April 14, 1953 P. E. FISCHER ET AL 2,634,894

POWDER HANDLING DEVICE WITH PROTECTED DRIVING MECHANISM

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FIG. 1

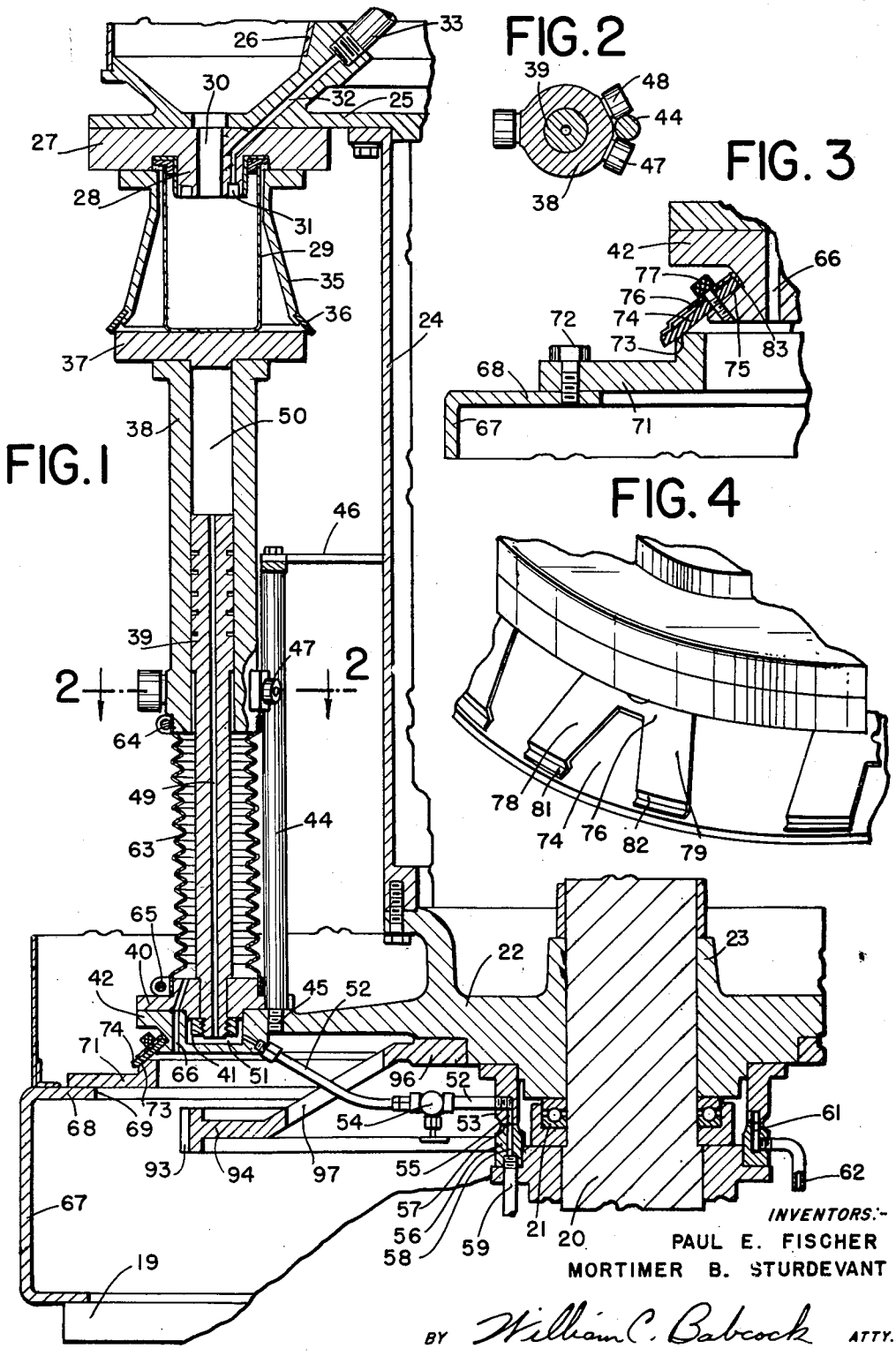


FIG. 2

FIG. 3

FIG. 4

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FIG. 5

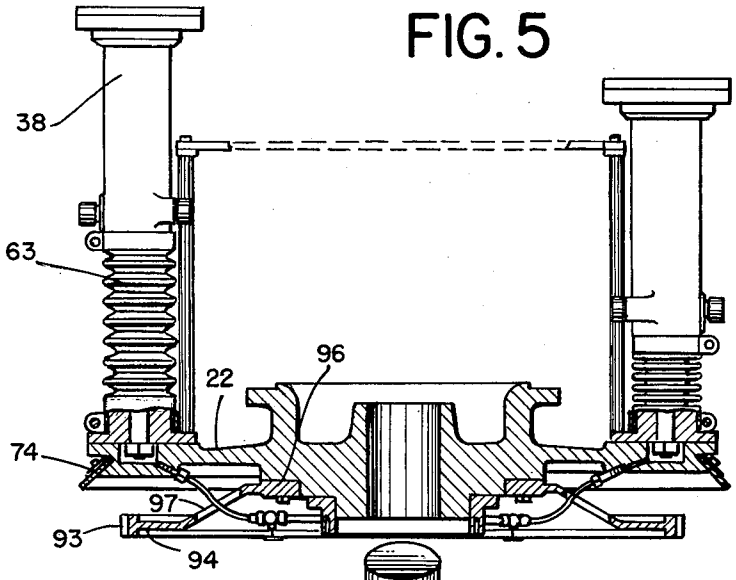
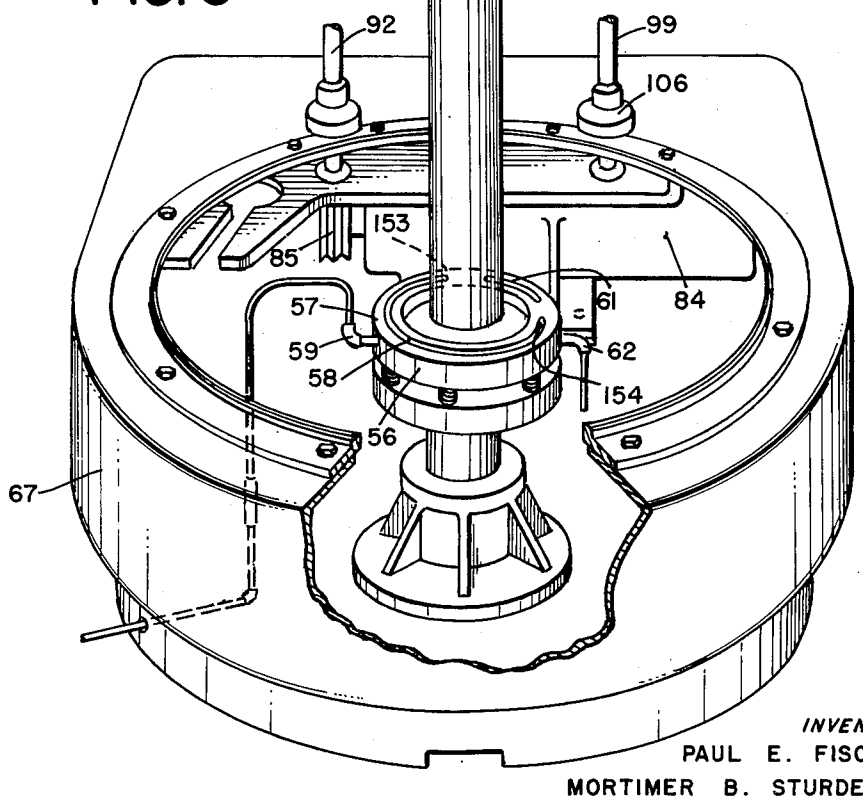


FIG. 6



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POWDER HANDLING DEVICE WITH PROTECTED DRIVING MECHANISM

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FIG. 7

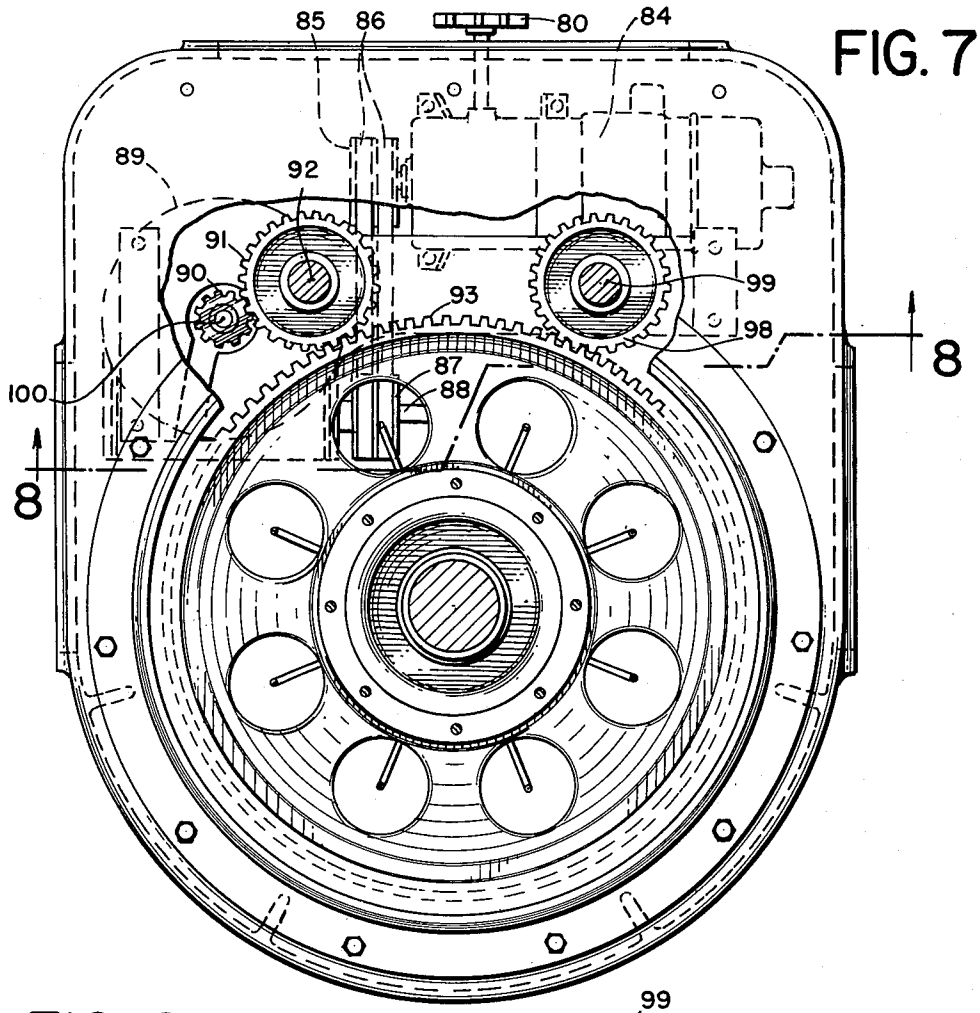
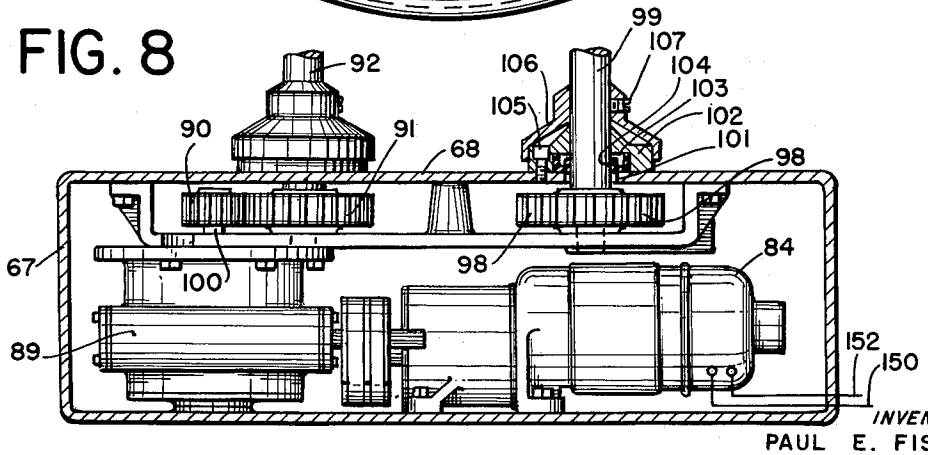


FIG. 8



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FIG. 9

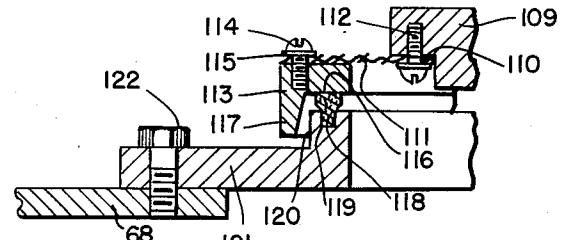
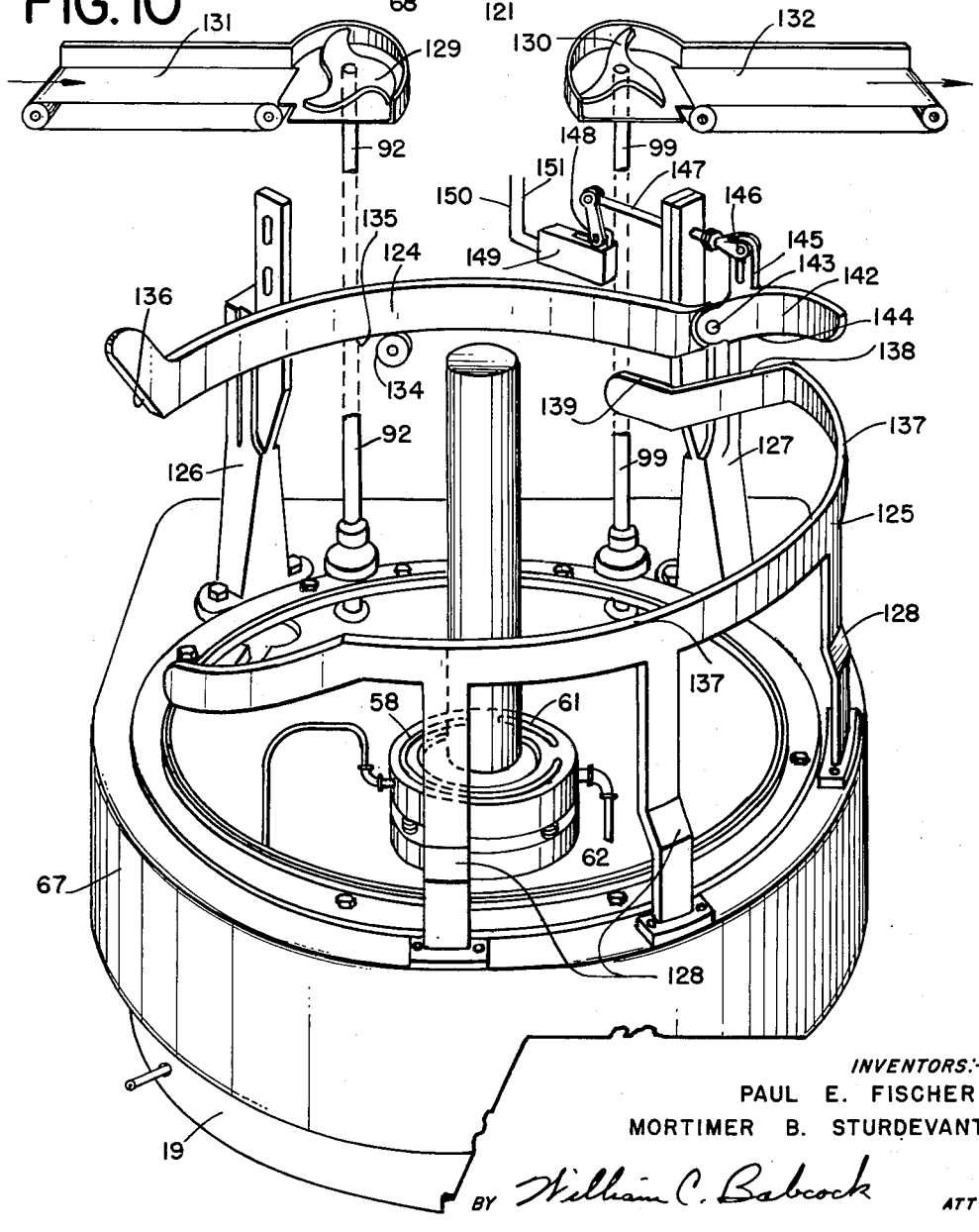


FIG. 10



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UNITED STATES PATENT OFFICE

2,634,894

POWDER HANDLING DEVICE WITH PROTECTED DRIVING MECHANISM

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Application April 5, 1948, Serial No. 19,104

20 Claims. (Cl. 226—96)

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The present invention relates to filling machines and more particularly to improved supporting means for containers to be filled, and to improved means for increasing the life of the machine parts.

Many devices are known which include a relatively movable filling head and support, between which a container is positioned for a filling operation. In high speed machines of this type a number of such filling heads and supporting plates are radially positioned with respect to a central vertical axis and are rotatable around said axis during the filling operation. Various methods have been proposed for production of the necessary relative movement between the filling head and support, and the use of air pressure to cause this movement is well known. The use of air pressure has the advantage that the relative distance between the filling head and support is limited by the size of the container, and the air pressure permits adjustment of this distance to containers of slightly different dimensions. However, the use of air pressure in known devices of this type often increases the dust problem, particularly in the filling of powdered materials.

One difficulty in filling machines of this general type and particularly in machines which are to be utilized for the handling of finely powdered materials is that the material to be filled will penetrate the various mechanical parts of the machine in the form of a fine dust. The abrasive action of this dust seriously shortens the life of the various moving parts of the usual driving mechanism and results in increased maintenance and repair costs. The use of air pressure in known devices of this type adds to the dust problem.

With these difficulties of the prior devices in mind, it is one object of the present invention to provide an improved pressure-actuated mechanism for production of relative movement between the filling head and supporting platform of a filling machine.

Another object is the provision of a filling machine in which the driving mechanism is protected against penetration of dust.

A further object is the provision of a filling machine in which the driving mechanism is enclosed in a housing wherein the pressure is higher than that outside of the housing.

Still another object is the provision of a filling machine in which the driving mechanism is enclosed in a housing and in which the pressure-actuated lifting mechanism for a container support is operatively connected to said housing for maintenance of increased pressure within the housing due to the exhaust from the pressure-actuated mechanism.

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Other objects and advantages will be apparent from the following specification in which a detailed description of a preferred embodiment of the invention is given.

In the drawings which form a part of this specification, and in which like reference characters indicate like parts,

Figure 1 is a partial sectional view of a filling machine embodying features of the present invention.

Fig. 2 is a sectional view on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged sectional view of a portion of the mechanism of Fig. 1.

Fig. 4 is a partial perspective view of the sealing means shown in Fig. 3.

Fig. 5 is a partial sectional view of the rotatable supporting plate of the filling machine of Fig. 1.

Fig. 6 is a partial perspective view of the base of the machine of Fig. 1, certain portions being broken away for clearness.

Fig. 7 is a top view of the base of the machine, certain portions being shown in section and others in dotted outline for the sake of clarity.

Fig. 8 is a sectional view on the line 8—8 of Fig. 7, with certain portions broken away to show details of the shaft seal.

Fig. 9 is a partial sectional view of a modified sealing device according to the invention, and

Fig. 10 is a partial perspective view of the base of the machine of Fig. 1 which shows details of the guide and limiting means for the container supports.

As shown in Fig. 1 the filling machine is provided with a base 19 which has a central cylindrical supporting column or post 20 rigidly mounted thereon. A suitable thrust bearing 21 on this central support 20 carries the weight of a filling unit. The various parts of this filling unit are carried by a substantially circular supporting member or plate 22 which has a central bearing portion 23 rotatably mounted on the post 20.

A supporting frame 24 on this plate 22 carries an upper filling head support 25. Above this upper support or plate 25 is a suitable hopper 26 for the material to be filled. Plate 25 also carries a plurality of filling heads 27, each of which has a cylindrical central depending projection 28 adapted to be inserted in the top of a container

29 to be filled. A passage 30 connects the hopper 26 to the interior of container 29 when the container is in position with respect to the filling head 27 and permits the desired material to pass into the container.

One or more additional openings 31 may be provided in the portion 28 for control of the pressure within the container during the filling operation. Thus the openings 31 are connected by air passages 32 to a suitable pipe or hose 33 connected to air pressure control means of any known type.

Since the particular type of filling head and the pressure conditions under which the container is to be filled form no part of the present invention and since the present invention may be utilized advantageously with any known types of filling units, no detailed description of the filling operation or of the filling head construction need be given.

If desired, the filling head may carry a suitable shroud 35 having a gasket 36 at its lower end for cooperation with the supporting plate 37 for container 29.

It is customary in these filling units to provide for relative movement between the filling head 27 and the supporting plate 37. Depending upon the type of unit, one of these members may remain stationary while the other moves toward and away from the stationary member, or in some cases both members may be movable. Thus the filling unit includes at least one member movably mounted on the rotatable support 22.

For purposes of illustration we have shown a filling unit in which the filling heads 27 remain relatively fixed in vertical position while the supporting plate 37 is reciprocated vertically to raise and hold the container 29 against the filling head. It will be understood that while the filling head 27 is not movable vertically, it does rotate around the central vertical axis of the machine by reason of the mounting of bearing portion 23 on the central post 20.

To provide the necessary vertical movement of plate 37, we have attached the plate to the upper end of a hollow cylinder 38. This cylinder is adapted to slide vertically on a fixed piston 39. Piston 39 is bolted to a supporting plate 40 by means of a nut 41 and this plate 40 is fastened to the outer portion 42 of the main circular supporting plate 22 of the rotatable filling unit.

A vertical guide rod 44 is provided for each lifting device and is fastened to the rotatable support 22 by means of threads 45. Rollers 47 and 48 (Fig. 2) are mounted on the vertically slidable cylinder 38 and engage opposite sides of the vertical guide 44 to steady the cylinder during its vertical reciprocation. Top bars 46 connect and reinforce adjacent rods 44.

To actuate the lifting mechanism, fixed piston 39 is provided with a central pasageway 49, the upper end of which communicates with the hollow internal chamber 50 of cylinder 38. The lower end of passage 49 opens into a small recess or air chamber 51 in main support 22. An air tube or hose 52 connects the chamber 51 to an annular valve member 53 which surrounds central post 20 and is carried by the rotatable plate 22. This annular valve member 53 has a horizontal lower face provided with an opening 55 connected to the air tube 52. A valve 54 may be provided in the air line 52 for control purposes.

The rotatable annular valve member 53 cooperates with a fixed annular valve member 56 which has a horizontal upper surface 57 provided with a pressure slot 58 connected to a pipe 59 for attachment to a suitable source of compressed air.

The fixed annular valve member 56 likewise has an exhaust slot 61 communicating with a suitable exhaust pipe 62. The arrangement of the annular valve member 56 will be clear from reference to Fig. 6. Thus as the rotatable supporting plate 22 revolves around the central post 20, the air control opening 55 corresponding to a given cylinder 38 will communicate alternately with the pressure valve slot 58 and the exhaust valve slot 61 When this opening is in communication with the pressure slot 58, the compressed air will be admitted through the pipe 52, chamber 51, and passage 49 to the interior 50 of cylinder 38 and will thus lift the cylinder and its supporting plate 37 to position the container 29 against the filling head 27. Similarly when the rotatable valve opening 55 is in alignment with the exhaust slot 61, the pressure within cylinder 38 will be relieved through exhaust passage 62 and the lifting plate 37 will be permitted to drop of its own weight.

In order to prevent abrasion of the piston and cylinder by the action of dust or particles of the material being filled, a bellows 63 is provided, which encloses the space between the bottom of the cylinder 38 and the top of supporting bracket 40. This bellows 63 is fastened to the lower end of the cylinder by a clamp 64 and is similarly fastened to a cylindrical shoulder on member 40 by a clamp 65. The bellows or sleeve 63 is of the expansible folding type and can thus lengthen and shorten as required to accommodate the raising and lowering of the cylinder 38 and maintain a protective cover at all times around the otherwise exposed portion of fixed piston 39.

To permit changes in the effective length of the bellows during movement of the cylinder without rupture of the bellows by increase of pressure as the cylinder is lowered, a bleed passage 66 is provided in members 40 and 42 which communicates at its upper end with the space inside the bellows 63 and outside piston 39. The lower end of this passage 66 opens at a point on the bottom of the peripheral portion 42 of circular supporting plate 22.

A housing 67 is provided on base 19 and is designed to form a substantially air-tight enclosure for the driving mechanism of the machine. This housing is provided with openings, only to the extent required to permit passage of the connecting members which operate the filling and conveying mechanism from the enclosed driving mechanism. The top portion 68 of housing 67 has a substantially circular opening 69 which is concentric with the supporting post 20 at the center of the base. An annular seating member 71 is fastened at the edge of opening 69 by bolts 72 (Fig. 3) and this annular member is provided with a seat 73 for cooperation with a sealing member 74 mounted on the peripheral portion 42 of circular supporting plate 22. As shown in Figs. 3 and 4, this sealing member 74 is made of rubber or other flexible air-tight material and is fastened against the beveled edge 75 of peripheral portion 42 by a series of spring clamps 76 held in place by bolts 77. These spring clamps 76 are provided with two spring arms 78 and 79 which have offset

ends 81 and 82 bearing against the edge of gasket 74. Thus the resilience of the spring arms 78 and 79 will hold the outer edge of gasket 74 firmly against seat 73 of the annular member 71 on the top 68 of casing 67. The other or inner edge of gasket 74, which is designated as 83 in Fig. 3, will be held tightly against the beveled portion 75 by the inner end of the spring clamp 76 and by bolt 77.

Since the circular supporting plate 22 is of solid construction, this plate with its gasket 74 will serve as a closure for the opening 69 in the top of casing 67 and will provide a construction in which all portions of the mechanism within the confines of housing 67 and plate 22 are substantially protected from dust and from particles of the material being filled.

With reference to Figs. 6, 7, and 8 the driving mechanism includes a motor 84 mounted within casing 67 and having a speed control wheel 80 (Fig. 7) which projects externally from the casing for manipulation by the operator. A drive pulley 85 on the motor shaft is connected by belts 86 to a driven pulley 87 on horizontal shaft 88 of a gear unit 89. This gear unit is also inside the base housing 67 and includes a vertical shaft 100 which carries a driving pinion 90. Pinion 90 meshes with a larger gear 91 on vertical shaft 92. This shaft carries at its upper end a suitable star wheel or transfer device 129 (Fig. 10) which shifts the containers from the supply conveyor 131 onto the lifting plates 37 of the rotatable portion of the machine in known manner. By the connections just described the motor 84 drives this transfer wheel 129 at the appropriate speed.

Gear 91 on shaft 92 also meshes with the large annular ring gear 93 which is carried by annular bracket 94 fastened to the circular supporting plate 22 at 96. Slots 97 in member 94 permit passage of the tubes 52 which control the pressure in cylinders 38. Thus as shaft 92 and gear 91 are rotated through their connections with the driving motor 84, gear 91 will in turn drive the ring gear 93 to rotate the supporting plate 22 and bring the lifting plates and cylinders successively into position to receive a container from the transfer wheel 129.

A similar transfer wheel 130 is carried by a shaft 99 and is utilized to move the filled containers from the lifting plates of the rotatable mechanism onto the discharge conveyor 132 (Fig. 10). Shaft 99 of discharge wheel 130 carries a gear 98 which is driven directly from the ring gear 93 on rotatable supporting plate 22. The size of the gears and the number of teeth involved are chosen to provide the desired coordination between the linear circular speed of the supporting plates and the respective feeding and discharge wheels 129 and 130.

As shown in Fig. 8, sealing means are provided to prevent dust and particles of material from entering the housing 67 where shafts 92 and 99 project through the upper housing plate 68. Thus the plate 68 has an opening 101 large enough to accommodate the shaft 99. A bearing and sealing member 102 is mounted on the plate 68 around the opening 101 and includes an annular channel 103 in which a resilient sealing gasket 104 is located. Bolts 105 clamp member 102 to plate 68. A dust shield or hood 106 is fastened to shaft 99 by screws 107 and includes a depending skirt portion which overlaps the edge of the bearing member 102 as shown to assist in the exclusion of dust and dirt from the mechanism housing. A similar sealing arrangement is provided for shaft 92.

As described above, housing 67 in which the driving mechanism is mounted is of substantially air-tight construction and is open only at the points where the shafts 92 and 99 project and also at the circular top portion which is covered by rotatable supporting plate 22 of the filling head mechanism. The presence of the various sealing gaskets further resists penetration of particles to the interior of the housing and thus the vital mechanical parts which are contained in that housing are protected against abrasion and undue wear. It should be noted that a suitable sealing arrangement may be provided at the point where the supporting post 20 projects through the central bearing portion 23 of plate 22. Or a suitable cap on member 22 may completely enclose the upper end of post 20. This additional sealing arrangement is provided in the present case by means of such a cap and includes the supporting frame or side housing 24 and the upper supporting plate 25. Thus, all portions of the mechanism are protected and the chances of penetration by small particles of material are reduced.

We have found, however, that even with all the precautions indicated above such as the provision of sealing gaskets at all openings, there is still a tendency for the very fine particles of powdered material or dust to work their way into the housing along the shafts and through the bearings which surround these shafts. These particles still have the effect of shortening the life of the working parts. We have found that this difficulty can be overcome by creation of a pressure differential between the inside and the outside of housing 67. Thus we provide means for introducing air or other gas to the interior of housing 67. This extra admitted air tends to increase the pressure within housing 67 to a point slightly above the external atmospheric pressure around the housing. Thus there is a tendency for air to leak outwardly through any openings in housing 67. For example, air tends to be forced outwardly between the sealing gasket 74 and the annular seat 73 in the top 68 of housing 67. Similarly, air tends to move outwardly along shafts 92 and 99. This tendency for the air to escape from the housing 67 effectively prevents penetration of dust and powder to the interior of the housing even under long and continuous use. Particles which do attempt to penetrate the housing, for example, along shafts 92 and 99, are met by the outward flow of air and are carried away and thus excluded from the housing.

While it would be possible to provide a separate source of air pressure which would serve the sole purpose of maintaining the desired pressure differential between the inside and the outside of the housing 67, we have found it particularly economical and advantageous to utilize the air which is exhausted from the lifting cylinders 38. Thus the exhaust passage 62 which communicates with the exhaust slot 61 in annular valve 56 opens directly to the interior of housing 67. In other words, compressed air is brought into the housing 67 and fed directly to stationary valve member 56 through connection 59. The compressed air then passes to each of the lifting cylinders in turn as these cylinders rotate to that portion of their circular path in which the corresponding valve openings 53 coincide with some portion of pressure slot 58,

i. e., between points 153 and 154 (Fig. 6). During this portion of the travel of the respective cylinders, they will be lifted as a result of the increased pressure in chambers 50. Further rotation of the plate 22 carries the valve opening of a given cylinder around to a point coinciding with a portion of exhaust slot 61. Through the portion of travel which corresponds to slot 61 the chamber 50 is effectively connected to exhaust pipe 62 and thus to the interior of housing 67 so that the cylinder 38 may drop of its own weight and the air which was compressed in chamber 50 may escape into the interior of housing 67.

In the present machine, with eight filling heads, at least one of the cylinders 38 will be in exhaust position over some portion of slot 61 at any given time, so that there will be a constant flow of air into the casing 67 through exhaust 62.

If the various gaskets and sealing devices were held too rigidly in place there would be a tendency for pressure within the housing 67 to build up to a point where there might be some interference with the lowering of cylinders 38. Also the gaskets would wear unnecessarily. This problem is avoided by use of a resiliently mounted sealing member such as gasket 74 previously described. Since this sealing gasket overlaps the annular seat on the outside of the casing, any excess pressure which tends to build up within the casing can be relieved automatically by flexing the gasket outwardly against the tension of the spring arms which hold it. Also, as described above, the seal should permit a slight but definite outward flow of air from the interior of casing 67, so that dust and particles of powder will be carried away from the sealing and bearing surfaces and will not wear out such surfaces or penetrate inside the casing.

Another important feature of the present arrangement is the location of bleed passage 66 for the bellows 63. Since the lower end of this passage opens into the interior of casing 67, the bellows 63 will have the same benefits of increased pressure and absence of dust as the other internal working parts. Wear and abrasion of cylinder 38 and piston 39 are thereby reduced.

In Fig. 9 an alternate arrangement for this main sealing gasket has been shown. In this embodiment of the invention the rotatable supporting plate of the lifting mechanism is designated as 109 and is provided with an annular shoulder 110 at its outer edge. A flexible gasket member 111 is fastened at its inner edge to shoulder 110 by screws 112. This gasket member 111 may be of fabric which is flexible and slightly porous. An annular metallic ring 113 is carried by the outer edge of flexible gasket 111 and is fastened to the gasket by screws 114 and washers 115. This annular member 113 has a horizontal surface 116 at its inner edge and a depending skirt 117 at its outer edge. The flat portion 116 is adapted to engage and seat on a strip 118 of suitable sealing material such as felt, which is carried in a groove 119 in the projecting rim 120 of annular seat 121. Member 121 is fastened to the top 68 of casing 67 by bolts 122 and provides the necessary gasket seat at the edge of the opening.

In the construction just described, the necessary sealing effect between member 113 and strip 118 will be obtained as a result of the weight of the metallic ring 113. The flexible gasket member 111 will permit vertical movement of gasket ring 113 to accommodate the ring to the sealing strip 118. Also this flexibility in the support of ring 113 permits movement of the ring to relieve the internal pressure if such pressure tends to build up to a higher point than is desirable. Further relief of the pressure may be obtained by reason of the porosity of the material from which the flexible gasket support is made.

In connection with the pressure operated cylinders 38 for the supporting platforms of the filling mechanism, we have provided conventional guide and limiting devices which insure smooth operation of the mechanism and prevent jamming of the machine. As shown in Fig. 10, guide or stop members 124 and 125 are provided in the form of rails which extend in a circular path co-axially with the axis of rotation of the main supporting plate 22 of the unit. Rail 124 is mounted on supports 126 and 127 fastened to the top 68 of casing 67. Rail 125 is carried by integral legs 128 which are likewise fastened to the top of the lower casing. These rails cooperate with rollers 134, one of which is provided on each lifting cylinder 38 as shown in Figs. 1 and 2.

Rail 124 serves as an upper limit and guide for the rollers 134 during that portion of the rotation of the cylinders in which compressed air is being admitted through the valve slot 58. Thus when the pressure is first increased inside a given cylinder 38, it will be raised until its roller 134 engages the bottom surface of rail 124. As the machine rotates, the roller 134 will travel along the lower surface 135, which will prevent lifting of the cylinder 38 and its associated platform until the roller reaches the upwardly inclined end 136 of rail 124. At this point, since pressure has been increased within the cylinder, the supporting platform will be raised smoothly to the extent permitted by the slope of portion 136.

The second rail member 125 is provided with a substantially horizontal top surface 137. This horizontal section extends opposite the first portion of exhaust slot 61, so that when the pressure is relieved in the normal operation of the machine, the cylinder roller 134 engages the top of horizontal surface 137. The end portion of rail 125 in the direction of rotation of the machine slopes downwardly as indicated at 138 and terminates in a lowered horizontal section 139. Since pressure within the cylinder has been relieved by the time roller 134 reaches the end of the horizontal rail portion 137, the weight of the cylinder and associated parts will cause it to drop smoothly as roller 134 reaches the sloping portion 138 and follows the slope downwardly. Thus in normal operation the cylinder 38 and its supporting platform will be lowered just prior to the point at which the discharge wheel 130 is to engage and remove the container from a particular supporting platform.

A safety device is provided to stop the machine in the event that the cylinder 38 should become jammed in its upper position. This safety device includes a pivoted lever arm 142 which is rotatably mounted at 143 to the end of rail 124. Should a container support become jammed in the upper position, the associated roller 134 would engage the lower surface 144 of this safety lever 142 and would tilt the lever in a counterclockwise direction with reference to Fig. 10. A crank arm 145 on lever 142 has a slot in which a connecting rod 147 is pivotally attached at 146. The connecting rod 147 is operatively connected to the arm 148 of a suitable switch 149. Switch 149 controls the operation of the main driving motor 84

by means of wires 150 and 151. The particular circuit by which this is accomplished is well known in the art and is omitted for clearness.

From the foregoing description, it is apparent that we have provided an improved pressure actuated mechanism for causing the necessary relative movement between the filling head and container support of a filling machine. While this mechanism has been shown and described in connection with a movable supporting platform, the same principles can be applied to a device in which the platform is stationary and the filling head is movable.

We have also provided means for enclosing the mechanism in a protective housing and maintaining a pressure differential between the inside and outside of the housing. The pressure in the housing is preferably maintained by connections with the pressure actuated container supports. The use of this improved arrangement of the housing and the pressure-operated supporting platforms offers definite advantages in commercial operation at high speed and is particularly desirable since it permits the combination of a practical pressure-operated lifting mechanism with a protective casing in which a pressure differential is maintained with respect to the surrounding atmosphere to exclude dust, dirt and particles of the material being filled.

Obviously many variations in the specific details of construction of the parts and the manner in which they engage each other to perform the specific functions may be made by persons skilled in this field. It is therefore intended that this invention shall include all such modifications, changes, and improvements as fall within the spirit and scope of the attached claims.

Now, therefore, we claim:

1. A filling machine comprising driving mechanism, a housing enclosing said mechanism and having an opening, a movable portion of the mechanism extending through the opening, a filling unit outside said housing connected to the movable portion, pressure responsive sealing means exhausting air from the housing around said portion, and means for introducing air under pressure within the housing in an amount insuring exhaust operation of the sealing means during each operation of the filling unit.

2. A filling machine comprising a relatively movable filling head and support for a container to be filled, pressure-operated means for relative movement of the head and support and including a source of pressure, driving mechanism for the machine, a housing enclosing the driving mechanism with the filling head outside the housing, and an air connection between the source of pressure and the interior of the housing for increasing the pressure in which the driving mechanism operates within the housing above the pressure in the vicinity of the filling head.

3. A filling machine comprising a base, a support rotatably mounted on the base, a filling unit having at least one member movably mounted on the support, means on the support for causing movement of the member including a pressure cylinder and piston, one of which is connected to the member, the piston having an exhaust opening communicating with the interior of the cylinder, driving mechanism mounted on the base, a housing enclosing the mechanism, and means connecting the piston exhaust opening to the interior of the housing for maintaining a pressure differential between the inside and outside of the housing.

4. A device for handling powdered materials comprising driving mechanism, a housing enclosing the mechanism and having an opening, a powder handling unit outside the housing, a driving connection between the mechanism and the unit including a movable driving member extending from the inside to the outside of the housing through the opening, means continuously introducing a pressure medium inside the housing and thereby maintaining a higher pressure inside the housing than in the vicinity of said powder handling unit, and sealing means between the housing and movable member permitting continuous controlled escape of the pressure medium through the opening around the movable driving member during movement of the member, thereby continuously carrying away from the housing any powder particles tending to enter the housing from said powder handling unit through said opening and along said driving member.

5. A device according to claim 4 in which the sealing means is movable as a result of predetermined pressure within the housing to provide a controlled flow of air from the inside to the outside of the housing.

6. A device according to claim 5 in which the sealing means includes a flexible annular sealing strip, and spring means resiliently holding said strip in sealing position.

7. A device according to claim 6 in which the sealing means includes a flexible annular sealing strip, and a rigid annular sealing ring carried by an edge of the strip.

8. A device according to claim 7 in which the sealing means includes a flexible annular sealing strip of porous material and an annular sealing ring carried by one edge of the strip.

9. A device for handling powdered materials comprising driving mechanism, a housing enclosing the mechanism and having an opening, a material handling unit outside the housing, a driving connection between the mechanism and the unit including a movable member extending from the inside to the outside of the housing through the opening, means introducing a fluid under increased pressure within the housing during each operation of the unit, and deformable sealing means at the opening for controlled relief of pressure through escape of said fluid between the housing and the movable driving connection member.

10. A filling machine comprising a base, a gas tight housing on the base having a top opening, a supporting plate rotatably mounted on the base and substantially closing the opening, a relatively movable piston and cylinder one of which is fixed to the plate, an expandable bellows enclosing the exposed portion of the piston and spaced therefrom to provide an air tight chamber, said plate having an air passage connecting the chamber and the interior of the housing.

11. A filling machine comprising a base, a gas tight housing on the base having a top opening, a supporting plate rotatably mounted on the base and having sealing means substantially closing the opening, a filling unit mounted on the plate and including a filling head member and a container support member one of which is movable with respect to the other, pressure actuated mechanism for the movable member including a piston and cylinder one of which is fixed to the plate and the other of which is fixed to the movable member, and means for exhausting the cylinder into the interior of the housing.

12. A machine according to claim 11 having

an expandable bellows fastened to the cylinder and enclosing the exposed portion of the piston to form a closed air chamber, and an air connection between the interior of the chamber and the interior of the housing.

13. A filling machine comprising a base, a gas tight housing on the base having a top opening, a supporting plate rotatably mounted on the base and substantially closing the opening, a filling unit mounted on the plate including a piston fixed to the plate, a cylinder reciprocable on the piston and a container support fastened to the cylinder, and valve means for selective connection of the cylinder to the interior of the housing to maintain a pressure differential between the inside and outside of the casing.

14. A machine according to claim 13 having a bellows enclosing the piston and fixed to the cylinder and plate to form an air tight chamber around the piston, the plate having an air passage between the chamber and the interior of the housing.

15. A device for handling powdered materials comprising driving mechanism, a housing enclosing the mechanism and having an opening, a powder handling unit outside the housing, a connection between the mechanism and the unit including a movable member extending from the inside to the outside of the housing through the opening, means introducing a pressure medium into the housing during each operation of the powder handling unit, and means exhausting the pressure medium from the housing through the opening around said member.

16. A device for handling powdered materials comprising driving mechanism, a housing enclosing the mechanism and having an opening, a powder handling unit outside the housing, a connection between the mechanism and the unit including a movable member extending from the inside to the outside of the housing through the opening, means constantly introducing air under pressure into the housing during operation of the powder handling unit and resiliently movable sealing means between the housing and movable member exhausting the excess air from the housing through the opening around said member.

17. A filling machine comprising a base, a gas tight housing on the base having a top opening, a supporting plate rotatably mounted on the base and substantially closing the opening, a plurality of filling units mounted on the plate and each including relatively movable filling head and container support members and pressure actuated mechanism for causing such relative movement, and rotary valve means within the housing including stationary annular pressure and exhaust slots located around the axis of rotation of the plate, means rotatable with the plate and connecting each pressure actuated mechanism successively with the pressure and exhaust slots during rotation of the plate, means for connecting the pressure slot to a source of fluid under pressure, and the exhaust slot discharging directly to the interior of the housing.

18. A filling machine comprising a base, a gas tight housing on the base having a top opening, a supporting plate rotatably mounted on the base and substantially closing the opening, a plurality of filling units mounted on the plate and each including relatively movable filling head and container support members and pressure actuated mechanism for causing such relative movement, and rotary valve means within the housing including pressure and exhaust slots with which each pressure mechanism is connected successively during rotation of the plate, the exhaust slot communicating directly with the interior of the housing.

19. A filling machine comprising a base, a gas tight housing on the base having a top opening, a supporting plate rotatably mounted on the base and having sealing means substantially closing the opening, a filling unit mounted on the plate and including a filling head member and a container support member one of which is movable with respect to the other, pressure actuated mechanism for the movable member including a piston and cylinder one of which is operatively connected to the movable member, and means for exhausting the cylinder into the interior of the housing.

20. A device for handling powdered materials comprising driving mechanism, a housing enclosing the mechanism and having an opening, a powder handling unit outside the housing, a driving connection between the mechanism and unit including a movable driving member extending from the inside to the outside of the housing through said opening, means maintaining a relatively higher pressure inside the housing than in the vicinity of the powder handling unit during operation of the latter, and means relieving the higher pressure from the housing through the opening around said driving member during operation of the powder handling unit, thereby carrying away from the housing and driving mechanism any powder particles which might otherwise escape from the powder handling unit and enter the housing through said opening and along said driving member.

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