Oct. 6, 1964 J. P. TAILOR 3,151,784

ROTARY AIR LOCK

Filed Oct. 24, 1961 2 Sheets-Sheet 1

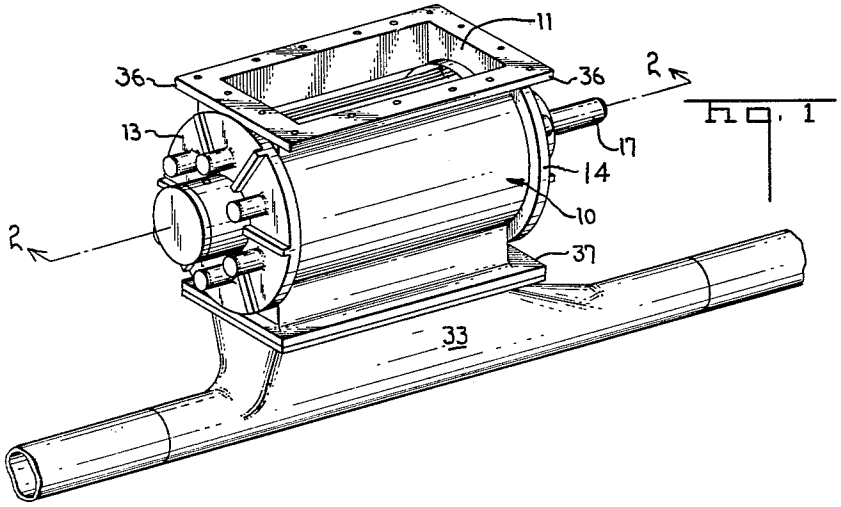

Fig. 1

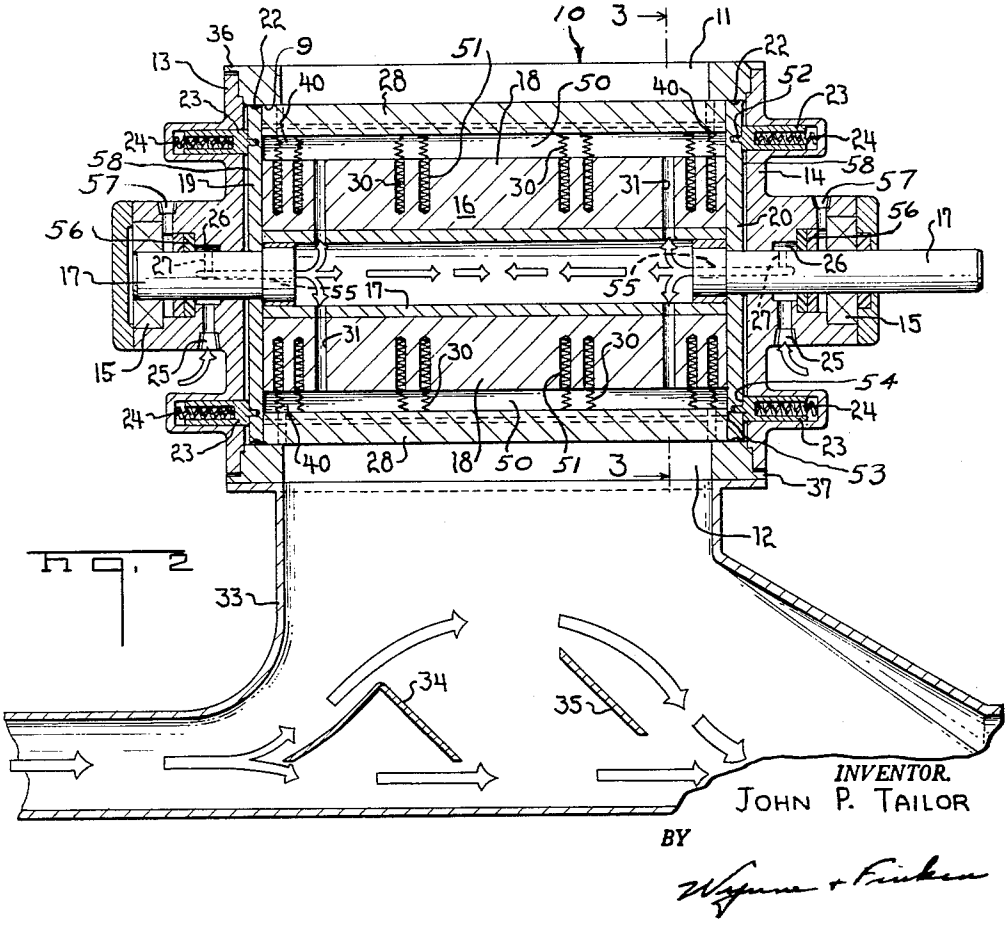

Fig. 2

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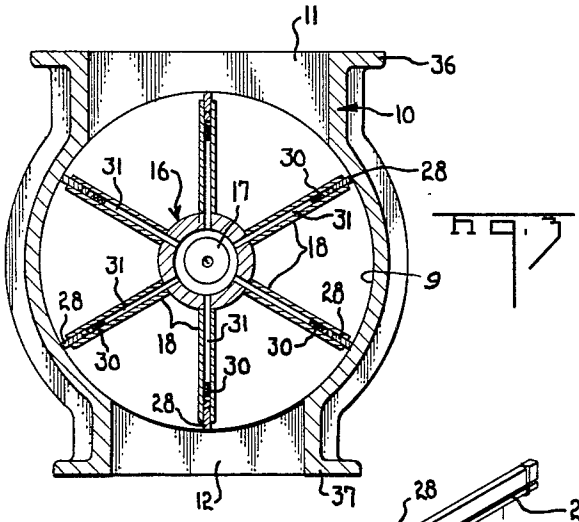

Fig. 3

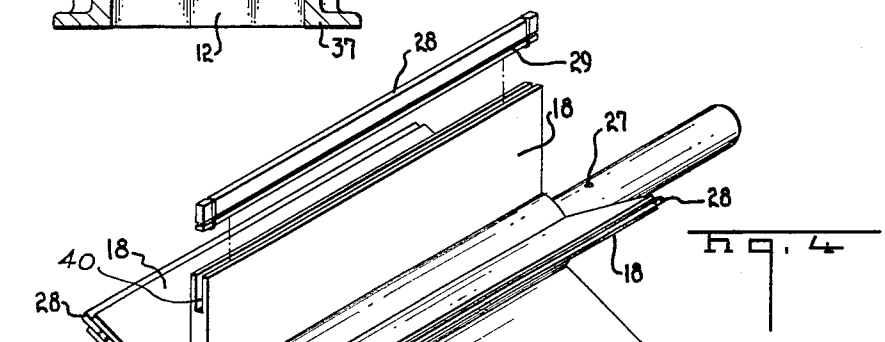

Fig. 4

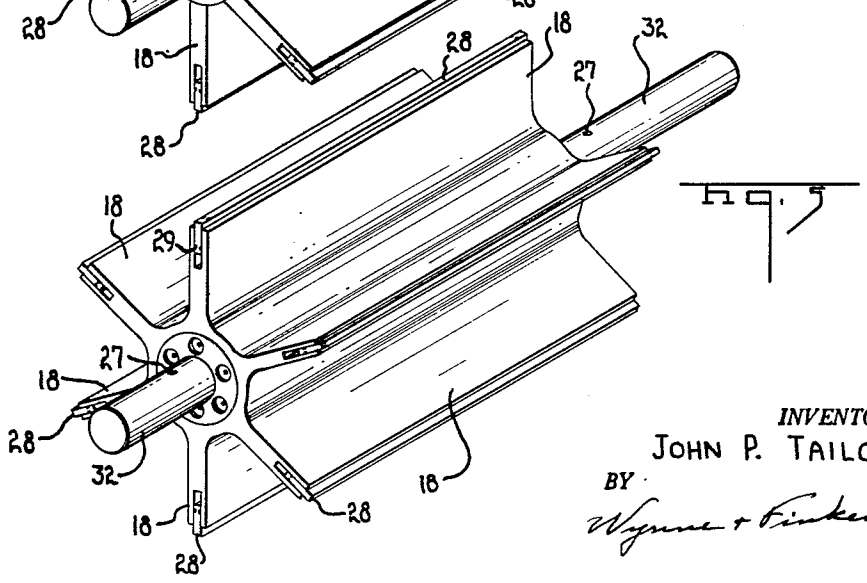

Fig. 5

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ROTARY AIR LOCK

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5 Claims. (Cl. 222—368)

This invention relates to a rotary feeder or air lock for transferring particulate material of the granular and pulverulent type.

Rotary air locks or feeders have long been in use for discharging such particulate material from chambers (particularly where a pressure differential exists between the interior of the chamber and the exterior) and for feeding material to pneumatic conveyors. Such locks are subject to extreme wear, particularly where abrasive materials are involved. This has caused problems in the industry in maintaining effective seals between pressured chambers or lines.

My invention compensates for wear as it occurs and thereby maintains an effectively sealed rotary feeder, this compensation being accomplished in a fashion which maintains the compensating elements in operative condition over a long period of time by preventing the ingress of material into the compensating operating elements. A positive pressure differential is maintained around the operating elements which not only aids in biasing the elements into sealing engagement but also maintains gas under pressure to insure an egress or outflow of gas thereby preventing an inflow of material.

Other important objects and advantageous features of my invention will be apparent from the following description and accompanying drawings wherein for purposes of illustration herein specific embodiments of my invention are set forth in detail and wherein:

FIG. 1 is a perspective view of a rotary air lock of the invention utilized as a feeder for a pneumatic conveyor;

FIG. 2 is a cross-sectional view taken on line 2—2 of FIG. 1;

FIG. 3 is a cross-sectional view taken along line 3—3 of FIG. 2;

FIG. 4 is a perspective view of the rotor with a blade removed to show the sealing strip; and

FIG. 5 is a perspective view of an alternate form of the rotor.

Referring to FIGS. 1–4, it will be seen that housing 10 includes connecting flanges 36 and 37 and cylindrical inner wall 9 (FIG. 3) and transverse end walls 13 and 14. The housing includes an inlet 11 having an opening through the inner wall 9 and an outlet 12 having an opening through the inner wall 9 remote from the inlet opening; in the embodiment shown the inlet opening is directly below and diametrically opposed to the outlet opening. The end walls 13 and 14 house bearings 15, 15 in which is journaled a rotor 16, the rotor 16 including a central shaft 17 from which outwardly extend longitudinal vanes 18 into sealing engagement with the inner wall 9. The vanes 18 are equally spaced around the shaft 17 and extend radially outwardly, the longitudinal ends thereof including wiper blades 28 slidably carried in longitudinal end slots 40. The rotor 16 also includes radial sockets 51 in the vanes 18 for housing blade resilient means or springs 30 which bias the blades 28 of the rotor 16 into wiping sealing engagement with the inner wall 9 of housing 10.

A floating sealing end plate 19 circular in shape is mounted on the end portion of shaft 17 with its inner face in sealing contact with the transverse ends of vanes 18 and blades 28 of rotor 16. It will be noted that a floating sealing end plate 20 is mounted on the other end portion of shaft 17 in a manner similar to end plate 19. Both plates 19 and 20 are transversely mounted between an end wall 13 and 14 respectively and its adjacent transverse end of the vanes 18.

The end plates 19 and 20 are longitudinally movable along shaft 17 but are held by presser pins 23 against rotational movement, each presser pin having lug 52 which locks in its respective socket 53 in the outer surface of its respective end plate 19 or 20. Each presser pin 23 also has a transverse face 54 which abuts the outer surface of its respective end plate 19 or 20 and transmits pressure from its spring 24 to its end plate to provide a sealing bias against the end plate. The springs 24 and presser pins 23 are housed in end walls 13 and 14 in an annular pattern to insure equal force application to the end plates 19 and 20.

O-rings 22, 22 (FIG. 2) in the outer periphery of the circular end plates provide a seal with the inner wall 9 of housing 10. Similarly, U-shaped sealing strip 29 (FIG. 4) positioned in suitable grooves in blades 28 provide a seal with the side walls of the longitudinal slots 40 in the vanes 18.

It will be noted in FIG. 2 that an annular portion of the inner wall 9 of housing 10 provides the end boundaries of the inlet 11 and outlet 12 along which the rubber or resilient wiper blades 28 slide as the rotor 16 is rotated.

The shaft 17 is made up of a hollow intermediate section and solid end sections, the solid end sections having longitudinal gas passages 55, 55 in fluid communication with the hollow intermediate section and extending longitudinally outwardly to transverse passageways 27, 27 positioned inwardly of the bearings 15, 15. The end plates at this area are cut away to form annular chambers 26, 26 around the shaft 17 in fluid communication with the transverse passageways 27, 27. Gas under suitable pressure (about 10 to 15 p.s.i.g.) is supplied to these chambers 26, 26 through gas conduits 25, 25 in the end walls 13 and 14. To prevent gas escaping outwardly along the shaft to bearings 15, 15, seals 56, 56 are provided between the bearings 15, 15 and the chambers 26, 26. Grease fittings 57 and 57 are provided for servicing the bearings.

Gas under pressure, therefore, is present in the annular chambers and through the structure described provides a gas means for maintaining gas under pressure in the space between the outer surface of the end plates 19 and 20 and their respective end walls 13 and 14. This gas means also includes means for maintaining gas under pressure in the longitudinal slot portion beneath or inwardly of the blades 28.

More specifically, gas flows from the annular chambers 26, 26 inwardly between the outer surface of shaft 17 and the surrounding portion of end walls 13 and 14 to the transverse disc-like spaces 58, 58 between the end walls and the end plates. Gas in spaces 58, 58 passes into the rotor chamber of housing 10 when due to vibration or other cause the O-rings 22, 22 temporarily fail to maintain a seal. In this fashion, foreign matter and the granular or pulverulent material is kept out of the disc-like spaces 58, 58 and the spring biased presser pins 23 are not fouled by such material. Shut-downs due to clogged presser pins and disc-like spaces are thereby eliminated.

Similarly, the blade resilient means is continually protected from clogging—thereby insuring a continuous sealing response of the rubber blades to wear and vibration. Gas passes from chambers 26, 26 through transverse passages 27, 27, longitudinal passages 55, 55, hollow intermediate shaft 17, and then through radial passages 31 in the vanes 18 to the sealed bottom zone of longitudinal slots 40. The bottom zones of longitudinal slots 40 are sealed by the rubber blades 28 and the U-shaped sealing strips 29, gas escaping from the longitudinal ends of the bottom zone of the slots being effectively sealed by engage-

ment of the transverse ends of the blades with the sealing end plates. Similarly, gas escaping between the solid end shafts **17** and the annular walls of the central holes in the end plates is prevented from flowing into the rotor chamber in the housing **10**.

The gas under pressure in the bottom zones of the longitudinal slots is available for blowing fine powder and the like out of the slots to insure a free wear and vibration action of the blades.

The rotor shown in FIG. 4 is of welded construction, the vanes **18** being welded to the hollow intermediate shaft **17** with the solid end shaft sections welded thereto.

The rotor in FIG. 5 is of cast construction wherein the hollow intermediate shaft **17** and vanes **18** are cast in one piece and stub shafts **32, 32** are bolted in central sockets in the ends of the cast portion.

The extending end shaft **17** may be connected to suitable power means for rotation in either direction preferably in the range of 60 to 90 feet per minute which for a rotor 14 inches in diameter is in the range of 15 to 25 r.p.m.

The rotary feeder is shown in FIGS. 1 and 2 attached to a pneumatic conveyor conduit **33**. The gas flows from left to right as shown by arrows in FIGS. 1 and 2 and preferably baffles **34** and **35** are employed to direct the gas into the particulate material in a manner to insure smooth flow. The rotary feeder may also be used to discharge materials from bins and furnaces and the like.

It has been found that wear due to rubbing of the end plates on the rotor is much less than that due to erosion and abrasion by the particulate material being conveyed.

In pneumatic conveyors, air is normally used but obviously for sensitive materials, any inert gas may be employed.

While the present preferred embodiment of the invention has been illustrated and described, it will be recognized that the invention may be otherwise variously embodied and practiced within the scope of the following claims.

What is claimed is:

1. A rotary feeder for particulate solids comprising a housing having a cylindrical inner wall and transverse end walls forming a cylindrical chamber therein, said housing including an inlet having an opening through said inner wall and an outlet having an opening through said inner wall remote from the other opening; a rotor mounted in said housing for rotation in said chamber, said rotor having a central shaft and longitudinal vanes extending outwardly therefrom into sealing engagement with said inner wall, means for rotating said shaft, at least one sealing end plate being transversely mounted between an end wall and said vanes and in substantially sealed relation with the inner wall at its periphery with provision for sliding longitudinal movement thereof, plate resilient means biasing said end plate longitudinally toward and into complete sealing engagement with the end of the rotor, and gas means maintaining gas under

pressure in the space between the outer surface of said sealing end plate and its adjacent end wall to increase the sealing bias and to insure an outflow of gas and thereby prevent an inflow of material.

2. A rotary feeder as defined in claim 1 and wherein the outer ends of said longitudinal vanes include longitudinal slots, blades mounted in said slots, blade resilient means biasing said blades outwardly into sealing engagement with said inner wall, said gas means including means for maintaining gas under pressure in the slot portion inwardly of said blade to insure an outflow of gas and to prevent an inflow of material.

3. A rotary feeder as defined in claim 2 and wherein sealing means are provided between the blade and its slot to inhibit outflow of gas therebetween.

4. A rotary feeder as defined in claim 3 and wherein said end walls include bearings rotatably receiving the ends of said central shaft, and a sealing end plate is mounted on each end of the shaft adjacent said vanes.

5. A rotary feeder for particulate solids comprising a housing having a cylindrical inner wall and transverse end walls forming a cylindrical chamber therein, said housing including an inlet having an opening through said inner wall and an outlet having an opening through said inner wall remote from the other opening, said end walls having bearings, a rotor having a central shaft with its ends journaled in said bearings, means for rotating said shaft, said rotor having longitudinal vanes extending outwardly therefrom, the outer ends of said vanes including longitudinal slots, blades mounted in said slots, blade resilient means biasing said blades outwardly of said slots into sealing engagement with said inner wall, sealing means between each blade and its slot, a sealing end plate mounted at each end of the central shaft with its inner face in sealing contact with the ends of said vanes including said blades, plate resilient means for biasing said end plates into sealing contact, and gas means including an annular gas chamber in each of said end plates surrounding the shaft between each bearing and its end plate, first gas conduit means from said gas chamber to the space between the outer surface of said sealing end plate and its adjacent end wall to increase the sealing bias and to insure an outflow of gas and thereby prevent an inflow of material, and second gas conduit means from said gas chamber to the space in each vane slot inwardly of said blade to increase the sealing bias and to insure an outflow of gas and thereby prevent an inflow of material.

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