FEEDING AND PNEUMATICALLY CONveying concrete materials

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FEEDING AND PNEUMATICALLY CONVEYING CONCRETE MATERIALS

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This application is a continuation of my co-pending application Serial No. 284,739, filed May 31, 1963, which in turn was a continuation-in-part of application Serial No. 185,926, now abandoned.

This invention relates to a means for feeding and pneumatically conveying concrete materials and more particularly to such a means capable of feeding and pneumatically conveying wet or dry concrete materials whereby the placement of such materials is facilitated.

While the prior art contains various patents, such as Patents 2,614,891, 2,565,546, and 2,649,289, various shortcomings of prior art equipment have been apparent.

As for example, Patent 2,614,891 discloses a rotary dispensing drum contained in a resilient gasket supported in a hopper and dispenser housing. In this structure, the resilient gasket has proved to be readily destructible due to the abrasive action of large chunks of aggregate carried in the pockets of the rotor as they approach the liner surrounding the rotor at a transition thereof with the feeding hopper. Thus, the large aggregate particles tend to tear and abrade the resilient liner and to create an intolerable maintenance problem. Furthermore, the liner, as shown in said patent, after being worn to a certain degree, does not fit the rotor closely and therefore tends to leak pneumatic fluid. The resilience of the liner, even though it may be made of rubber or other similar material, is not sufficient to compensate for the wear around the rotor. Additionally, Patents 2,614,891 and 2,565,546 disclose the projection of concrete materials directly from pockets of the rotor into a nozzle by pneumatic fluid exhausted through the pockets. This manner of feeding concrete material directly from the rotor pockets into a nozzle by pneumatic fluid is applied through the pockets, tends to create problems of abrasion and other difficulties within the rotor and housing liner structure, as well as uneven delivery of materials from the respective machine.

Accordingly, it is an object of the present invention to provide a means for feeding and pneumatically conveying concrete materials wherein a novel resilient liner structure surrounds a pocketed dispensing rotor; said pocketed rotor being fed by a hopper; rotating means at one side of the hopper adjacent the periphery of the rotor disposed to spread and remove coarse aggregate at a peripheral area of the pocketed rotor upon its approach to the resilient liner surrounding the rotor whereby the coarse aggregate is prevented from tearing or seriously abrading the liner as each loaded pocket of the pocketed rotor passes from the hopper area internally of the sealing surfaces of the liner.

Another object of the invention is to provide a means for feeding and pneumatically conveying concrete materials wherein a metering pocketed rotor is fed by a hopper and surrounded by a sealing liner which is pneumatically loaded against the periphery of the rotor and wherein such material released pneumatically in the pocketed portions of the rotor to substantially balance the pressure exerted pneumatically on the liner against the rotor whereby the liner is not pressed into the pockets of the rotor thereby avoiding undue abrasion and/or wear of the liner adjacent to which the pockets of the rotor rotate.

Another object of the invention is to provide a means for feeding and pneumatically conveying concrete materials wherein a pocketed dispensing rotor carries material from a feeding hopper to an air lock outlet of said means and wherein a novel pneumatically loaded liner maintains a seal around the rotor; said liner being of resilient material and having inflatable cavities; and resilient walls between said cavities and the periphery of said rotor wherein steel reinforcing bars are disposed to provide for uniform deflection of the resilient wall of the liner longitudinally of the axis of the rotor and abrading material conveying pockets therein.

Another object of the invention is to provide a novel means for feeding and pneumatically conveying concrete materials wherein a pocketed dispenser rotor is rotatably mounted between a feeding hopper, which is disposed thereabove, and a screw-type conveyor disposed therebelow and subject to a pneumatic jet action for conveying concrete materials through conduits to various remote areas.

Another object of the invention is to provide a novel means for feeding and pneumatically conveying concrete material wherein a pocketed rotor forms an air lock and transmits material from a hopper therefore into a screw conveyor therebelow and wherein said screw conveyor is provided with a central hollow shaft terminating in a nozzle for emitting a jet of compressed air at the delivery end of the screw conveyor so that the material moved from a position below the air lock rotor by the screw conveyor is transmitted pneumatically by jet action from the delivery end of the conveyor into a conduit or tube which may extend to a remote concrete materials placement area.

Further objects and advantages of the invention may be apparent from the following specification, appended claims and accompanying drawings, in which:

FIG. 1 is a vertical sectional view of a means for feeding and pneumatically conveying concrete materials, in accordance with the present invention;

FIG. 2 is a sectional view taken from the line 2—2 of FIG. 1;

FIG. 3 is an enlarged fragmentary sectional view taken substantially the same plane as that shown in FIG. 2 and disclosing details of the air lock rotor and casing liner of a means for feeding and pneumatically conveying concrete materials, in accordance with the invention:

FIG. 4 is an enlarged fragmentary sectional view taken substantially the same plane as shown in FIG. 1 and showing details of the rotor structure, of the invention, together with details of the casing liner thereof;

FIG. 5 is an enlarged fragmentary sectional view of structure at the drive end of a material conveyor wherein compressed air is induced centrally of the conveyor for propelling or conveying concrete materials pneumatically;

FIG. 6 is an enlarged fragmentary sectional view of the housing liner, according to the present invention; and

FIG. 7 is a fragmentary sectional view taken on the same plane as FIG. 1, showing a modification of the present invention.

As shown in FIG. 1, the drawings, the means for feeding and pneumatically conveying concrete materials, in accordance with the invention, comprises generally a materials receiving hopper 10 having an agitator 12 therein which feeds material into pockets of an air lock rotor 14 which is rotatably mounted in a housing 16, the rotor 14 dumps its pockets into a casing 18 above helices of a screw conveyor 20 which is provided with a hollow central shaft 22 terminating in a nozzle 24 which conducts compressed air into material moved by the conveyor 20 in order to propel such material through a tubular conduit to a placement area.

According to detailed construction of the invention,
the hopper 10 is a downwardly converging hopper having a shaft 26 rotatably mounted therein and carrying arms 28 of the agitator. The shaft 26 is mounted in bearings 39 and 32 in opposite sides of the hopper and a sprocket 34 is coupled to one end of the shaft 26. Engaging sprocket 34 is a chain sprocket 38, as will be hereinafter described. Thus, the agitator 12 is driven in the hopper 10 in order to move materials downwardly into the housing 16 and rotor 14. The housing 16 is provided with materials entrance openings 40 and 42 above the rotor 14, all as shown in perspective drawings of the drawings.

As shown in FIG. 2 of the drawings, the housing 16 is composed of an upper section 44 and a lower section 46. These sections 44 and 46 are connected at their respective flanges 48 and 50 by means of bolts 52. The housing section 44 is provided with arculate inwardly disposed concave wall portions 54 which coincide substantially on a concentric basis with arculate inner wall portions 56 of the lower housing section 46. A resilient liner and seal surrounds the rotor 14 and is held in the substantially concentric arculate wall portions 54 and 56. This housing section 44 is provided with an upper section 58 carried in the upper housing section 44 of the housing 16. This upper section 58 is provided with openings 60 and 62 coinciding with the openings 40 and 42 of the housing 46 directly below the outlet of the hopper 16, as shown in FIG. 1 of the drawings. The liner section 58 is provided with cavities 63 having cavities 64 into which pneumatic fluid may be induced in order to exert pressure on the liner and hold it in close contact with peripheral portions 66 of the rotor 14.

Embedded in the wall of the liner 58 adjacent each of cavities 64 are rigid bars 68 which are preferably made of steel but which may be made of any suitable material. As shown in FIGS. 2 and 6, these bars 68 are fixed to plates 69 and are closely spaced and extend axially of the rotor 14 in order to provide a reinforcing or stiffening structure which will bridge pockets 70 and prevents the peripheral portion 66 as such pockets rotate in contact with inner surface portions 72 of the liner 58.

A tubular fitting 74 extends through an outer wall of the housing structure 44 and communicates with the interior of the cavity 64 in the tube 63. Thus, pressure fluid is induced into the cavity 64, which communicates with each other via liner cavity portions 76 of the cavities 64 which extend over the top of the rotor 14 and around the openings 60 and 62, as shown in FIG. 1 of the drawings.

A lower section 78 of the housing liner is similar to the section 58 of the liner, hereinafter described. This liner section 78 is provided with inner surfaces 80 which contact and seal around peripheral portions 66 of the rotor 14 in a similar manner to described in connection with the liner section 58.

The liner section 78 is provided with a separate pressure fluid receiving tube 81 having cavities 82 similar to cavities 64, hereinafter described in connection with the liner section 58. These cavities 82 are supplied pressure fluid through a tubular fitting 84 in the side wall of the tube 81 and and the cavities 82 intercommunicate through cavities 76 of the housing section 78. These reinforcing bars 68 and 92 also extend longitudinally or parallel to the axis of the rotor 14 and tend to prevent undue deflection of the inner surface portions 72 and 80 of the housing liner into the cavities 70, yet the pneumatic or fluid pressure in the cavities 64 and 82 provides for intimate and continuous contact of the inner surface of the liner with the peripheral portions of the rotor and thereby compensates for wear of the inner surfaces of the liner as abrasive materials are carried axially which such inner surfaces during movement of the materials by the rotor 14 from the inlet openings 40 and 42 to the outlet openings 88 and 90 of the rotor housing 16. The plates 69 and 93 support the respective bars 68 and 92 to hold them in spaced relation to each other and to resist torque imparted to the liner structures by friction of the rotor thereof, as all as shown in detail in FIG. 6 of the drawings.

The rotor 14 is provided with a plurality of pockets 70 which align with the inlet 40 and outlet 88 of the housing 16, it being noted that there are five such pockets, as shown in FIG. 2 of the drawings.

The rotor 14 is also provided with another group of pockets 70 which align with the inlet 42 and outlet 90 of the housing 16. The group of pockets 70 which receive material from the inlet 40 are angularly displaced relative to the pockets 70 which receive material from the inlet 42 of the housing 16. Thus, some of the pockets 70, all as shown in the drawings, are always receiving material from the hopper 10 and some of the pockets 70, during such rotation, are always dumping material from one of the outlets 88 or 90 into the casing 18 and onto the screw conveyor 20.

As shown in FIG. 3 of the drawings, a rotary float 95 is rotatably mounted about the axis of a shaft 94 which drives said drum 95. This shaft is driven by a suitable means, not shown, which may comprise a sprocket and chain, if desired. The float drum 95 is provided with a peripheral portion 96 which coincides with peripheral portions 66 of the rotor 14.

The peripheral surface 96 of the float drum 95 extends adjacent to the peripheral portion 66 of the rotor 14 axially thereof whereby the shaft of the shaft 94 is parallel to the rotational axis of the rotor 14. The float drum 95 is co-extensive with the peripheries of the pockets 70 at one side of both housing inlets 40 and 42. Thus, the peripheral portion 96 of the float drum 95 bridges all of the pockets 72 as they rotate thereunder in a direction of an arrow A, as shown in FIG. 3 of the drawings.

The float drum 95, at its peripheral portion 96, rotates upwardly in a direction of an arrow B toward the hopper 10 and in an opposite direction to the normal flow of material into the pockets 70. Thus, these large particles are floated or screwed down to a level coinciding with the normal periphery 66 of the rotor 14 so that these projecting pieces of aggregate do not tend to scuff or abrade the inner surfaces 72 and 80 of the liner sections 58 and 78. Thus, the float drum 95 tends to screw material at the peripheral portions of the full pockets 70. These pockets are filled by material which is caused to flow downwardly in the hopper by the agitator 12 during rotation of its shaft 26 and the movement of its arms 28 in the material. Thus, the pockets 70 are filled as they rotate beneath the periphery of the rotating float drum 95. In this manner, all of the material, as it passes into engaged relationship with the inner surface of the liner section 58 coincides therewith and does not tend to abrade or tear the 14.

The peripheral portion 96 of the float drum 95 is notched longitudinally thereof. The longitudinal notches are designated 98 and filled with rubber or other suitable material bonded therein. Thus, rubber strips 100 are bonded in the notches or grooves 98 and these strips 100,
in these grooves, extend the full length of the drum 95 parallel to the axis thereof. The periphery 96 is thus composed of alternate sections of metal and rubber which tend efficiently to frictionlessly engage and displace large portions of aggregate in an upper direction toward the hopper 10 while the rotor 14 operates in the direction of the arrow A.

The alternate ridges of solid material 98 may be made of steel integral with the float drum 95 and the strips of rubber or soft material 100 therebetween permit the corners or portions of large pieces of aggregate to be engaged slightly between the ridges 98 and thus efficiently engage and movement of the large parts of aggregate out of the peripheral area of the rotor 14 is readily accomplished by the float drum 95.

A seal 102 engaging the peripheral portion 96 of the float drum 95 is disposed between a lower portion 104 of the hopper 10 and the periphery 96 of the drum 95 and this seal 102 is held in place by a plate 104 and screw 106, as shown best in FIG. 3 of the drawings. The plate 104 engages the resilient material of the seal 102 while the plate 104 provides a backing for the seal and a pressure plate for receiving force from an inner end 108 of the screw 106. The screw 106 is screwed into a stationary support member 110 secured to the housing 116.

A jam nut 112 screwthreaded on the screw 106 is jammed against the support member 110 to lock the screw 106 in position.

The rotor 14 is carried by a shaft 114 which is mounted in bearings 116 and 118. These bearings 116 and 118 are supported in retainers 120 and 122 held by and between the sections 44 and 46 of the housing 16. Coupled to the retainer 120 by means of bolts 124 is a packing gland 126 engaging a seal 128 surrounding the shaft 114. This packing gland 126 is held by a conventional adjustable collar 130.

Outwardly of the collar 130, a sprocket hub 132 is fixed on the shaft 114 by means of a key 134. This sprocket hub 132 is integral with another sprocket 136, as will be hereinafter described.

A conventional torque converter 138 is mounted on an extending portion of the shaft 114 and is connected in drive therewith.

The torque converter 138 is driven by a multiple belt assembly 140, all of which is part of the present invention.

Mounted concentrically and internally of a bore portion 142 in the shaft 114 are seal collars 144 and 146. These seal collars are coupled to the exterior of an air distributor tube 148 which is stationary and to which the seal collars 144 and 146 are fixed. The air distributor tube 148 is provided with an open end 150 which is disposed outwardly of the bearing 118, as shown best in FIG. 4, of the drawings.

The bearing 118 is held by a cap 152 secured by bolts 154 to the bearing retainer 122.

A smaller cap 156 is secured by bolts 158 to the cap 152 and the air distributor tube 148 is fixed in the cap 156 and sealed therein at 160. This seal may be in the form of a braided joint, or any other suitable seal, to render an air tight connection between the tube 148 and the member 156.

The air distributor tube 148 is provided with laterally disposed orifices 162 communicating with the interior of the cap 152 and at one side of the bearing 118 adjacent the cap 152.

Seals 164 sealingly surround the shaft 114 adjacent the bearing 118 and at the inner side of the retainer 122 in order to retain lubrication for the bearing and prevent it from passing inwardly of the shaft and toward the rotor 14.

Between the bearing 118 and the seals 164, the shaft 114 is provided with an orifice 166 which is on the opposite side of the bearing from the orifice 162. Both of these orifices thus provide for pneumatic pressure at opposite sides of the bearing and thus prevent a pressure differential from existing therefrom, consequently preventing the tendency to force lubrication to be displaced axially of the bearing.

Inwardly of the seals 164, the air distributor tube 148 is provided with a lateral orifice 168 which provides for pneumatic pressure to be applied between the seals 164 and the seal 146. Another orifice 170 in the air distributor tube 148 permits the application of pneumatic pressure to an area 172 between the seals 144 and 146.

Seals 174 are disposed at the inner side of the bearing 116 to prevent lubrication from the bearing from passing along the shaft 114 toward the rotor 14. Between the bearing 116 and the seal 174 is an orifice 176 which projects through a side wall in the shaft 114. This orifice 176 conducts pneumatic pressure to an area between the seal 174 and the bearing 116. Another orifice 178 on the opposite end of the bearing 116 conducts pneumatic fluid pressure to the opposite end of the bearings so that there is no pressure differential across the bearing tending to displace lubrication therefrom in an axial direction.

A plug 180 is screwthreaded in an extending end of the hollow shaft 114 to provide a pneumatic seal therein.

The shaft 114 is also provided with orifices 182 and 184 which communicate with spaces between the bearing retainers 120 and 122 and opposite ends of the rotor 14. These orifices 182 and 184 provides for a balance pressure to exist around the rotor 14, as will be hereinafter described.

The air distributor tube 148 is provided with air conducting ports 186 and 188 communicating directly with ports 190 and 192 in the seals 146 and 144, respectively. These ports in the seals communicate with ports 194 in the side wall of the shaft 114 which in turn communicate with short ports 196 in the rotor 14 at the bottoms of the pockets 70.

Communicating with each port 196 is a resilient valve member 198 disposed and held in the bottom of each pocket 70 by a sheet metal retaining ring 200. Each sheet metal retaining ring 200 is secured in the bottom of each pocket 70 by means of bolts 202. Each resilient valve 198 is provided with a slit 204 communicating with each port 196 so that pneumatic fluid under pressure may pass inwardly of the air distributor tube 148 through each of the ports 186, 189, 194 and 196 and force its way through the respective slits 204 and into each pocket 70, as will be hereinafter described. It will be understood that the ports 186 and the ports 190 and 192 are directed downwardly toward the outlet portions 88 and 90 of the housing 16 and that the ports 194 and 196 only register with the ports 190 and 192 when the pockets 70 are in a position at the lower side of the rotor and directed downwardly toward the outlet 88 and 90, as will be hereinafter described with reference to FIG. 2 of the drawings.

As shown in FIG. 2 of the drawings, the port 186, for example, communicates directly with the port 190 which is fan-shaped and downwardly diverging, which in turn communicates with the port 194 in the shaft 114 and that the port 194 communicates directly with the port 196 and the resilient valve 198.

Due to the downwardly diverging shape of the port 199, the port 194 may communicate with compressed air carried by the air distributor tube 148 for a predetermined number of degrees of rotation of the rotor 14. This permits the rotor 14 at one of the pocket portions 70, completely to pass a respective outlet port, as for example, a port 88 in the housing 16 before the port 194 passes the port 190 and shuts off compressed air flowing from the interior of the air distributor tube 148. When each port 194 passes the port 190, air pressure supplied by the air distributor tube 148 is shut off, as will be hereinafter described in detail.
As the rotor 14 rotates in the direction of arrow A, the agitator 12 moves material in the hopper 10 and it, by means of gravity and agitation, fills the pockets 70 in the rotor 14, as they successively pass under the hopper.

As each pocket 70 passes the rotary float drum 95, coarse aggregate and materials are scooped off, as hereinbefore described, to a level coinciding with the periphery of the drum so that these materials when contained in the pockets may pass smoothly around the inner surfaces of the housing liners 58 and 78. During rotation of the rotor 14, intermittently of the housing liners, these liners being resilient and pneumatically cushioned, as hereinbefore described, provide an efficient seal between the various cavities and laterally thereof, as hereinbefore described.

As each pocket 70 approaches one of the outlets 88 or 90, at the lower side of the rotor, a respective port 194 registers with the port 199 or the port 192 whereupon compressed air is caused to pass through the ports 194 and 196 and through a respective slit 204 in a respective resilient valve 198, thereby expelling the concrete materials from the respective pockets 70 into a respective outlet 88 or 90.

During this operation, pneumatic pressure in the casing 18 equals or substantially equals that of pressure fluid in the air distributor tube 148. Consequently, when each pocket 70 passes beyond a respective outlet 88 or 90, the pneumatic pressure in the pocket substantially equals that in the chambers 82 and 64 of the respective liner sections 78 and 58.

Thus, there is a balance of pressure across the resilient housing liner to prevent deflection of the liner into each respective pocket 70 as it rotates from an unloading position to a loading position under the hopper 10.

As each pocket 70 approaches the hopper 10, compressed air therein passes outwardly through an exhaust port 206 which extends through a short liner section 208 at an upper portion 209, of the liner 58, all as shown best in FIG. 2 of the drawings. Thus, compressed air is exhausted from each pocket 70 before it is disposed under the hopper 10 for subsequent filling thereof with aggregate or concrete materials.

The short liner section is provided with a curved surface 211 which matches the peripheral curvature of the float drum and a corresponding concave surface 213 of said portion 209.

As hereinbefore described, materials are constantly dispensed from the pockets 70 into the outlets 88 and 90, as shown in FIG. 1 of the drawings, and onto a screw conveyor 20 contained in the casing 18. This casing 18 is provided with a substantially vertical plenum portion 210 and an integral horizontal cylindrical portion 212 in which an outer end portion of the screw conveyor 20 is mounted, as will be hereinlater described in detail.

An upper portion of the helical screw conveyor 20 is disposed to receive material in the plenum 210 of the casing 18 and a delivery end portion 214 of the helical screw conveyor 20 is rotatably mounted in the hollow cylindrical portion 212 of the casing 18.

The screw conveyor 20 is mounted on a hollow tube 216. The tube 216 is supported on the exterior of a hollow tubular nozzle conduit 218.

This nozzle conduit 218 is provided with external screw threads 220 onto which the nozzle 24 is screwthreadedly secured. The nozzle 24 provides an end play bearing for one end 224 of the tube 216, thereby retaining the conveyor 20 in one axial direction. The opposite end 226 of the tube 216 is provided with driving notches 228 engaging a pin 230 carried by the nozzle conduit 218. Thus, the shaft 230 drives the conveyor 20.

The nozzle conduit 218 is fixed to a stub shaft 232 which is provided with a hollow portion 234 in which the nozzle conduit 218 is retained.
in its sealed relationship, as hereinbefore described, by the housing liner structures will form an air lock material in a housing line in which moves these materials into the cone area for action by the jet nozzle 24 to accomplish pneumatic conveying or propelling of the materials into a conduit F.

Inasmuch as air pressure throughout the mechanism of the invention is equal, air pressure in the outlet portion 38 and 40 of the housing liner in each air pressure in spaced 281 and 282, at opposite ends of the rotor 14, thus, no pressure differential exists across the lower portions of the housing liner and therefore there is no tendency of compressed air in the casing 18 to force abrasive materials to pass axially between the housing liner and the peripheral portions of the rotor toward the spaced 281 and 282.

It will also be apparent that the pressure of compressed air in the chamber 64 and 82, of the housing liners 58 and 78, is equal to that admitted to the air distributor tube 148 and the conduit 262.

In the modification as shown in FIG. 7 of the drawings, a valve 290 is coupled to a compressed air conduit 292 extending from the outlet of the humidifier 264. This valve 290 is provided with an outlet communicating with the fitting 262 which is disposed to deliver compressed air into the plenum 240 communicating with the interior of the bore 220 of the conduit 225 concentric with the helical conveyor 20.

The valve 290 is provided with a second outlet 294 communicating through a fitting 296 with the interior of the casing 18. The valve 290 is a valve capable of delivering all of the air flow from the conduit 292 through the fitting 262 and into the plenum 240 or it may be disposed to deliver all of the air into the casing 18 or the valve may be operably disposed to deliver part of the air into the casing 18 and part of the air into the plenum 240. Thus, it will be apparent to those skilled in the art that the concrete material being delivered by the screw 20 may be backed up by air pressure directly applied internally of the casing 18 and that the rotor structure of the machine hereinbefore described provides an airlock permitting the issuance of compressed air through the jet nozzle 24 and also provides an airlock for compressed air in the chamber 18 so that material being fed by the screw 20 toward the nozzle 24 may be backed up by pneumatic pressure. Thus the machine of the invention according to the modification shown in FIG. 7 of the drawings is versatile with respect to the convention and placement of various materials such as wet or dry concrete or other materials which may be dispensed by the machine.

It will be further apparent to those skilled in the art that the screw 20 may be removed from the structure shown in FIGS. 7 and 8 and that pneumatic pressure dispensed by the valve 290 through the fitting 296 into the casing 18 may be utilized to force materials outwardly through a conduit coupled to the flange 24 as hereinbefore described.

It will also be apparent that the pressure of compressed air in the chambers 64 and 82, of the housing liners 58 and 785 is equal to that admitted to the air distributor tube 148 and the conduit 262.

In operation, the invention may be used for feeding and/or conveying wet concrete materials or may be used for conveying dry materials in a dry form wherein water or hydration may be applied to these materials at the outlet board or delivery end of the conduit F.

It will be obvious to those skilled in the art that various modifications of the present invention may be resorted to in a manner limited only by a just interpretation of the following claims.

Having thus described my invention, I claim:

1. In a means for feeding and pneumatically conveying concrete materials the combination of

- a housing having an opening at an upper portion thereof disposed to receive materials therein;
- a rotor in said housing and having pockets open at the periphery thereof;
- said pockets disposed to receive materials from said opening;
- a resilient liner for said housing and engaging the periphery of said rotor;
- cavity means in said liner disposed to receive pressure fluid; and
- means for inducing pressure fluid into said cavity means whereby said liner may be forced intimately into contact with the periphery of said rotor;

an inner wall of said liner having a plurality of stiffening bars disposed parallel to the axis of said rotor and of sufficient length to bridge the pockets whereby pressure fluid acting in said cavity means creates force which is distributed by said stiffening bars thereby preventing excessive deflection of said liner into said pockets at the periphery of said rotor.

2. The combination as in claim 1, including a thin flexible plate supporting said bars and disposed between said bars and said cavity means.

3. The combination as in claim 2, said liner comprising a tube in which said cavity means is disposed and a separate rotor engaging portion adjacent said tube and forming said inner wall; the flexible plate fixed to said bars and disposed adjacent of tube.

4. In a means for feeding and pneumatically conveying concrete materials the combination of:

- a housing having an opening at an upper portion thereof disposed to receive materials therein;
- a rotor in said housing and having pockets open at the periphery thereof;
- said pockets disposed to receive materials from said opening;
- a resilient liner for said housing and engaging the periphery of said rotor;
- a rotary screw conveyor in a lower portion of said casing;
- a hollow nozzle conduit extending through the center of said screw conveyor;
- first means disposed to deliver compressed air through said nozzle conduit to the delivery end of said screw conveyor;
- and further means disposed to deliver compressed air through the center of said rotor and said pockets and into said casing above said screw conveyor when said pockets are disposed at said outlet opening of said housing and delivering concrete materials into said casing above said screw conveyor.

5. The combination as in claim 4 including:

- a humidifier disposed to humidify air delivered by said first means whereby it does not tend to dry materials being delivered by said screw conveyor and by compressed air from said nozzle conduit.

6. The combination as in claim 4 including:

- a nozzle projecting from the end of said nozzle conduit on beyond the delivery end of said screw conveyor; and
- concrete materials delivery means surrounding said nozzle to deliver materials from said conveyor in surrounding relationship to said nozzle, whereby such materials may then be pneumatically conveyed by compressed air issuing from said nozzle.

7. The combination as in claim 4, said further means comprising a rotatable hollow shaft carrying said rotor;

- a stationary shaft and seal means internally of said hollow shaft;
said stationary shaft and seal means having ports directly downwardly toward said outlet openings of said housing;
and port means in said hollow shaft and rotor communicating with said pockets and disposed to register with such port means in said stationary shaft and seal means when said pockets are in position to deliver materials under said casing above said screw conveyor.

8. The combination as in claim 4, said further means comprising a rotatable hollow shaft carrying said rotor; a stationary shaft and seal means having ports directed downwardly towards said outlet opening of said housing;
port means in said hollow shaft and rotor communicating with said pockets and disposed to register with said port means in said stationary shaft and seal means when said pockets are in position to deliver materials under said casing above said screw conveyor; and
additional port means in said stationary shaft and said hollow shaft disposed to conduct compressed air to opposite ends of said rotor and said liner to establish a fluid pressure equilibrium across the engaging and sealing surfaces of said liner and said rotor.

9. The combination as in claim 4 including, an exhaust port means in said liner disposed to exhaust compressed air from said pockets as they approach said inlet of said housing to receive materials therefrom.

10. In a means for feeding and pneumatically conveying concrete materials in the combination of:
a housing having an opening at an upper portion thereof disposed to receive materials therein;
a rotor in said housing and having pockets open at the periphery thereof;
said pockets disposed to receive materials from said opening;
a resilient liner for said housing and engaging the periphery of said rotor;
said housing having an outlet opening aligned with said pockets and disposed in the lower portion of said housing;
an airtight casing therebelow disposed to receive the materials from the pockets of said rotor;
and means disposed to deliver compressed air through the center of said rotor and said pockets and into said casing when said pockets are disposed at said outlet opening of said housing and delivering concrete materials into said casing;
said last named means comprising a rotatable hollow shaft carrying said rotor;
a stationary shaft and seal means internally of said hollow shaft;
said stationary shaft and seal means having ports directed downwardly toward said outlet opening of said housing;
port means in said hollow shaft and rotor communicating with said pockets and disposed to register with said port means in said stationary shaft and seal means when said pockets are in position to deliver materials into said casing through said opening; and
additional port means in said stationary shaft and said hollow shaft disposed to conduct compressed air to opposite ends of said rotor and said liner to establish a fluid pressure equilibrium across the engaging and sealing surfaces of said liner and said rotor.

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