

Oct. 6, 1970

HANS-DIETER SCHILLING ET AL

3,532,326

DEVICE FOR SEPARATELY SUPPLYING COARSE GRAIN AND FINE
GRAIN MATERIAL TO A CONTAINER SUCH THAT THE MATERIAL
IS UNIFORMLY DISTRIBUTED IN THE CONTAINER

Filed July 22, 1968

3 Sheets-Sheet 1

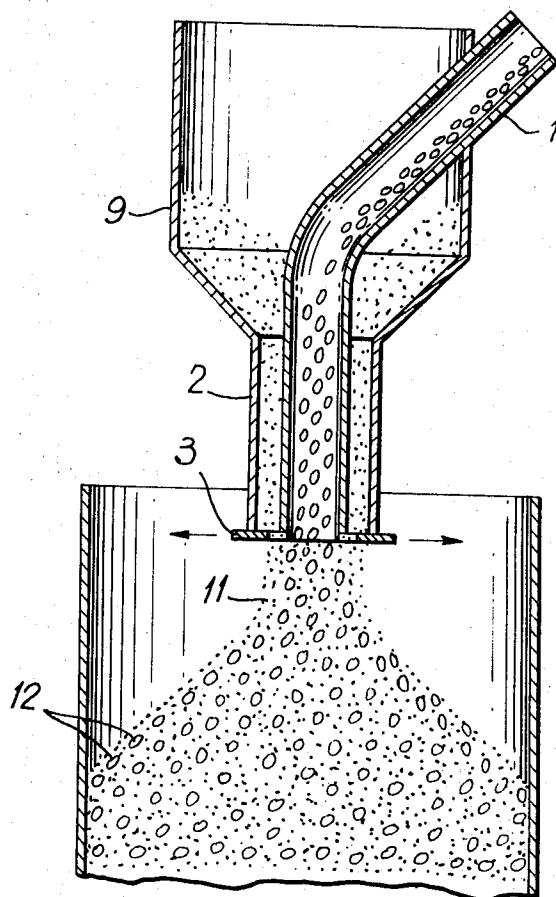


FIG. 1

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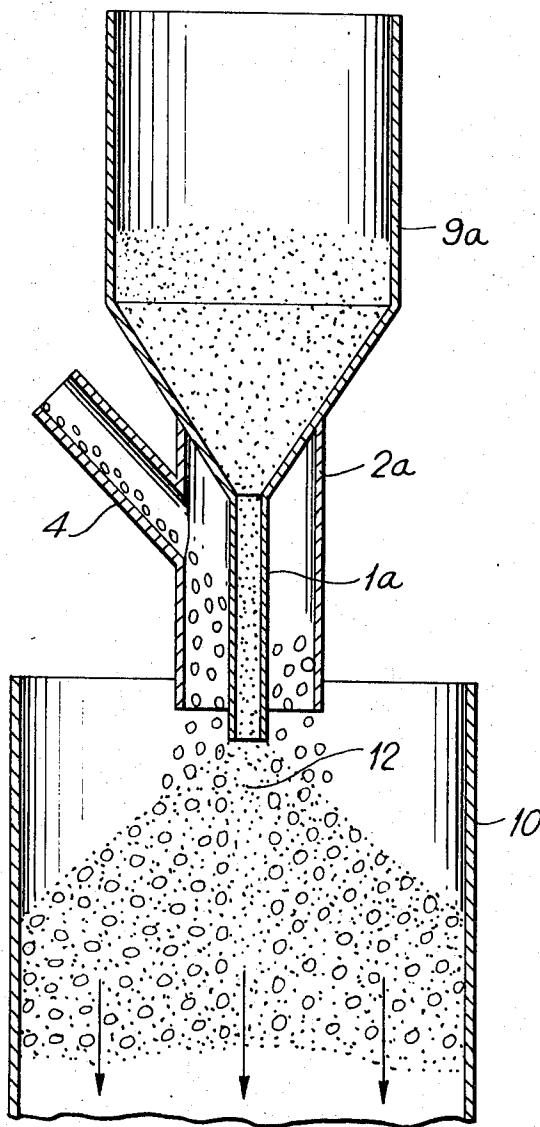


FIG. 2

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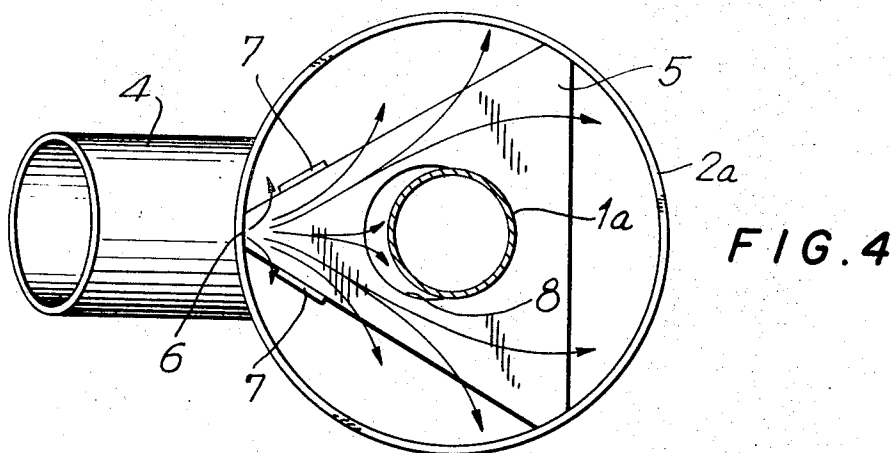
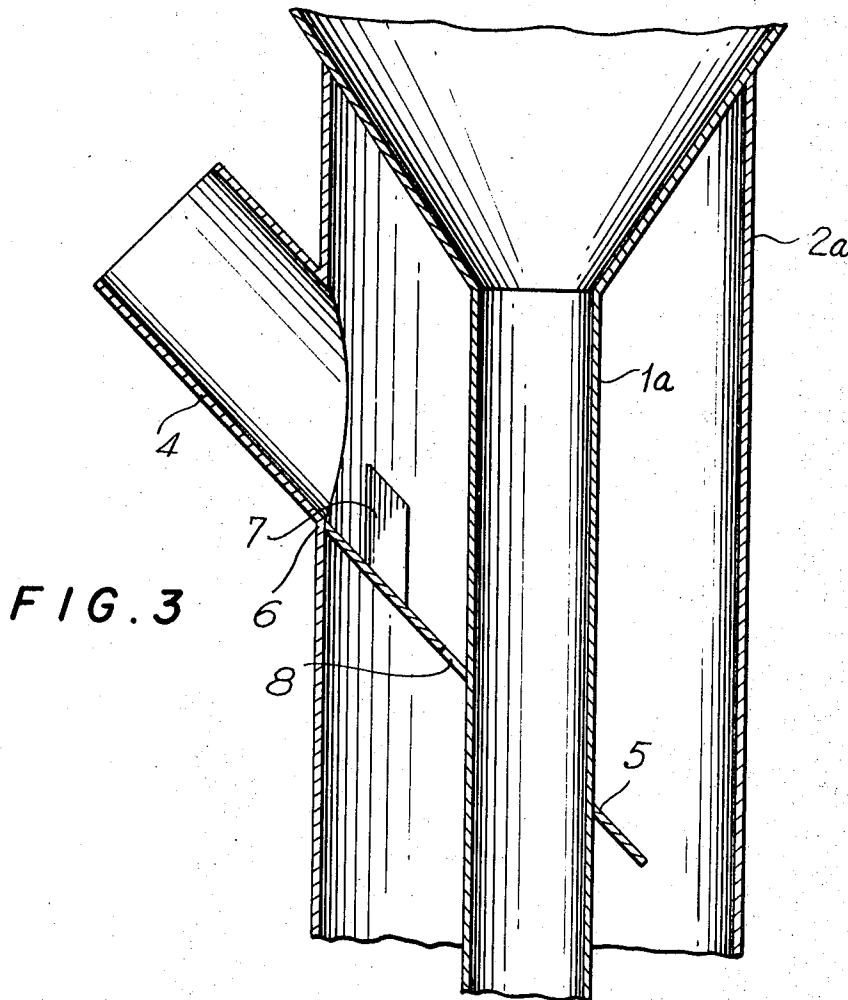
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DEVICE FOR SEPARATELY SUPPLYING COARSE GRAIN AND FINE GRAIN MATERIAL TO A CONTAINER SUCH THAT THE MATERIAL IS UNIFORMLY DISTRIBUTED IN THE CONTAINER

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8 Claims

ABSTRACT OF THE DISCLOSURE

A distributor device in which two vertical concentric pipes respectively supply fine grain and coarse grain material, the pipes projecting into a container and supplying the material therein through the center of the inner pipe and the annular gap between the pipes such that the distribution of the material in the container is uniform. In order to feed material to the outer pipe an inclined chute opens thereinto and distributor may be placed in the outer pipe to insure uniform feed of material into the outer pipe. The distributor is in the form of a triangular plate having one edge attached to the inner surface of the outer pipe at the lower edge of the chute outlet and two vertical blades are disposed on the edges of the plate proximate the chute outlet.

BRIEF SUMMARY OF THE INVENTION

The present invention relates to a device for feeding a container, especially a bunker, a silo or a reactor with different size materials through a separate coarse material feed pipe and a fine material feed pipe to ensure even distribution of the materials over the cross-sectional area of the container.

A great number of devices are known for uniformly feeding containers with a solid material, the most common being displaceable feeding conveyors, rotating and swivelling transversal belts or pivoted distributing pipes. Also known are shovel loader type distributors, disk feeders, and distributing cones, both rotating or non-rotating. All of the known devices, however, are handicapped by the disadvantage that they employ rotating and/or swivelling components which must be moved by driving mechanisms.

An object of the present invention is to provide a feeding device which operates without mechanically movable components and which utilizes only the gravity of the material being discharged and the conical shape of the feed pile to effect even distribution of the material.

According to the invention, this object is achieved by disposing in a substantially vertical position two concentric feeding pipes projecting into the container, the inner pipe being surrounded by the outer pipe. In the feeding device according to the invention it does not make any difference whether the finer or coarser material is discharged through the outer or the inner pipe. In every case, the outlet of the outer and/or the inner pipe can be formed by an annular gap the size of which can be adjusted to the desired flow quantity.

In one embodiment the size of the annular gap may be adjusted by a regulable iris diaphragm.

Furthermore, a chute may be fixed to the outer pipe for the supply of the material, preferably coarse-grained material.

In order to obtain a uniform, statistical distribution of

coarse material within fine grained material in the column of bulk material in the container, it has been found important to provide an even distribution in the annular space between the inner and outer pipes. This objective is achieved by furnishing the pipes with suitable dimensions. It has been shown to be particularly advantageous if the ratio between the width of the chute and the outer diameter of the inner pipe is 3 to 2 and if the width of the annular space is 2 to 4 times the mean size of the coarse material.

If the annular space is greater, it is contemplated according to the invention to provide a distributor in the form of a triangular insert in the annular space, said insert being disposed at an angle of 45° in relation to the horizontal and its upper corner being fixed to the outer pipe at the lower end of the outlet of the delivery chute. The triangular insert is a plate and is shaped such that its horizontal projection forms an equilateral triangle, of which the corners are cut off.

To further improve the regular distribution of coarse material in the fine-grained material, the distributor further comprises two narrow blades fixed to two sides of the triangle adjacent the outlet of the delivery chute, to divide the coarse material upon its arrival on the plate into three streams of equal size. Moreover, a crescent-shaped opening is formed between the inner pipe and the bore through which it passes in the plate on the side of the chute.

The feeding device according to this invention will now be described in more detail with reference to the enclosed drawing which is only intended to show schematically and by way of example several embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side elevation view in section of a feed device for coarse and fine grain material;

FIG. 2 shows another embodiment of such a feed device;

FIG. 3 shows a third embodiment of a feed device; and FIG. 4 is a plan view of the device in FIG. 3.

DETAILED DESCRIPTION

In FIG. 1 there is shown a device in accordance with the invention which comprises an inner pipe 1 for the coarse grain material and an outer pipe 2 surrounding the first pipe in spaced relation to define an annular gap 3 therebetween. The fine-grained material is discharged through the annular gap. The quantity of feed material to be discharged is controlled by the size of the annular gap 3 at the lower end or by an iris diaphragm which may be disposed thereat. The fine-grained material is supplied from storage bin 9 and discharged into a container 10, which may be a bunker, reactor, silo or the like to be filled. A cylindrical curtain 11 of fine-grained material pours down and forms a conical pile 12 with a crater-shaped top. The coarse grain material which is surrounded by the curtain of fine-grained material is dropped into the crater and many particles of coarse-grain material force their way through the curtain and are distributed in all directions into the mass of fine-grain material. In doing so the coarse-grain material will not roll down the flank of the cone towards the walls of the container, but is encircled by the current of the fine-grained material so as to rest in the cone in a statistical distribution.

In FIG. 2 the feeding device comprises an inner pipe 1a in the center of the container 10 to supply fine-grained material from the storage bin 9a, the coarse material being discharged through a chute 4 into the annular space between the inner pipe 1a and the outer pipe 2a; in this case the width of the annulus is considerably greater than the diameter of the inner pipe 1a. The blended mixture of the coarse and fine grain material is drawn

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off at the bottom of the container 10 such that the column of bulk material descends evenly as, for example, in a shaft furnace for the carbonization of coal briquettes by means of solid heat carriers. As the inner pipe 1a is in contact with the conical pile 12, the column of fine-grained material will build up in the inner pile and rise up to the storage bin 9a so as to form a gas-tight lock between the bin 9a and the container 10. The flow of the fine-grained feed automatically follows the descent of the blended material in the shaft.

In order to gain uniform distribution of the coarse-grain material in the fine-grain material, the chute 4 should have a diameter which is in the ratio of 3:2 compared to the diameter of inner pipe 1a; and the width of annular gap 3 is between two and four times the mean size of the coarse material.

FIG. 3 shows an arrangement in which a distributor is placed at the outlet of chute 4 to divide the incoming feed of coarse material into a plurality of streams thereby to insure uniformity of deposit of coarse material across the entire cross-section of the outer pipe 2a. The distributor comprises a triangular plate 5 disposed at an angle of about 45° from the horizontal. The plate 5 is attached to the outer pipe 2a in such a way that the upper corner of the triangular insert 5 is fixed at the discharge end 6 of the delivery chute 4.

In order to divide the stream of the material, two vertical, narrow blades 7 are fixed to the two sides of the triangle adjacent discharge end 6, and the bore in the plate 5 for passage of the inner pipe 1a is enlarged on the ascending side of the plate towards the discharge end 6 by a crescent-shaped recess 8, the maximum width of which ranges from 1.5 to 2.5 times the mean diameter of the coarse feed material. The arrows in FIG. 4 show the path of travel of the material over the plate 5.

As a consequence of this path of travel of the coarse feed material, the distribution of the feed of coarse material over the cross-section of the outer pipe 2a is substantially uniform at its lower end.

What is claimed is:

1. A device for simultaneously feeding a container with different grade materials to obtain uniform distribution of the materials over the cross-sectional area of the container, said device comprising two separate feeding

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pipes projecting into a container and disposed concentrically in a substantially vertical position, the outer pipe forming an annular gap with the inner pipe, one pipe being coupled to a supply of relatively coarse material, the other pipe being coupled to a supply of relatively fine material, a chute for delivery of material to the outer pipe, said chute being inclined with the horizontal and having an outlet which opens into the outer pipe, and distributor means in said outer pipe at said outlet of the chute to provide uniform distribution of the feed of the material into said outer pipe.

2. A device according to claim 1 comprising means in said gap at the lower end thereof for varying the size thereof.

3. A device according to claim 1, wherein said chute is inclined at an angle of 45°.

4. A device as claimed in claim 1, wherein said distributor means comprises an inclined triangular plate adjacent the lower end of the chute outlet.

5. A device as claimed in claim 4, wherein said triangular plate has apex portions respectively adjacent the inner surface of the outer plate, one of said apex portions being at the lower end of the chute outlet.

6. A device as claimed in claim 5, wherein said distributor means further comprises a pair of upright blades on the edges of said plate proximate the chute outlet.

7. A device as claimed in claim 6, wherein said plate has a bore for the passage of said inner pipe, said bore being enlarged on the side facing the chute outlet to form a crescent shape opening with said inner pipe.

8. A device as claimed in claim 7, wherein said crescent-shaped opening has a maximum width which is between 1.5 and 2.5 times the mean diameter of the feed material supplied to the chute.

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ROBERT W. JENKINS, Primary Examiner

U.S. Cl. X.R.

259—180