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(19)

(54) BAG FEEDING MACHINE

(71) We, UNICEM — UNIONE CEMENTERIE MARCHINO, EMILIANE E DI AUGUSTA, a body corporate organised and existing under the laws of Italy, of Viale Ottavio Marchino 10, 15033 Casale Monferrato (Alessandria), Italy, for one half, and ANDREA DORIA and ANGELO RAITERI, both Italian subjects, of Via F. Ruffini 16, 10015 Ivrea (Turin), Italy, and Via E. Fermi 5, 10015 Ivrea (Turin), Italy, respectively for one quarter each, 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:—

This invention relates to apparatus for automatic packaging of powder material, such as cement, flour, grain, fertilizer, insecticide, and the like. More particularly, the invention relates to a machine and a method for feeding bags in such packaging apparatus.

Powder materials are often packaged in bags of paper or other material provided on a pair of end edges with two flanges as bellows, which flanges are normally folded on one face of the bag. One of the flanges is provided with a valve opening which can be opened by pressing together the two wings of the flange and which closes automatically due to the pressure of the packaged material.

In a known bag feeding machine of the above type, the bag to be fed is picked up by the grippers engaging the valve flange. The grippers rock the picked bag and carry it toward the spout of a powder dispensing machine causing the flange to cross a funnel for opening the valve. This machine has a disadvantage in that the grippers are carried by a shaft which must rotate and translate through reciprocating movements, resulting in a rather low speed of movement of the bag. Furthermore, the funnel is located close to the spout, whereby after having guided the bag, the funnel must be removed to allow the bag to be filled.

According to the invention there is provided a bag feeding machine for use with a bag which is substantially closed at the top and has folds which form two wings along the top edge, the bag having an opening which can be exposed by pushing the two wings together, the machine comprising means for taking bags one at a time from a magazine and supplying them to a shaping tube having a cross-section which varies along its length, whereby on moving a bag along the tube with the top edge inside the tube and the body of the bag passing along a longitudinal slot in the bottom of the tube, the wings are supported away from the faces of the bag and are pressed together to expose the opening, wherein there are provided moving means for moving a bag along the shaping tube, comprising a pair of surfaces which can engage opposite faces of the body of a bag, the surfaces being movable around closed paths and at least one being driven by a motor.

The invention also provides an apparatus for filling bags with powder material, and a method for placing a bag on a spout of a powder dispensing apparatus.

The invention will be described by way of example and with reference to the accompanying drawings, wherein:

Fig. 1 is a general plan view of a powder material packaging apparatus embodying the invention;

Fig. 2 is partial sectional view taken along the line II—II of Fig. 1;

Fig. 3 is a partial lateral view of the machine from the right of Fig. 1;

Fig. 4 shows part of Fig. 2 in more detail;

Fig. 5 is a partial lateral view of another packaging apparatus embodying the invention;

Fig. 6 is a partial plan view of the machine of Fig. 5;

Fig. 7 is a partial sectional, lateral view

of the machine of Fig. 5, in more detail;

Fig. 8 is a partial sectional view taken along the line VIII—VIII of Fig. 7;

Fig. 9 is a partial sectional view taken along the line IX—IX of Fig. 5, in an enlarged scale.

With reference to Fig. 1, the numeral 11 generally indicates a rotatable structure of a powder dispensing machine of an apparatus for packaging powder materials, particularly cement. The structure 11 is provided with a plurality of spouts 12, adapted to be connected one at a time with a cement supplying station, generally indicated by the numeral 13. To this end, the structure 11 is rocked step by step around a vertical shaft 10 to bring the spouts 12 sequentially on the station 13. Each spout 12 (Fig. 3) terminates with an opening directed downwards for the exit of the cement.

The cement is automatically packaged from the spout 12 into bags 14, indicated by broken lines in Fig. 3. The bags 14 are provided on two end edges with two flanges 16 and 17 as bellows, normally folded on one face of the bag 14. The lower flange 16 is closed, while the upper flange 17 is provided with a valve opening 18, which must be opened to place the bag 14 on the spout 12. Since the cement is sent to the spout 12 under pressure produced by compressed air, when the bag 14 is removed from the spout 12, the pressure of the cement automatically closes the valve 18.

The spouts 12 are mounted on the structure 11 so as to be rocked downwards after having filled a bag 14, to allow the filled bag 14 to be automatically taken off from the spout 12. The structure 11 is surrounded by a shell 19 (Fig. 1) having an aperture 20 on the station 13 to allow the bags 14 to be placed on the spout 12.

The bags 14 are fed to the powder dispensing machine by a bag feeding machine, generally indicated by the numeral 21, which includes a magazine 22 containing a pile of bags 14, a bag picking and transfering device 23 and a bag introducing device 24 which also provides for opening the valve 18.

The bag feeding machine 21 comprises a stationary frame formed of a pair of parallel flanks 25 connected by a plurality of transverse bars 26 (Fig. 2). The magazine 22 is secured to the flanks 25 by means of a pair of plates 27 and is formed by a metallic parallelepiped frame 28, including a bottom plate 29 supporting the bags 14. The plate 29 is slightly arcuate to take into account the thickness of the folded flanges 16 and is slightly inclined downwardly to the right in Fig. 2. The bags 14 are loaded into the magazine 22 with the flanges 16 and 17 directed downwardly and with the flange 17 having the valve 18 at the left in Fig. 2. The plate 29 is provided with an aperture 31 and a portion 32 bent with respect to the plate 29 to cause the flange 16 of the bottom bag 14 to rock, as indicated in Fig. 2.

The device 23 comprises a pair of chains 33, each one engaging three toothed pulleys 34, 35 and 36. The corresponding pulleys of the two chains are secured to three shafts 37, 38 and 39 (Fig. 3) rotatable on the flanks 25 of the machine. The shaft 39 is connected through a clutch 41 to an electric motor 42 adapted to rotate the chains 33 clockwise in Fig. 2.

Two grippers 43 for picking up the bags 14 are mounted aquidistant on the two chains 33, whereby at each cycle of the chains 33 two bags 14 can be picked up from the magazine 22. Each gripper 43 is fulcrumed on a pivot 47 carried by a member 48 secured to links of the two chains 33. Each gripper 43 is held closed by spring means not shown. It is also provided with a roller 59 adapted to cooperate with the profile of two stationary plates 60 and 62 (Fig. 3) located between the two chains 33 and adapted to rock the gripper 43 on the pivot 47 (Fig. 2) against the urge of another spring not shown. Another roller 68 of each gripper 43 is adapted to cooperate with the profile of two other stationary cam plates 69 and 70 for opening the gripper 43 against the spring urge.

Located in correspondence with the two ends of the aperture 31 are two wedges 74 (Figs. 1 and 2). Each wedge 74 is secured to a piston rod 75 of a fluid-actuated cylinder 76 which is secured to a flange of a C-shaped bar 77 of the magazine 22. The piston rod 75 and a pair of pins 78 also secured to the wedge 74 can slide in corresponding holes of the other flange of the bar 77. The cylinder 76 is adapted to be operated in synchronism with the movement of each gripper 43, in a known manner.

Each gripper 43 is associated with a group of three bars 83 (Fig. 2) each one secured to two corresponding links of the two chains 33. Each gripper 43 is also associated with a wedge 84 secured to two links of the chains 33. The wedge 84 is directed in a direction opposite to the movement of the chains 33. When the wedge 84 and the associated gripper 43 lie in a rectilinear portion of the chains 33, the sharp edge of the wedge 84 is distanced from the end of the associated gripper 43 less than the distance between the flanges 16 and 17 of a bag 14. The gripper 43, the bars 83 and the wedge 84 are so distanced from the chains 33 that when the bag 14 is partly in the horizontal zone of the chain path and partly in the vertical zone, the flange 17 engages the wedge 84 and is rocked thereby with respect to the bag 14.

Three pressure rollers 90 of elastic material, for example rubber, are mounted on vertical slots of the flanks 25 of the machine frame. Each roller 90 is normally held downwards

by springs not shown. Two bent members 92 (Figs. 1 and 3) are fulcrumed on two pivots 94 secured to the flanks 25 adjacent the two pulleys 35 of the two chains 33. Secured to each member 92 is an arm 96 (Fig. 1) normally urged by a spring 97 (Fig. 3) to contact a stationary stop member 98. The arm 96 is adapted to be engaged by a chain portion 99 (Fig. 1) laterally connected to each chain 33. A stationary bar 100 parallel to the pivots 94 is located in correspondence with the members 92 to form a guide for the flange 17 of the bags 14.

Upon switching on the motor 42 (Fig. 3), this latter rotates the pulleys 36, thus continuously moving the two chains 33 (Fig. 2) clockwise, together with the grippers 43. When the lower gripper 43 arrives at a predetermined position a bag picking up cycle is started. Firstly the two cylinders 76 (Fig. 1) are operated to move the piston rods 75 rightwardly together with the two wedges 74. These latter engage the flange 16 (Fig. 2) of the lower bag 14, which is thus further rocked. Simultaneously, the roller 68 of the gripper 43 engages the cam plate 69, which causes the opening of the gripper 43. When the wedges 74 reach the end of their rightward stroke, the roller 68 leaves the plate 69, whereby the gripper 43 is suddenly closed and engages the flange 16 of the bag 14. Now the cylinders 76 are operated in opposite direction, whereby the wedges 74 are returned leftwardly.

Thereafter, the roller 59 of the gripper 43 engages the cam portion 67 of the plate 62, which rocks the gripper 43 clockwise on the pivot 47, to the horizontal positions occupied by the upper gripper 43 in Fig. 2, thus extracting the flange 16 of the bag 14 from the magazine 22. Now the transport of the extracted bag 14 is effected, while the bars 83 and the wedge 84 prevent the bag 14 from contacting the chains 33. In turn the rollers 90 prevent the bag 14 from fluttering.

Before the gripper 43 reaches the vertical portion of its path, the two lateral chain portions 99 (Fig. 1) engage the arms 96, thus rocking the members 92 to take them out of the path of the bags 14. Thereafter, the roller 59 (Fig. 2) of the gripper 43 engages the cam plate 62, whereby the gripper 43 is rocked to the vertical position and inserts the bag 14 between the bar 100 and the members 92 (Fig. 1). Since the radius of the path of the bag 14 is greater than that of the chains 33 (Fig. 2), the flange 17 of the bag 14 engages the wedge 84, whereby the flange 17 is rocked with respect to the bag 14.

The lateral chain portions 99 (Fig. 1) release the arms 96, whereby the members 92 are brought to a stop position for the flange 17. Thereafter, the roller 59 (Fig. 2) leaves the plate 62, thus causing the gripper 43 to rock counterclockwise on the pivot 47, while the roller 68 engages the cam plate 70, which causes the gripper 43 to open. The flange 17 of bag 14 is now arrested by the bar 100 and the members 92. Finally, the roller 68 leaves the cam plate 70, whereby the gripper 43 closes again after having disengaged the flange 16. While this gripper 43 leaves the plate 70, the other gripper 43 is ready to extract the next following bag 14, whereby the transport cycles are effected sequentially.

According to a first embodiment of the invention, illustrated in Figs. 1 to 4, the bag introducing device 24 is supported by a plate 104 and a C-shaped bar 105, both secured to one of the flanks 25 of the machine. Secured to the bar 105 are two transverse members 106 (Fig. 3) having a reverse T-shaped section and mounting a shaping tube 107 which is adapted to open the valve 18 of the bag 14. Particularly, the shaping tube 107 is formed of two parts 108 (Fig. 4) mutually symmetrical with respect to a vertical plane. The two parts 108 terminate downwards with two bent edges 109 defining a longitudinal slot 111 for the passage of the body of the bag 14. Secured to each transverse member 106 (Fig. 3) is a bracket 110, on which the two parts 108 can be individually secured at an adjustable mutual distance between certain limits, in order to enable adjustment of the width of the tube 107 to the width of the flange 17 of the bag 14. In fact the width of the flange 17 may vary between certain limits according to the sizes of the bags 14, which follow specific standards and may also vary according to the material to be packaged.

The shaping tube 107 is distanced from the spout 12 to allow a bag 14 placed on the spout 12 to be filled and removed from the spout 12 without displacing the tube 107. Since, as it has been mentioned hereinabove, the spout 12 is rocked downwardly when the bag 14 is full, to allow the removal of the filled bag, the distance between the left end of the tube 107 and the structure 11 must be at least slightly greater than the width of the bag 14. As the spout 12 preferably extends almost to the centre of the bag, it will be appreciated that the shaping tube 107, and the remainder of the bag feeding machine will generally be spaced from the powder dispensing machine by a distance greater than twice the distance by which the spout extends from the dispensing machine. Consequently, the bag has to be propelled from the tube 107 at a speed sufficient to ensure that it is placed on the spout 12.

For moving the flange 17 of the bag 14 through the shaping tube 107, the bag 14 is propelled at high speed by continuously moving means engaging the bag 14 below the slot 111 of the tube 107. Said moving means include a driving belt 112 (Fig. 1) wound on a driving pulley 113 and a set of idle pulleys 114 and 115. The pulley 113 is

secured to a shaft 116 of an electric motor 117 (Fig. 2) secured to the plate 104. The pulleys 114 are rotatable on corresponding shafts 118 secured to the plate 104, whereas the pulleys 115 are rotatable on corresponding shafts 119 (Fig. 4) each one secured to a fork 120. This latter is provided with a prismatic projection 121, which is slidable into a horizontal guide 122 provided on a support member 123 secured to the plate 104. A compression spring 124 urges the fork 120 rightwardly in Fig. 4, to tension the belt 112 and to urge it toward the bag 14.

The path of the belt 112 (Fig. 1) includes a rectilinear portion comprised between one of the pulleys 114 and one of the pulleys 115 and having a length substantially equal to the length of the shaping tube 107. This rectilinear portion is vertically aligned with the slot 111 (Fig. 4) of the tube 107 and cooperates with a driven belt 126 (Fig. 1) wound on a set of idle pulleys 128 rotatable on vertical shafts 127. These latter are mounted on a plate 129 having a pair of lugs 125 secured to the transverse members 106 by means of a pair of vertical bars 130. The two end pulleys 128 (Fig. 1) are mounted on the plate 129 by means of forks similar to the forks 120 (Fig. 4) above described for the pulleys 115, in order to tension the belt 126.

The shaping tube 107 is provided with a cross section which varies along its length. The tube has an axis which is defined by the series of barycentres of the various cross sections. This axis is indicated by dots and dashes in Fig. 3 and by the numeral reference 131. Particularly, the shaping tube 107 includes a portion 132 substantially in the form of a funnel and having an oblong cross section with the larger dimension in the horizontal direction. This portion starts with a section 133 (Fig. 4) of substantially rectangular shape, with rounded corners and with a width much greater than the width of the two wings of the flange 17 of the bag 14 and tapers away from the inlet end of the tube 107. The portion 132 terminates with a section 134 having the upper edge slightly rounded and a width slightly narrower than the width of the two wings of the flange 17. Therefore under the urge of the belts 112 and 126 on the bag 14, the flange reaching the section 134 is compelled to be slightly curved, whereby the two wings of the flange 17 are bent downwards.

The portion 132 of the shaping tube 107 is followed by a portion 136 (Fig. 3) having a constant cross-section and followed in turn by another portion 137 having a cross-section which varies. The portion 137 starts with the section 134 (Fig. 4) and terminates with a section 138 having a larger dimension in the vertical direction. However, the distance around the perimeter of the cross section of the portion 137 remains substantially constant from the section 134 to the section 138.

A pair of supporting elements within the tube 107 extend over its entire length, the supporting elements are formed by the bar 100 and by a second bar 139 (Fig. 1) which is parallel to the bar 100 and aligned to the corner of the members 92 in the position stopping the flange 17. Secured to the member 92, adjacent the tube 107, is a pin 140, which is provided to reduce to a minimum the separation of the members 92 from the bar 139, and so to guide the flange 17 of a bag into the shaping tube 107.

The zone of the tube 107 adjacent the slot 111, and particularly, the rectilinear corner 141 formed by each bend edge 109 on the corresponding part 108 of the tube 107, is located at a constant distance from the corresponding bar 100, and 139 respectively. Therefore, the axis 131 (Fig. 3) of the portion 137 of the tube 107 is slightly inclined upwardly with respect to the bars 100 and 139 and with respect to the axis of the portions 132 and 136. When the flange 17 of the bag 14 is propelled along the portion 137 of the tube 107, the wings of the flange 17 which were bent downwardly in the portions 136 (Fig. 4) are raised. Since the bag 14 is gripped between the belts 112 and 126, the wings are maintained in contact with the bars 100 and 139, whereby the valve 18 is automatically opened with a high reliability (as indicated in Fig. 4 by the dot and dash lines adjacent the section 138).

The bag introducing device 24 (Fig. 1) comprises also a continuously rotating roller 143, which is adapted to cooperate with the bar 100 for advancing the bag 14, when arrested by the bar 100 and the member 92, towards the shaping tube 107. The roller 143 is secured to a shaft 144 of an electric motor 146. This latter is secured to one end of an oscillating arm 147 (Fig. 3) pivotally mounted on a stationary shaft 148 and connected by means of a rod 149 to a piston rod 151 of a double acting fluid-actuated cylinder 152 which is secured to one flank 25 of the machine frame. The cylinder 152 can be actuated to move the piston rod 151 either in one direction for rocking the arm 147 counterclockwise, or in the opposite direction for restoring the arm 147 clockwise in Fig. 3.

After a predetermined delay with respect to the operation of the cylinders 76 (Fig. 1), the cylinder 152 is actuated to move the piston rod 151 (Fig. 3) rightwardly. The arm 147 is thus rocked counterclockwise and brings the rotating roller 143 into engagement with the flange 17 of the bag 14 which is in contact with the bar 100. The roller 143, under the action of the motor 146 (Fig. 1) moves the bag 14, guided by the bars 100 and 139, towards the shaping tube 107 and the belts 112 and 126.

The belt 112 moved by the motor 117 (Fig. 3) and cooperating with the belt 126 propels the bag 14 at high speed leftwardly in Fig. 3, causing the flange 17 to pass along the shaping tube 107. The valve 18 is opened by the shaping tube and then the bag 14 is propelled by the belts 112 and 126 out of the tube 107, with the result that the valve 18 is placed on the spout 12 of the powder dispensing machine as indicated in Fig. 3. Thereafter, the cylinder 152 is actuated to restore the arm 147 to the position shown in Fig. 3, whereby the bag introducing device 24 completes its cycle. The belt 112 is run at a speed sufficient to ensure that the valve opening 18 does not drop out of alignment with the spout 12 as the bag emerges from the bag feeding machine.

According to another embodiment of the invention, the bag introducing device 24 includes a stationary frame 160 (Fig. 5) and a pair of bars 161 located at the entrance of the shaping tube 107 for guiding and supporting the bag 14. The shaping tube 107 is mounted on a pair of L-shaped supports 164 and 166 secured to the frame 160.

The distance between the two symmetric parts 108 (Fig. 9) of the tube 107 can be easily adjusted according to the width of the flange 17 of a bag 14. Each part 108, near its two ends, is provided with two shoulders 167 and 168 (Fig. 5) each one provided with a vertical threaded hole 169 (Fig 7). A screw 170 is screwed in the hole 169 of each shoulder 167 and 168 and passes through a corresponding oblong slot 171 (Fig. 6) of the corresponding support 164, 166.

Each screw 170, has a manipulative lever 172 rotatable with a washer 173 (Figs. 7 and 9). A gasket 174 is located between each support 164, 166 and each washer 173. Another gasket 176 is located between the support 164, 166 and the relevant shoulder 167, 168. Upon rocking each lever 172 in one direction, the relevant shoulder 167, 168 is immediately and rigidly locked on the corresponding support 164, 166. By rocking the lever 172 in the opposite direction, the shoulder 167, 168 can move relative to the support 164, 166.

Each shoulder of each pair 167, 168 (Figs. 8 and 9) is also provided with a horizontal threaded hole 177, and 178 respectively. The two holes of each pair 177 and 178 are threaded in opposite directions and are engaged by a double screw 179 having two portions threaded also in opposite directions. Each screw 179 is rotatable in a cylindrical hole of a rib 181 of the corresponding support 164, 166 and is secured to a corresponding manipulative knob 182.

Assuming that the two parts 108 are correctly secured at a predetermined distance, to alter the distance between the two parts 108 (Fig. 6) of the tube 107, the four levers 172 are rocked to unlock them from the supports 164 and 166. Then the two knobs 182 (Fig. 8 and 9) are rotated in the same direction and simultaneously. The two screws 179 thus cause the pair of shoulders 167 and 168 to move in opposite directions either for increasing or for decreasing their separation, whereby the distance between the two parts 108 is altered, while the parts remain always equally spaced from their plane of symmetry. Therefore, this plane of symmetry, and consequently also the axis 131 (Fig. 5) of the tube 107, remains always centred with respect to the spout 12 (Fig. 1). Of course, if the two parts 108 are initially incorrectly secured on the supports 164 and 166 (Fig. 6), for instance, if they are converging or diverging, the two knobs 182 must be rotated individually. In any case, after having adjusted the distance between the parts 108, they are again locked on the supports 164, 166 by accordingly rocking the levers 172.

Secured to the machine frame 160 is a bracket 184 (Fig. 6) including an upper plate 187 adjustably mounted on a pair of supports 188 and 189 of the machine frame 160, and a lower plate 190 (Fig. 9) secured to the upper plate 187 by means of a set of transverse plates 191. The bracket 184 carries continuously moving means, generally indicated by 186 (Fig. 6), for propelling the bag 14 towards the spout 12. The moving means 186 comprise a set of pivots 192 (Fig. 6) secured to the plates 187 and 190. Each pivot 192 rotatably mounts, by means of a rolling bearing, a corresponding toothed pulley 193 (Fig. 9) cooperating with a driving toothed belt 194. The plate 187 is provided with a notch 196 (Figs. 8 and 9) for adjustably mounting a plate 197, by means of a pair of screws 199 screwed on a pair of brackets 198. The external screw 199 engages also a ring 200 integral with another screw engaging a transverse bracket 210, whereby by screwing on this latter screw the corresponding bolt, the position of the plate 197 can be adjusted.

Secured to the plate 197 is the stator of an electric motor 201 having a shaft 202 secured to the hub of a toothed driving pulley 203 engaged by the belt 194. By adjusting the position of the plate 197 on the notch 196, the tension of the driving belt 194 can be accordingly adjusted. The adjustable mounting of the plate 187 on the supports 188 and 189, allows the adjusting of the position of the belt 194 with respect to the symmetry plane of the shaping tube 107, according to the thickness of the bag 14.

The machine is also provided with a second bracket 184′ (Fig. 6), substantially symmetric to the bracket 184, whereby the corresponding parts of the bracket 184′ are indicated with the primed numeral references of the parts of bracket 184. Therefore, the bracket 184′

carries a second set of toothed pulleys 193', a second electric motor 201', the shaft 202' of which (Fig. 7) is secured to a driving pulley 203', and a belt 194' engaging the pulleys 193' and 203', whereby the path of the belt 194' is symmetric to that of the belt 194. It is thus evident that both belts 194 and 194' drive the bag 14 into the shaping tube 107.

Unlike the bracket 184, the plate 187' of the bracket 184' is provided with a bushing 204 (Fig. 9) rotatably mounted on a pivot 206 secured to a support 207 (Fig. 6) integral with the machine frame 160. Particularly, the pivot 206 comprises a threaded portion screwed into a hole of the support 207 and a head 208 (Fig. 9) for retaining the plate 187'. Furthermore, the plate 187' is provided with at least one slot 209 (Fig. 8) adapted to slide on a corresponding pin 211 provided with a head, which is directed downwards and is secured on a shoulder 212 (Fig. 9) provided on the frame 160.

Adjustably secured to the plate 187' is a plate 214 integral with an L-shaped member 215 (Fig. 8). The member 215 is provided with a hole 216 adapted to engage in indexing pin 217 (Fig. 9) secured to another shoulder 218 of the frame 160. The member 215 carries a pair of stop screws 219 located one above and the other below the hole 216. The screws 219 are adapted to stop against the shoulder 218. The screws 219 allow the adjustment of the position of the belt 194' with respect to the plane of symmetry of the shaping tube 107.

A support 221 (Fig. 8) secured to the frame 160 mounts a toggle locking device known per se, which comprises a manually operable lever 222, a locking lever 223 and a rod 224 connecting the levers 222 and 223. In the position of Fig. 8, the rod 224 is behind the dead point of the lever system and, through a lug 225, holds the lever 223 locked against the member 215, whereby it is impossible to unlock the bracket 184' without manually operating the lever 222.

Secured to each of the two plates 187 and 187' are two blocks 226, to which two stems 228 are secured. The stems 228 extend through two corresponding large holes 229 (Fig. 9) provided on the corresponding part 108 of the tube 107. The two stems 228 are also secured to a substantially horizontal corresponding bar 231 for supporting the flange 17 of the bag 14. The bars 231 each include an arcuate portion 232 (Fig. 8) and are adapted to facilitate the opening of the valve 18, in a manner similar to that of the bars 100 and 139 of Figs. 1—4.

If it is necessary to enter the space between the belts 194, 194' (Fig. 8) for example for replacing one of the belts, the lever 222 is manually rocked clockwise in Fig. 8, thus removing the lever 223 from the member 215. Thereafter the bracket 184' is manually rocked around the pivot 206 (Fig. 6) between the limits allowed by the slot 209 (Fig. 8). Even though the part 108 of the tube 107 corresponding to the bracket 184' remains stationary, the holes 229 (Fig. 9) are enough large to allow the stems 228 to move together with the bracket 184'.

The operator can now enter the space between the pulleys 193, 203 and 193', 203' and for example remove the belt 194 or 194' downwardly. After having replaced the belt, the bracket 184' is returned to a position in which the hole 216 is engaged by the indexing pin 217, and is locked in this position by returning the lever 222 to the position of Fig. 8. Obviously, the displacement of the bracket 184' may be used for other operations of maintenance or for remedying incorrect working for example for removing a bag 14 accidentally entangled in the tube 107.

It should be evident that many modifications, improvements and additions of parts may be made to the described bag feeding machine, without departing from the scope of the invention. For example, the described bag feeding machine 21 may be used for a packaging apparatus having one or more spouts in fixed positions. If only one spout 12 is provided, the feeding machine 21 will be located in a fixed position, with the shaping tube 107 aligned with the position of the spout 12. Alternatively, if the packaging apparatus is provided with more than one spout 12, the feeding machine 21 may be mounted on a carriage, which can be moved according to a predetermined program or cycle to bring sequentially the shaping tube 107 in front of the various spouts.

WHAT WE CLAIM IS:—

1. A bag feeding machine for use with a bag which is substantially closed at the top and has folds which form two wings along the top edge, the bag having an opening which can be exposed by pushing the two wings together, the machine comprising means for taking bags one at a time from a magazine and supplying them to a shaping tube having a cross-section which varies along its length, whereby on moving a bag along the tube with the top edge inside the tube and the body of the bag passing along a longitudinal slot in the bottom of the tube, the wings are supported away from the faces of the bag and are pressed together to expose the opening, wherein there are provided moving means for moving a bag along the shaping tube, comprising a pair of surfaces which can engage opposite faces of the body of a bag, the surfaces being movable around closed paths and at least one being driven by a motor.

2. A machine according to Claim 1, wherein the end of the said moving means at which the bags leave the moving means is

in the region of the end of the shaping tube at which the bags leave the tube.

3. A machine according to Claim 1 or 2, wherein at least one of the said surfaces is provided on a belt driven by the said motor around a closed path which includes a substantially straight portion below the shaping tube and of substantially the same length as the tube.

4. A machine according to any of Claims 1 to 3, wherein the said surfaces are provided on respective belts.

5. A machine according to claim 4, wherein the belts are driven by respective motors around paths which are substantially symmetrical with respect to a vertical plane through the centre of the slot in the shaping tube.

6. A machine according to claim 5, wherein at least one of the motors is movably mounted to enable the associated belt to be tensioned.

7. A machine according to any of claims 4 to 6, wherein there are provided means to urge the two belts together.

8. A machine according to any of claims 4 to 7, wherein one of the belts is carried by a plate which is mounted on the frame of the machine so as to be movable between a first position in which the two belts can engage opposite faces of a bag and a second position in which the two belts are separated, there being provided means to lock the plate in the first position.

9. A machine according to claim 8, wherein the plate is mounted on the machine frame by means of a pivot located in the region of a first end of the shaping tube.

10. A machine according to claim 9, wherein the belt which is carried by the plate is driven by a motor mounted in the region of the second end of the shaping tube.

11. A machine according to any preceding claim, wherein there is provided within the shaping tube a pair of supporting elements for supporting and guiding the wings of a bag as it passes along at least part of the tube.

12. A machine according to Claim 11, wherein the said pair of supporting elements is formed by a pair of bars mounted inside the shaping tube above the longitudinal slot, a bag being received between the bars as it moves along the tube, the bars being arranged to engage respective wings of the bag and support the wings away from the faces of the bag.

13. A machine according to any preceding claim, wherein the shaping tube comprises a first region defining at the inlet end of the tube a passage which is wider than the separation of the edges of the two wings of a bag when the wings are supported away from the faces of the bag, the said passage defined by the first region tapering away from the said inlet end to a width which is less than the said separation, whereby the wings of a bag are curved downwardly as the bag passes along the first region, and further comprises a second region arranged with its axis inclined upwardly relative to the axis of the first region, whereby the wings of a bag are raised to open the valve as the bag is passed along the second region.

14. A machine according to any of claims 1 to 12 wherein the shaping tube comprises at least two portions arranged in line, a first portion adjacent, and tapering from, the end of the tube at which the bags enter the tube, the first portion having a substantially oblong cross-section with a larger dimension in a substantially horizontal direction, and a second portion the cross-section of which varies along its length and has a larger dimension in a substantially vertical direction at the end of the second portion nearest the end of the shaping tube at which the bags leave the tube.

15. A machine according to claims 13 or 14, wherein there is provided within the shaping tube a pair of supporting elements for supporting and guiding the wings of a bag as it passes along at least part of the tube, and the said second region or the said second portion adjacent the slot in the shaping tube is of substantially constant distance from the said supporting element.

16. A machine according to any of Claims 13 to 15, wherein the perimeter of the said second region or the said second portion is substantially constant along its length.

17. A machine according to any preceding Claim, wherein the said shaping tube comprises two parts arranged symmetrically on either side of the vertical plane through the centre of the said slot, at least one of the parts being movable towards and away from the other to enable adjustment of the cross-section of the tube for use with bags having wings of different sizes.

18. A machine according to Claim 17, wherein the two parts are mounted on a machine frame by means of at least one double screw having portions threaded in opposite directions, each threaded portion engaging a correspondingly threaded hole provided in one of the parts.

19. Apparatus for filling bags with powder material, comprising a bag feeding machine according to any preceding Claim and a powder dispensing machine having at least one spout for dispensing powder, the shaping tube of the bag feeding machine being aligned with the position of the spout.

20. Apparatus according to Claim 19, wherein the bag feeding machine is spaced from the powder dispensing machine so that it does not interfere with the removal of a filled bag from the spout.

21. Apparatus according to Claim 20, wherein the bag feeding machine is spaced from the powder dispensing machine by a

distance greater than twice the distance by which the spout extends from the dispensing machine.

22. Apparatus according to Claims 20 or 21, wherein the shaping tube and the moving means of the bag feeding machine are spaced from the powder dispensing machine by a distance greater than the width of a bag, the moving means being operated at a speed sufficient to ensure that the opening of a bag does not drop out of alignment with the spout of the powder dispensing machine as the bag emerges from the bag feeding machine.

23. Apparatus according to any of Claims 19 to 22, wherein the powder dispensing machine comprises a plurality of spouts mounted on a structure which is rotatable to bring the spouts one at a time into alignment with the shaping tube.

24. Apparatus according to any of Claims 19 to 23, wherein the powder dispensing machine comprises at least one spout which is mounted so as to be pivotable from a substantially horizontal position in which a bag can be arranged with its opening around the spout, downwardly to a position in which the bag can be slid downwardly off the spout.

25. Method for placing a bag on a spout of a powder dispensing apparatus, the bag being substantially closed at the top and having folds which form two wings along the top edge, and having an opening which can be exposed by pushing the two wings together, the method including the step of moving a bag along a shaping tube having a cross-section which varies along its length, the top edge of the bag passing inside the tube and the body of the bag passing along a longitudinal slot in the bottom of the tube, the means for moving the bag comprising a pair of surfaces which can engage opposite faces of a bag, the surfaces being movable around closed paths and at least one being driven by a motor, whereby the wings are supported away from the faces of the bag and are pressed together to expose the opening, wherein the shaping tube is aligned with the position of the spout, and the shaping tube and the means for moving a bag along the tube are spaced from the powder dispensing machine so that they do not interfere with the removal of a filled bag from the spout.

26. A bag feeding machine substantially as herein described with reference to the accompanying drawings.

27. Apparatus for filling bags with powder material, comprising a bag feeding machine and a powder dispensing machine, the apparatus being substantially as herein described with reference to the accompanying drawings.

28. A method for placing a bag on a spout of a powder dispensing apparatus, the method being substantially as herein described with reference to the accompanying drawings.

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1567082 COMPLETE SPECIFICATION

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Sheet 1

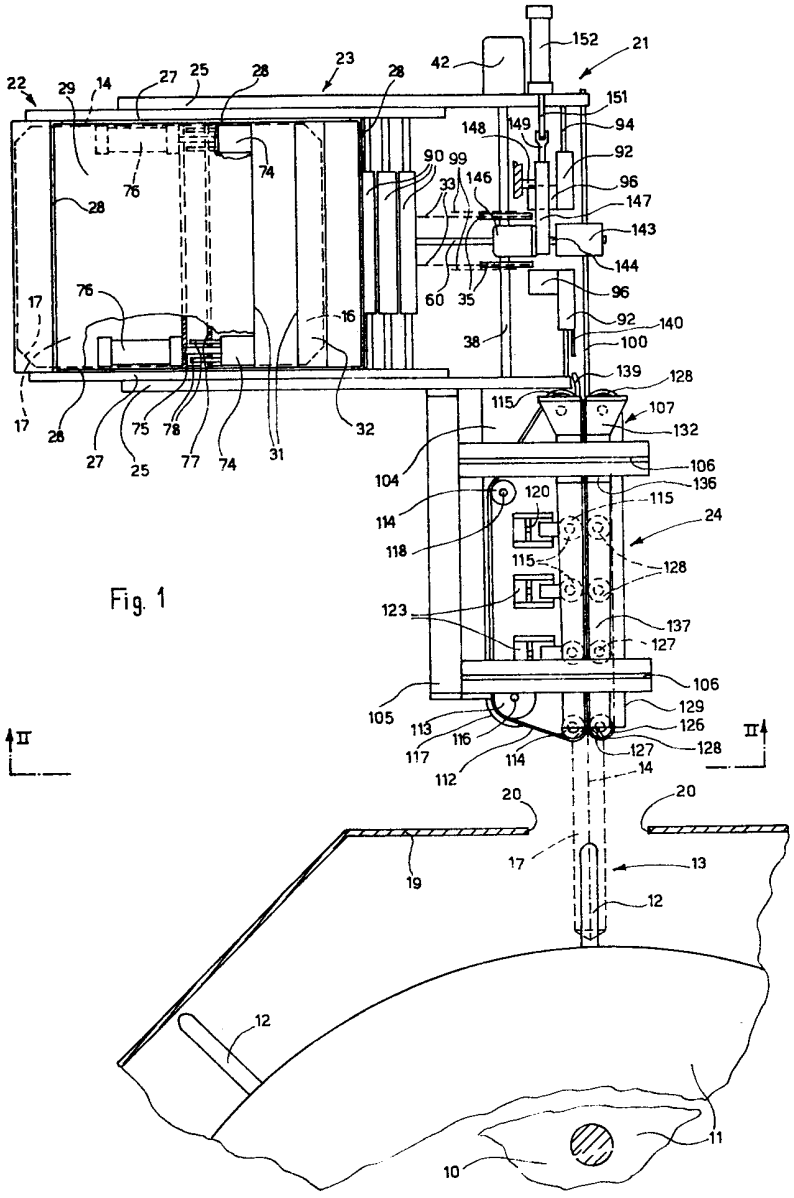

Fig. 1

1567082 COMPLETE SPECIFICATION

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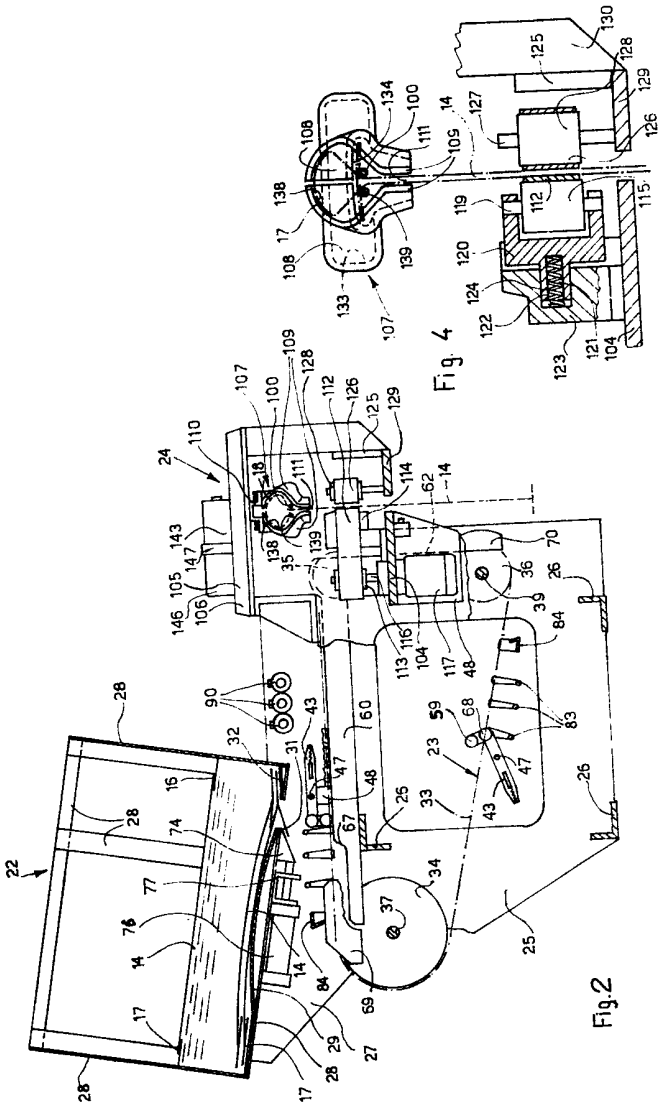
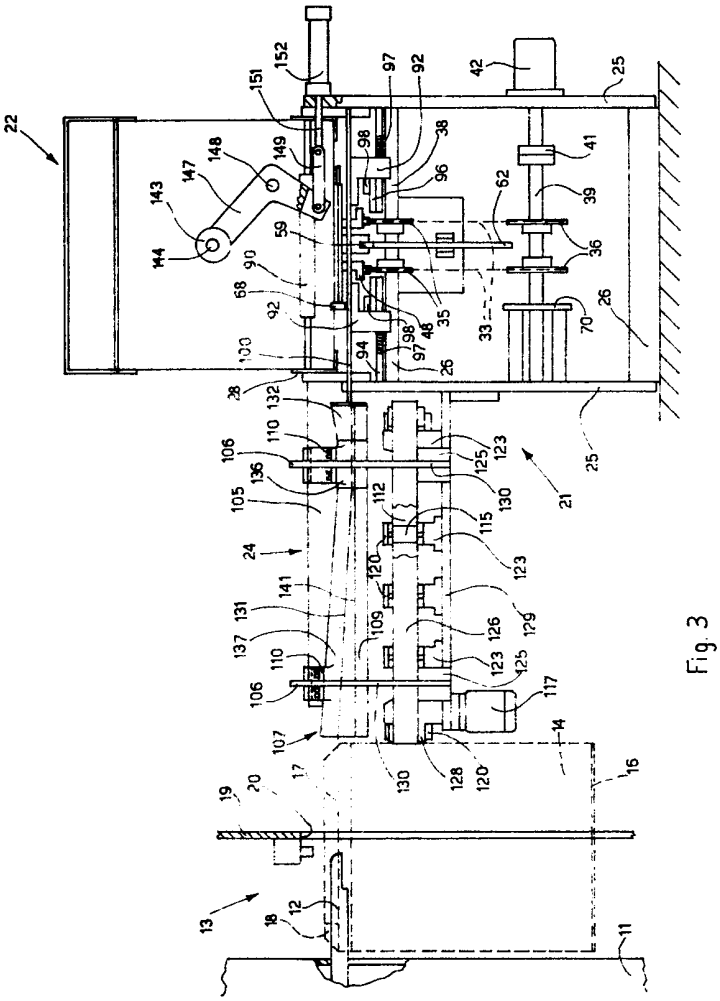


Fig. 2

Fig. 4



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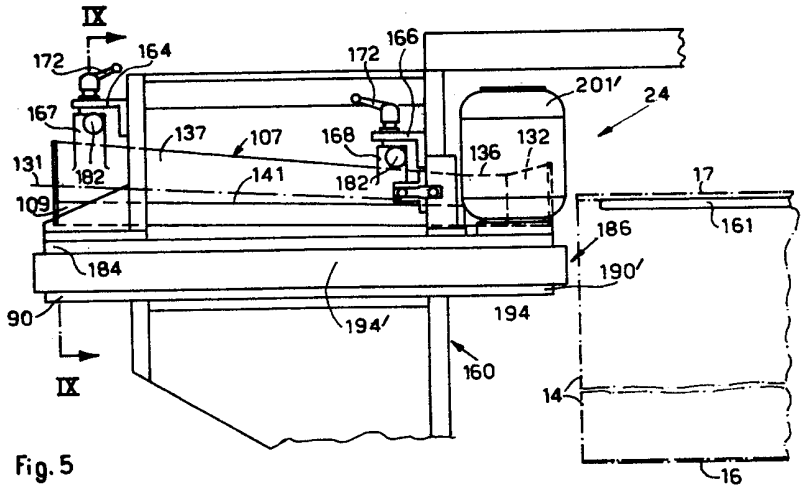
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Fig. 5

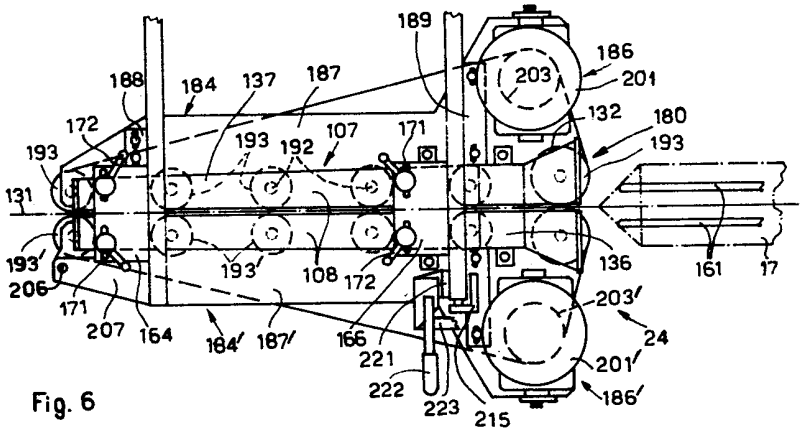
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Fig. 6

1567082 COMPLETE SPECIFICATION

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Sheet 5

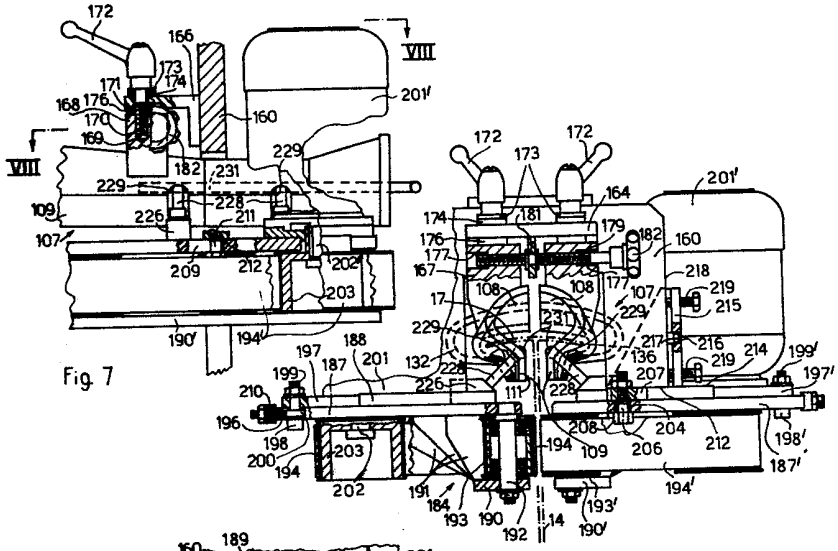

Fig. 7

Fig. 9

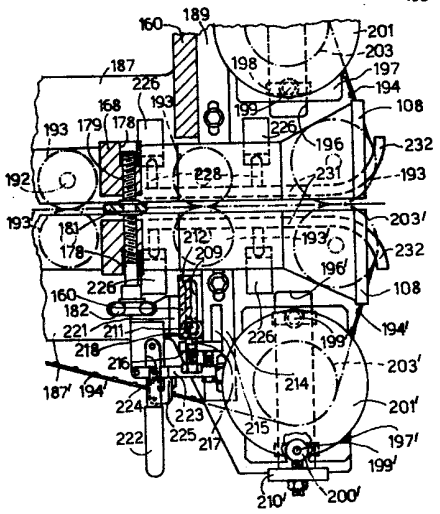

Fig. 8