

PATENT SPECIFICATION (11)

1 483 974

1 483 974

- (21) Application No. 20003/75/ (22) Filed 13 May 1975/ (19)
 (31) Convention Application No. 7474/74 (32) Filed 31 May 1974 in
 (33) Switzerland (CH)
 (44) Complete Specification published 24 Aug. 1977
 (51) INT. CL.³ G01F 11/20
 (52) Index at acceptance
 B8N 5A1B 5A1D 5F 5L 6B1B3B 6X2



SCIENCE REFERENCE LIBRARY

(54) A FEED DISPENSER FOR BULK MATERIAL

(71) We, SPRIKAG AKTIENGESellschaft, of Bellikonstrasse 167, 8967 Widen-Mutschellen, Switzerland, a Swiss Company, 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 a pneumatic feeder dispenser for bulk materials arranged to progressively dispense measured amounts of bulk materials such as mortar, sand, gravel and particularly prepared cement employed in pressure spraying and injection forming processes.

Feeders of such materials have been known. For example, in Swiss Patent Number 432,360 a feeder is disclosed in which a body is provided with a plurality of chambers uniformly spaced about its periphery. Each of the chambers is open at both ends and arranged to run parallel to the rotational axis of the body. One of the ends of the body is covered by a housing in which a material delivery slot is provided on one side and an air inlet slot is provided on the other side. An analogous housing having a material outlet aligned with the air inlet slot aperture is provided to cover the other frontal end of the body. The material to be transported arrives from a bunker or a similar delivery device into the delivery slot in the upper housing cover and passes through said slot progressively into each of the chambers of the rotor body which body indexes continuously at a speed of for instance ten revolutions per minute and the feed and speed of rotation are matched to one another in such a manner that the chambers become sequentially filled with the bulk material to be transported. The air inlet and material outlet are normally offset by 180° from the delivery slot so that as the rotor indexes, pressurized air is forced into the air inlet forcing the material in the aligned chamber out the outlet opening.

A similarly constructed and operational compressed air conveyor device is disclosed in German Patent Number 485,983.

In practice, the bulk material feeders of the prior art present considerable difficulties when they are required to forward moist material. In operation such moist material becomes deposited inside the chambers of the rotor body in fine particles which build up in increasing layers upon the chamber walls. Ultimately this decreases the capacity of each chamber and, finally, results in the chambers becoming incapable at all of transporting material. In order to maintain the said feeder in operative condition, it has become necessary to cleanse each chamber at least four times during every working shift. This is extremely laborious and costly, and a great loss of productivity and power is caused thereby. Such repeated interruption of operation for cleansing, requires the use of a second feeder in order to ensure continuous throughput.

Another arrangement proposed in this field was disclosed in German Published Patent Application Number DAS 1,148,727. such an arrangement comprises a housing within which a rotatable pocketed wheel is located. An exchangeable closing ring is located between the bottom of the wheel and of the housing, which can be replaced when clogged.

However, this does not satisfactorily meet the problem arising from the choking of the passages in the rotor so that a great deal of cleaning must still be made in order to maintain the device in operative condition.

It is therefore an object of the present invention to provide a feeder-dispenser which overcomes the drawbacks and disadvantages of the known constructions.

Accordingly, it is another object of the present invention to provide a bulk material feeder-dispenser whose maintenance requirements are reduced to a minimum and which ensures a permanent continuous operation with little or no interruption in normal working patterns for cleansing.

According to the present invention we provide a feeder-dispenser for bulk material, comprising a rotor provided with a plurality of material-receiving chambers which are distributed about its rotational axis and are

open at apposite end faces of the rotor, the rotor being mounted for rotation between and relative to a pair of end plates, one of which has a material feed inlet aperture so arranged that the chambers successively register with said inlet aperture as the rotor rotates and the other of which has a discharge outlet aperture with which said chambers successively register during rotation of the rotor, the outlet aperture being angularly offset from the inlet aperture so that, in use each chamber fills with material whilst it is in registry with said inlet aperture and discharges said material when it subsequently registers with said outlet aperture, each chamber being at least partially covered on its internal surface with an elastic material lining.

Preferably said one end plate is provided with an air inlet opening which is connectible to a source of pressurised air and can communicate with said outlet aperture in the other end plate via each successive chamber whereby, in use, discharge of material from each chamber can be effected by subjecting the material in the chamber to the action of the pressurised air.

The lining may be separable in the form of a hollow tube set within the chamber and held at each end thereby allowing the lining to vibrate or flex, or it may be sprayed onto the surface of the chamber for the same effect.

In operation, by using linings having smooth internal surfaces, the tendency for the bulk material (even wet cement) to adhere to and/or set down on the internal walls of the chamber is overcome. The smooth walls permit the compressed air streaming inwardly to force the bulk material to leave the chamber with relatively clean walls.

Full details of the present invention are set forth in the following description with reference to the accompanying drawings.

In the drawings:

Fig. 1 is an elevational view partly in section, of the feeder-dispenser embodying the present invention;

Fig. 2 is a partial sectional view of the feeder-dispenser illustrated in Fig. 1 taken along line II—II;

Fig. 3 is a vertical view of a chamber of the feeder-dispenser along line III—III in Fig. 2, and

Fig. 4 is an exploded view of the feeder-dispenser of the present invention illustrating in enlarged detail the cover plates, the rotor body, pressurized air supply and inlet and discharge openings.

As seen in the figures 1—3, the feeder-dispenser, generally depicted by the numeral 1 comprises a rotor assembly having a body 3 formed from a plurality of identical cylindrical hollow open ended chambers 5 arrayed in uniform manner about a central

drive shaft 7 whose outer end is provided with a square cross-sectioned dog 8, adapted to be connected by conventional means to a driving source, such as a transmission, a motor, or the like. While the chambers are illustrated as cylindrical tubes other shapes can be employed, particularly one having a slightly downward outward conical taper.

The chambers 5 are held together at their upper and lower ends by plates 10 and 11 respectively, which are provided with holes 12 about their periphery conforming to that position of the chambers. The plates 10 and 11 are joined to each of the chambers by suitable plug bolts 13 which thread into bores 15 extending through to the plates and the peripheral lip of the chambers. The plates and chamber assembly are joined by suitable webbing brackets or the like to the central drive shaft 7.

Each of the chambers 5 is provided with a radial hole 17 extending through its wall approximately midway between its ends. Finally, each chamber is provided with a tubular, conforming elastic lining 19, which covers at least part of the length, and preferably substantially the entire length, of its wall. The elastic material may be rubber, synthetic rubber or plastics or similar material which provides a smooth continuous surface and a resilient flexible characteristic. The linings 19 may be formed to be self supporting, or at least shape retaining even though resilient and flexible. In this manner they resemble tubular hose sections.

To secure the linings 19, securely within the chambers 5, each is provided at its top and bottom ends respectively with a radially outward annular flange 21, 22, thus defining between them a central cylindrical work surface 23. The flanges 21 and 22 are adapted to seat within the annular cut-out groove 24 at each end of the chamber 5, and be squeezed, in force fit, into firm secure engagement by the end plates 10 and 11 respectively when the plates and chambers are joined. While the flanges are illustrated in Fig. 1 as planar, they may take other shapes, such as having a reverse bend 29 as seen in Fig. 3, or provided with an enlarged bulb-like formation or bead. It may also be found advantageous, in certain cases to provide the retaining annular slot with a dove-tail or tapered cross-section 25 as seen in Fig. 3.

The lining 19 is advantageously arranged at a distance from the internal surface of the chamber 5, so that an annular intermediate space 27 is provided separating the lining 19 from the wall of the chamber 5. Since the linings 19 are secured only at their ends, the space 27 provides some degree of freedom allowing elastic radial play. The radial hole 17 prevents entrapment of air and permits such play. In principle, it is also possible to provide linings on the walls of the chambers

5 with a directly deposited coating of a suitable elastic rubber material, glued on, sprayed on, poured onto or welded to the internal surface of the chamber 5, provided that the same degree of surface smoothness and elasticity is generally obtained.

Figure 4 shows an example of how a rotary body according to Figures 1 to 3 may be incorporated into a feeder-dispenser installation. On the upper side of such an installation, a compressed air supply duct 31 is provided, as well as a supply duct 33 for bulk material. The latter can be for instance in communication with the outlet of a bunker, a hopper, a cyclone feeder or the like, and may be provided with suitable dosing valves and feed controls.

A top and bottom cover disc 35 and 38 comprising a part of a stationary housing, is located opposite the respective plates 10, 11. The top cover disc 35 is of doubled structure (i.e. two superimposed layers) and is provided feed slot 36 aligned with both the duct 33 and the locus of the chambers 5; thus permitting passage of the bulk material into each of the chambers 5, i.e. each time a chamber 5 arrives under the slot 36. The slot 36 is arranged to permit sufficient space for the material to flow while the rotor body rotates. At approximately 180° diametrically opposite to the slot 36 is a hole 37 which is aligned to the air conduit duct 31 and the chambers 5. The bottom cover 38 is also a doubled structure, serving for discharging the bulk material. This cover is arranged on the lower side of the rotary body 3 and is provided with a dispensing aperture 42 and has attached thereto a transport and discharge pipe 47. The aperture 42 is in direct axial alignment with the air inlet duct 31.

The bulk material feeder-dispenser according to the present invention operates as follows:

The rotary body is set in motion, either continuously or in indexing intervals, so as to rotate in the direction of the arrow shown in Fig. 4.

The bulk material, which for example may be a concrete mass (gunned concrete) adapted to be sprayed or projected into a form or mold, is supplied via duct 33 through the feed slot 36 into one of chambers 5 which arrives at a given time interval below the feed slot. The material drops into and is received by the chamber 5 which is covered with the elastic material lining as previously described. During the further rotation of the body 3, the chamber 5, having received a charge of the bulk material, continues moving under and past the feed slot 36 toward the outlet aperture 42. During the first half of the rotation of the chamber, the bottom cover plate 38 maintains the filled chamber 5 closed at its lower end. When

however it arrives at a position where it is aligned between the compressed air supply duct 31 and the lower dispensing aperture 42, a strong impact of compressed air is supplied into the chamber 5. The surge of air empties the chamber and the bulk material is pneumatically ejected through the discharge pipe 47. Simultaneously, and continuously the succeeding chambers 5 passing beneath the supply duct 33 become filled with material and pregress to the ejection station.

The lateral openings 17 in each of the chamber walls serve to immediately recognize a defective lining since the compressed air will escape laterally through the hole rather than through the discharge aperture.

It has been found that the incorporation of linings, as described or of equivalent internal coatings in the chambers 5 is very advantageous since such linings prevent any deposition of the bulk material in the rotary body, even when same is in a moist state. To ensure elasticity, the material of the lining 19 must be elastic, but it is not absolutely necessary to provide a spacing, such as that marked by the numeral 27, between the wall of the chamber 5 and the tubing 19 inserted therein.

It is very important, nevertheless, through appropriate assembling as described, of the chambers 5 and plates 10 and 11 into the rotor body, as well as through the appropriate assembly of the housing cover discs 35 and 38, as by the use of tie rods and the like, that the plates 10 and 11 securely seat and fasten the flanges 21 and 22 (or 29) in a good metal joint established by the ends of the chambers 5, and the plates 10, 11, and that the central body 3, is uniformly arranged with just sufficient space between it and the housing cover discs 35 and 38 that rotation of the body 3 can freely rotate yet the considerable amount of heat which is generated during the feeding and dispensing operations can easily flow away. To this end the flat design of the flanges 21 and 22 has proven to be very serviceable. It is, moreover, not the regular cleaning operation of the rotor, which is periodically necessary, that has brought the prior art devices into disrepute, but the fact that the construction of the rotor body itself is so complex, that it is generally very badly damaged during cleaning and therefore had to be frequently replaced.

It is possible, in the present apparatus, to periodically impart to the exterior of each of the tubular linings 19, a surge of air under compression, which would tend to flex the lining and prevent any of the material from becoming permanently deposited thereon, or if deposited thereon to cause it to crack and fall off. This surge of air can be conveniently imparted into the radial hole 17 through

4 a suitable manifold and valve arrangement built into the housing and connected to the source of pressurized air. As a rule, however, such measure will not be usually necessary since the elastic and repelling characteristics of the rubbery lining or coating material should be sufficient under normal operating conditions.

10 In practice, it is preferred that the linings be formed of elastomeric or rubber inserts or moldings of given shape, so that standard shapes and lengths can be provided. This enables a standard quality to be maintained and permits the user of the equipment to maintain supply in stock for easy and swift replacement should it be necessary. Replacement of the linings will be extremely simple due to the tie rod connection of the housing members, and the screw fastening of the plates to the chambers. Since the rotating plates 10 and 11 must display a strong resistance to abrasion compared to the housing cover discs 35 and 38, they are preferably made of tool steel. Further, to prevent unnecessary penetration of material between the housing cover discs 35 and 38 and the plates 10 and 11 respectively, it is preferred that they be closely spaced and braced together by the tie rods.

30 It is possible to form the tubular linings or coatings with central portions 23 of different shapes. They may be cambered (i.e. curved toward their central axis) or with a conical or tapering cross-section. The elastic lining may also be inserted in a metal pipe, and the entire structure is seated in the chamber 5. The chamber 5 may itself be in the form of a removable pipe which can be removed and replaced as needed. As a result, the chamber insert and/or the insert-tubing can be formed more strongly and can be more easily placed in position, but they will of course be more expensive. In addition, the chambers 5 are illustrated as running parallel to the axis of rotation but it will be obvious that they may be obliquely arranged, for example, in an outward taper from top to bottom.

50 WHAT WE CLAIM IS:—

1. A feeder-dispenser for bulk material, comprising a rotor provided with a plurality of material-receiving chambers which are distributed about its rotational axis and are open at apposite end faces of the rotor, the rotor being mounted for rotation between and relative to a pair of end plates, one of which has a material feed inlet aperture so arranged that the chambers successively register with said inlet aperture as the rotor rotates and the other of which has a dis-

charge outlet aperture with which said chambers successively register during rotation of the rotor, the outlet aperture being angularly offset from the inlet aperture so that, in use each chamber fills with material whilst it is in registry with said inlet aperture and discharges said material when it subsequently registers with said outlet aperture, each chamber being at least partially covered on its internal surface with an elastic material lining.

2. A feed-dispenser as claimed in Claim 1 in which said one end plate is provided with an air inlet opening which is connectible to a source of pressurised air and can communicate with said outlet aperture in the other end plate via each successive chamber whereby, in use, discharge of material from each chamber can be effected by subjecting the material in the chamber to the action of the pressurised air.

3. A feed-dispenser as claimed in Claim 1 or 2 in which said chambers extend parallel to the rotor axis.

4. A feed-dispenser as claimed in Claim 1 or 2, in which said chambers extend obliquely to said rotor axis.

5. A feed-dispenser as claimed in any one of Claims 1—4 in which the lining comprises a tube inserted into each chamber.

6. A feed-dispenser as claimed in Claim 5 in which the tube is provided with a flange at each end which extends into annular grooves extending around the open ends of the respective chamber.

7. A feed-dispenser as claimed in Claim 6 in which said flanges are flat.

8. A feed-dispenser as claimed in Claim 6 in which said flanges have shaped beads.

9. A feed-dispenser as claimed in Claim 6 in which at least one of the grooves associated with each chamber is tapered.

10. A feed dispenser as claimed in any one of Claims 1—9 in which each lining is deflectable inwardly of the chamber away from the internal surface thereof.

11. A feed-dispenser as claimed in any one of Claims 1—4 in which the linings comprise coatings deposited on the internal surfaces of the chambers.

12. A feed-dispenser as claimed in any one of Claims 1—9 including a sleeve insert removably interposed between the lining and the chamber wall.

13. A feed-dispenser as claimed in Claim 12 in which said sleeve insert and lining are attached together.

14. A feed-dispenser as claimed in any one of Claims 1—13 in which the rotor and the end plates are arranged in closely spaced relation with just sufficient space therebetween so that the rotor can rotate freely



13

4

1,483,974

4

5

a suitable manifold and valve arrangement built into the housing and connected to the source of pressurized air. As a rule, however, such measure will not be usually necessary since the elastic and repelling characteristics of the rubbery lining or coating material should be sufficient under normal operating conditions.

In practice, it is preferred that the linings be formed of elastomeric or rubber inserts or moldings of given shape, so that standard shapes and lengths can be provided. This enables a standard quality to be maintained and permits the user of the equipment to maintain supply in stock for easy and swift replacement should it be necessary. Replacement of the linings will be extremely simple due to the tie rod connection of the housing members, and the screw fastening of the plates to the chambers. Since the rotating plates 10 and 11 must display a strong resistance to abrasion compared to the housing cover discs 35 and 38, they are preferably made of tool steel. Further, to prevent unnecessary penetration of material between the housing cover discs 35 and 38 and the plates 10 and 11 respectively, it is preferred that they be closely spaced and braced together by the tie rods.

It is possible to form the tubular linings or coatings with central portions of different shapes. They may be cambered (i.e. curved toward their central axis) or with a conical or tapering cross-section. The elastic lining may also be inserted in a metal pipe, and the entire structure is seated in the chamber 5. The chamber 5 may itself be in the form of a removable pipe which can be removed and replaced as needed. As a result, the chamber insert and/or the insert-tubing can be formed more strongly and can be more easily placed in position, but they will of course be more expensive. In addition, the chambers 5 are illustrated as running parallel to the axis of rotation but it will be obvious that they may be obliquely arranged, for example, in an outward taper from top to bottom.

WHAT WE CLAIM IS:—

1. A feeder-dispenser for bulk material, comprising a rotor provided with a plurality of material-receiving chambers which are distributed about its rotational axis and are open at apposite end faces of the rotor, the rotor being mounted for rotation between and relative to a pair of end plates, one of which has a material feed inlet aperture so arranged that the chambers successively register with said inlet aperture as the rotor rotates and the other of which has a discharge outlet aperture with which said

said chambers successively register during rotation of the rotor, the outlet aperture being angularly offset from the inlet aperture so that, in use each chamber fills with material whilst it is in registry with said inlet aperture and discharges said material when it subsequently registers with said outlet aperture, each chamber being at least partially covered on its internal surface with an elastic material lining.

2. A feed-dispenser as claimed in Claim 1 in which said one end plate is provided with an air inlet opening which is connectible to a source of pressurised air and can communicate with said outlet aperture in the other end plate via each successive chamber whereby, in use, discharge of material from each chamber can be effected by subjecting the material in the chamber to the action of the pressurised air.

3. A feed-dispenser as claimed in Claim 1 or 2 in which said chambers extend parallel to the rotor axis.

4. A feed-dispenser as claimed in Claim 1 or 2, in which said chambers extend obliquely to said rotor axis.

5. A feed-dispenser as claimed in any one of Claims 1—4 in which the lining comprises a tube inserted into each chamber.

6. A feed-dispenser as claimed in Claim 5 in which the tube is provided with a flange at each end which extends into annular grooves extending around the open ends of the respective chamber.

7. A feed-dispenser as claimed in Claim 6 in which said flanges are flat.

8. A feed-dispenser as claimed in Claim 6 in which said flanges have shaped beads.

9. A feed-dispenser as claimed in Claim 6 in which at least one of the grooves associated with each chamber is tapered.

10. A feed dispenser as claimed in any one of Claims 1—9 in which each lining is deflectable inwardly of the chamber away from the internal surface thereof.

11. A feed-dispenser as claimed in any one of Claims 1—4 in which the linings comprise coatings deposited on the internal surfaces of the chambers.

12. A feed-dispenser as claimed in any one of Claims 1—9 including a sleeve insert removably interposed between the lining and the chamber wall.

13. A feed-dispenser as claimed in Claim 12 in which said sleeve insert and lining are attached together.

14. A feed-dispenser as claimed in any one of Claims 1—13 in which the rotor and the end plates are arranged in closely spaced relation with just sufficient space therebetween so that the rotor can rotate freely



1,483,974

5

yet the heat generated during operation can easily flow away.

15. A feeder dispenser for bulk material, substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

FOR THE APPLICANTS:
GEORGE FEURY & CO.,
St. Martin's House,
Bull Ring,
Birmingham, B5 5EY.
Chartered Patent Agents.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1977.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.

