the delivery conduit 13 and propel it longitudinally of the conduit 10. Of course, shortly after the fluidized pulverulent material passes into the conduit 10, there is a substantial reduction in pressure in view of the fact that the lower wall portions of the conduit 10 have been cut away. As a result, the flour or other pulverulent material will descend to the bottom of the bin adjacent the end of the bin having the inlet 8 therein. The flour or other pulverulent material will continue to pile up until it registers and surrounds the conduit 10. We have found that the flour searches out even the most laterally disposed areas in a bin of rectangular cross section and fills them completely.

By fluidized pulverulent material, we mean pulverulent material such as flour being carried in an air stream so as to flow similarly to water. Such a fluidized stream will contain approximately 50—80 pounds of flour for each pound of air and will vary in either direction from there

3

according to the specific gravity of the material being pumped.

When the flour reaches the elevation of the conduit 10 and the more lateral portions of the bin 6 have been filled adjacent the inlet end of the bin, the flour serves to close off the openings in the conduit 10 more closely adjacent to the inlet 8 with the result that, in effect, that portion of the conduit 10 has complete circumferential wall structure. In other words, the flour previously deposited in the bin serves to complete the wall structure of the conduit 10 so that the portion of the conduit 10 adjacent the inlet is just as effectual in conveying the flour longitudinally of the conduit 10 as if no portion of its wall structure had been cut away therefrom. The result is that the flour continues to travel longitudinally of the conduit 10 and gradually fill up the portions of the bin adjacent to the previously filled portions until finally the end farthest from the inlet 8 will be completely filled.

We have found that, when a conduit such as the conduit 10 is utilized in combination with such an actuator 14 and air compressor 16, a bin such as the bin 6 may be completely filled throughout its interior area. In fact, we have found that, even though the conduit 10 is disposed as much as 8 inches from the top 7 of the bin 6, the flour will completely encircle the conduit 10 in the areas more adjacent to the inlet 8 so that the bin will be filled completely to the top. In this manner there is no loss of space within the bin 6. Such a device is of great importance where it is desired to store pulverulent material such as flour and where the lack of storage space is critical.

Thus, it can be seen that we have provided improved bin filling apparatus which is extremely simple both in construction and operation, and which can be manufactured very inexpensively. It can be readily seen that our device completely obviates a previously vexing problem and utilizes all of the available space of a bin such as the bin 6. It should be noted that our invention utilizes the pulverulent material deposited within the bin during the initial stages of the filling operation to complete and replace the previously removed sections of the conduit in order to effect a more efficient filling of the bin in the more remote areas relative to the inlet of the bin.

As pointed out in the application referred to above, the fluidized nature of the pulverulent material obviates the need for any extensive air filter structure across the air outlet 9. Thus, the entire mechanism is relatively inexpensive.

It will be readily appreciated, of course, that it is contemplated that, with the use of a trailer 5 having a bin 6, the delivery conduit 13 will be removably attached to the inlet so that the actuator 14 and the compressor 16 may be fixed installations at the flour mill and so that a plurality of trailers 5 with bins 6 may be utilized in conjunction with such a compressor and actuator. In this manner, the bins 6 may be quickly and completely filled preparatory to delivery of the flour to various desired locations.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of our invention which consists of the matter shown and described herein and set forth in the appended claims.

What we claim is:

1. Bin filling apparatus having in combination a substantially closed elongated bin adapted to receive pulverulent materials therewithin, said bin having a top portion and an inlet adapted to admit pulverulent material therethrough and an air outlet disposed remotely from said material inlet, and an elongated tubular member mounted within said bin adjacent its top portion and extending along the same longitudinally of said bin and being connected to said inlet, said tubular member hav-

4

ing open longitudinal lower portions along its entire length to adapt the same to completely fill said bin when a substantially solid stream of fluidized pulverulent material is propelled inwardly through said inlet.

2. The combination of a substantially closed elongated bin adapted to receive pulverulent material therewithin, said bin having a top, an inlet adapted to admit pulverulent material therethrough and an air outlet positioned at an end of the bin remote from said material inlet, and an elongated conduit mounted within said bin longitudinally thereof and extending across the interior and along the top thereof and being connected to said inlet of said bin, said conduit having wall structure at least some of the lower portions of which along the entire length thereof have been removed whereby as a substantially solid stream of fluidized pulverulent material is propelled inwardly through said inlet and the portions of said bin adjacent said inlet becomes filled with the accumulated pulverulent material, the latter material closes off the open portions of said conduit directly thereabove and serves as wall structure to complete the conduit whereby the remaining portions of said bin will be completely filled.

3. Bin filling apparatus having in combination a substantially closed elongated bin adapted to receive pulverulent material therewithin, said bin having a top and an inlet adapted to admit pulverulent material therethrough and an air outlet disposed remotely from said material inlet, an elongated conduit mounted within said bin and extending along beneath the top thereof and across the length of the interior thereof and being connected to said inlet of said bin, said conduit having wall structure the lower portions of which have been removed at various points throughout the length thereof, and mechanism for propelling fluidized pulverulent material in ratios of 50-80 pounds to each pound of air through said inlet and into said conduit and said bin.

4. Bin filling apparatus having in combination a substantially closed elongated bin adapted to receive pulverulent materials therewithin, said bin having a top portion and an inlet adapted to admit pulverulent material therethrough and an air outlet positioned adjacent an end of said bin remote from said material inlet, an elongated conduit mounted within said bin and extending along the top and across the length thereof and being connected to said inlet, said conduit having wall structure the lower portions of which along its entire length are open at spaced intervals, and mechanism for fluidizing such pulverulent material and propelling the same in a fluidized state in proportions of over fifty pounds of material per pound of air through said inlet and into said conduit and said bin whereby said bin will become completely filled with such pulverulent material.

5. The combination of a substantially closed elongated bin adapted to receive pulverulent materials therewithin, said bin having a top portion and an inlet adjacent said top portion adapted to admit pulverulent material therethrough and an air outlet positioned adjacent an end of said bin remote from said material inlet, and an elongated conduit mounted within said bin and extending across the length thereof beneath its top portion and being connected to said inlet, said conduit having wall structure arcuately shaped cross-sectionally and inverted so that the lower portions thereof are open at spaced intervals along its length whereby said bin will be completely filled with such pulverulent material when the latter is propelled in sufficient quantities inwardly through said inlet while in a fluidized state.

6. Bin filling apparatus having in combination a substantially closed elongated bin adapted to receive pulverulent materials therewithin, said bin having a top and an inlet adapted to admit pulverulent material therethrough and an air outlet positioned adjacent an end of said bin remote from said material inlet, and an elongated conduit mounted within said bin and extending entirely across

5

the interior thereof along the longitudinal central portions of its top, said conduit having a plurality of longitudinally spaced sections cut away from the lower wall portions thereof and having wall structure separating said sections whereby said bin may be completely filled with such pulverulent material when the latter is propelled inwardly through said inlet and said conduit in a fluidized state.

7. The method of completely filling the interior of a substantially closed container having a top and an inlet and an outlet positioned remotely relative to said inlet and a conduit connected with said inlet and extending longitudinally along the longitudinal central portion of its top, the conduit being open along its length at its lower portions, said method consisting in first fluidizing such pulverulent material into a substantially solid stream in proportions of over fifty pounds of material to each pound of air, and then introducing such material in a fluidized state and under pressure of approximately 8-10 pounds into the interior of and longitudinally of said conduit.

8. Bin filling apparatus having in combination a substantially closed elongated bin adapted to receive pulverulent material therewithin, said bin having a top portion and an inlet adapted to admit pulverulent material therethrough and an air outlet positioned adjacent an end of said bin remote from said material inlet, and an elongated tubular member mounted within said bin adjacent its top

6

portion and extending along the same throughout the length thereof and being connected to said inlet, said tubular member having spaced open longitudinal portions along its length to adapt the same to completely fill said bin when fluidized pulverulent material is propelled inwardly through said inlet.

9. Bin filling apparatus having in combination a substantially closed elongated bin adapted to receive pulverulent material therewithin, said bin having a top portion and an inlet adapted to admit such pulverulent material therethrough and an air outlet positioned adjacent an end of said bin remote from said material inlet, and an elongated tubular member mounted within said bin and having one of its ends connected to said inlet, said tubular member extending from a point adjacent the top portion of said bin across the length thereof, said tubular member having a plurality of spaced open longitudinal portions along its length to adapt the same to completely fill said bin when fluidized pulverulent material is propelled inwardly through said inlet and said tubular member.

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