

Aug. 22, 1961

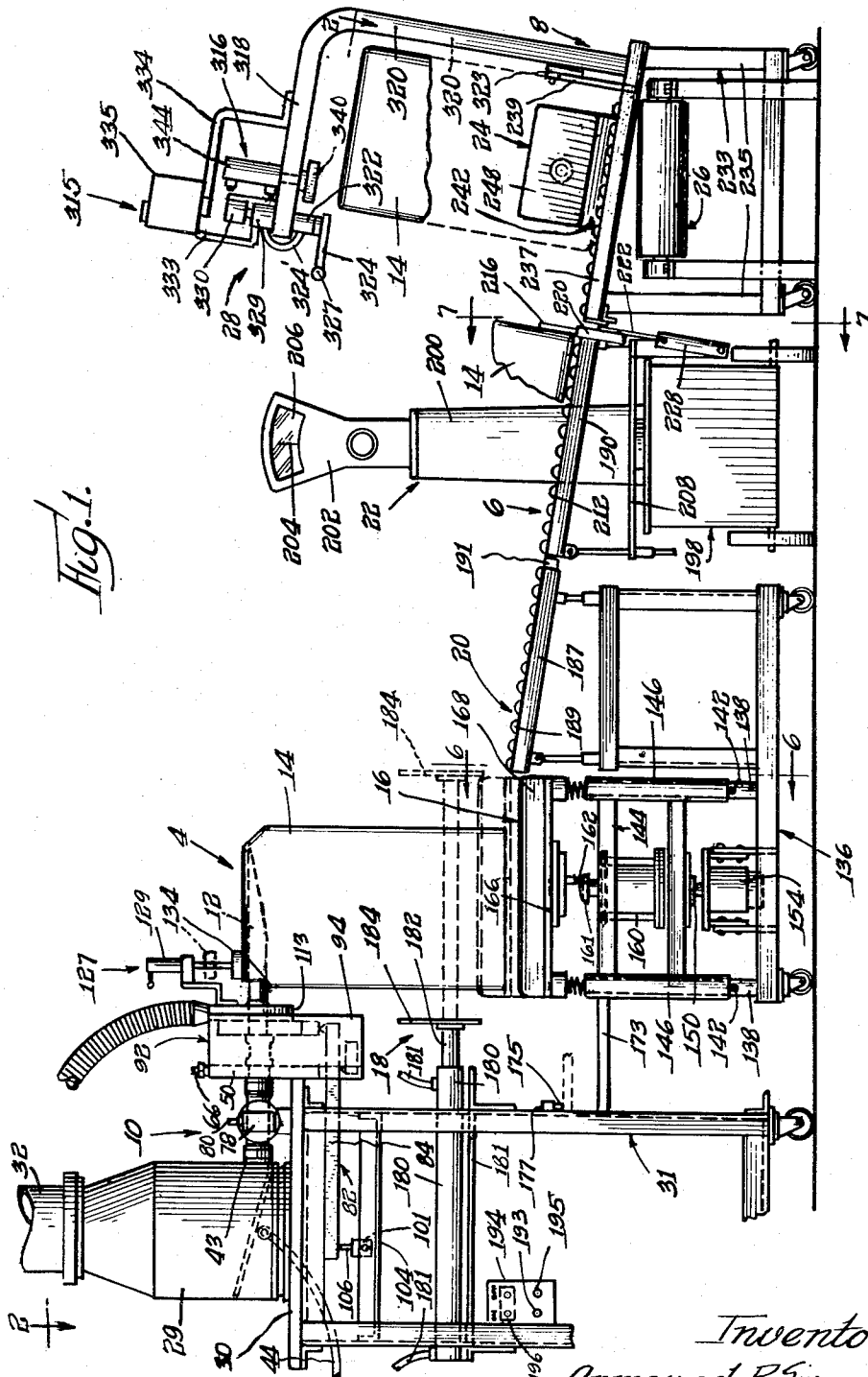
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2,996,858

BAG-FILLING AND HANDLING MACHINE

Original Filed Sept. 10, 1957

6 Sheets-Sheet 1



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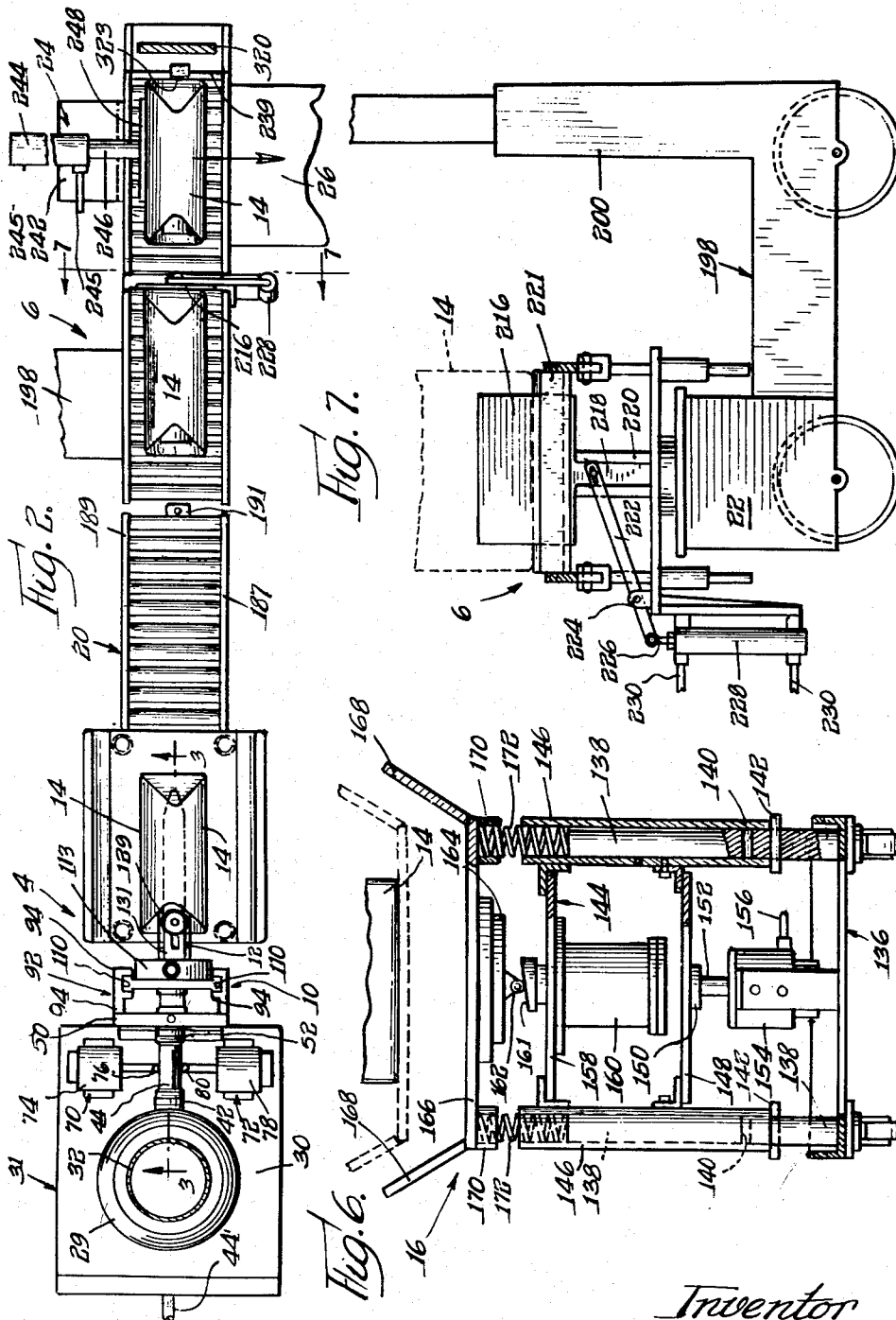
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BAG-FILLING AND HANDLING MACHINE

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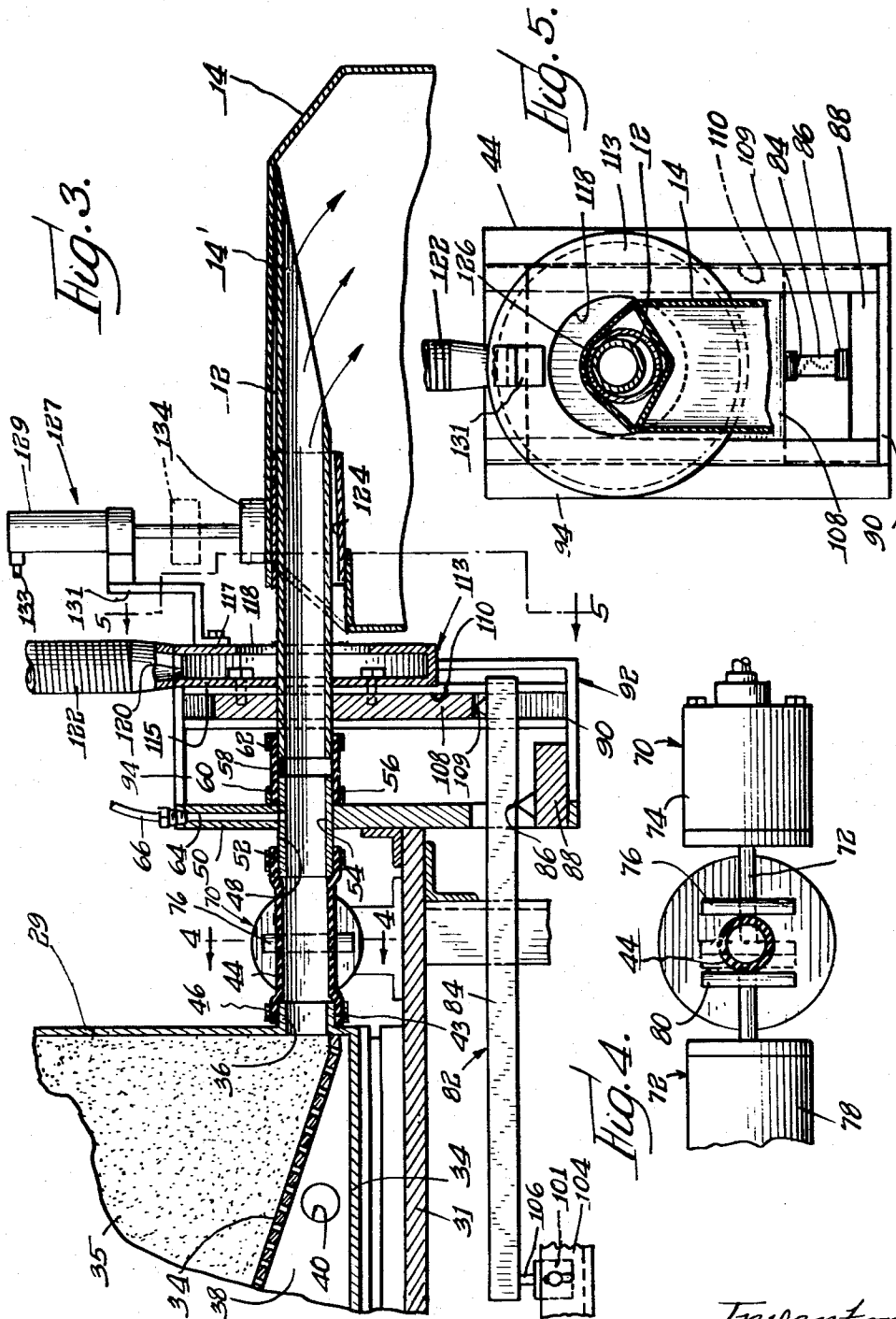
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BAG-FILLING AND HANDLING MACHINE

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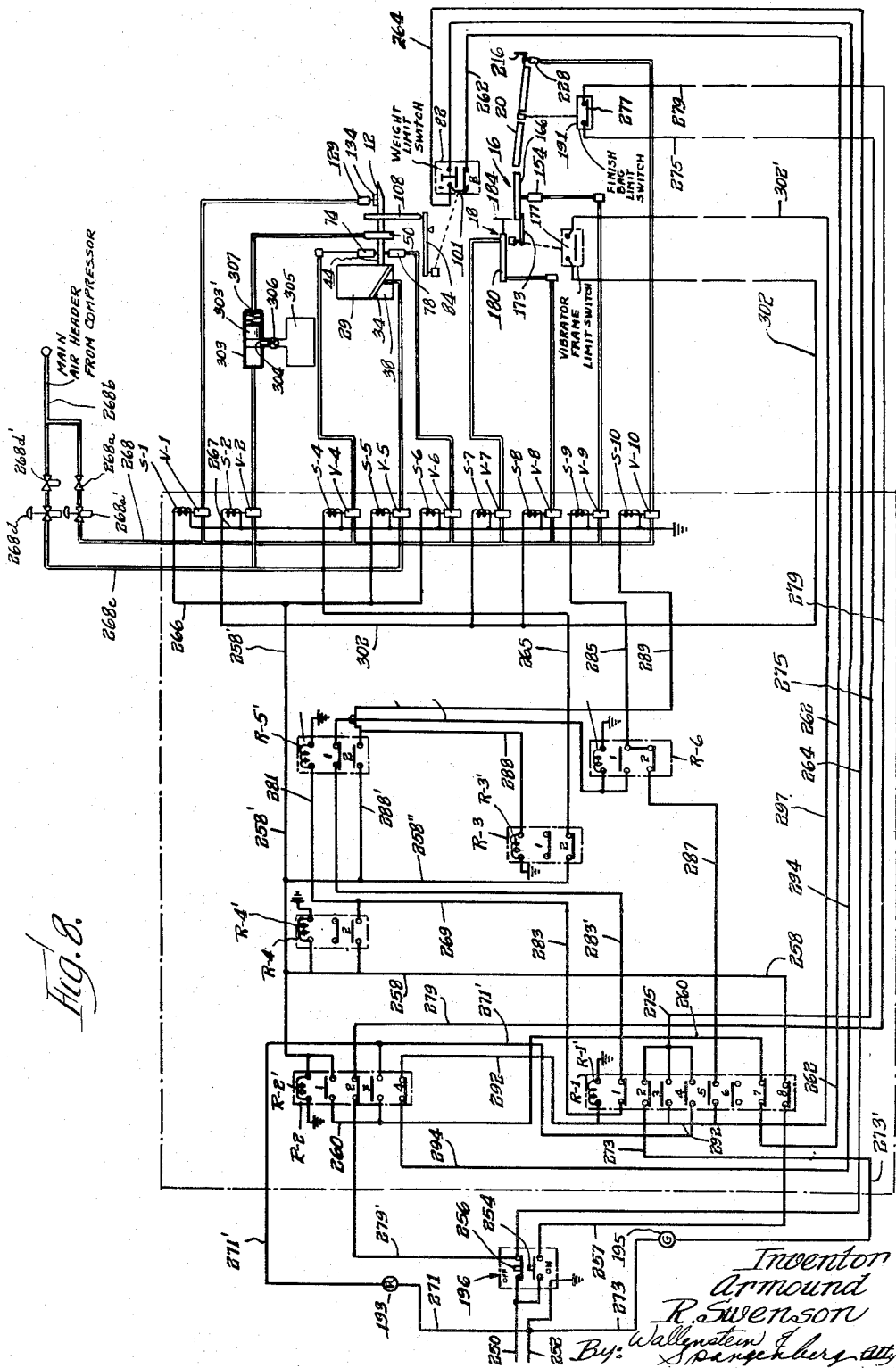
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BAG-FILLING AND HANDLING MACHINE

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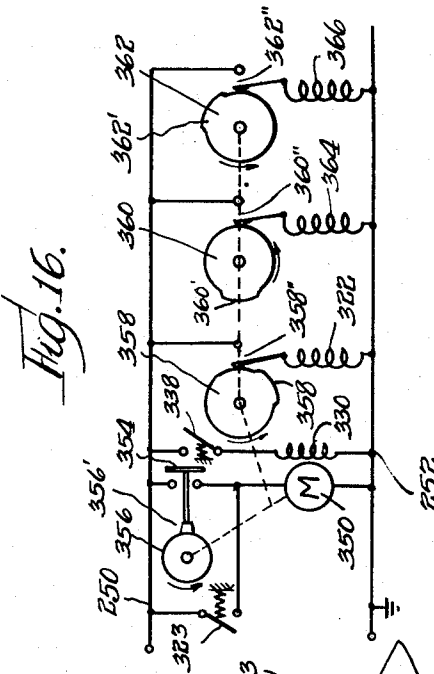
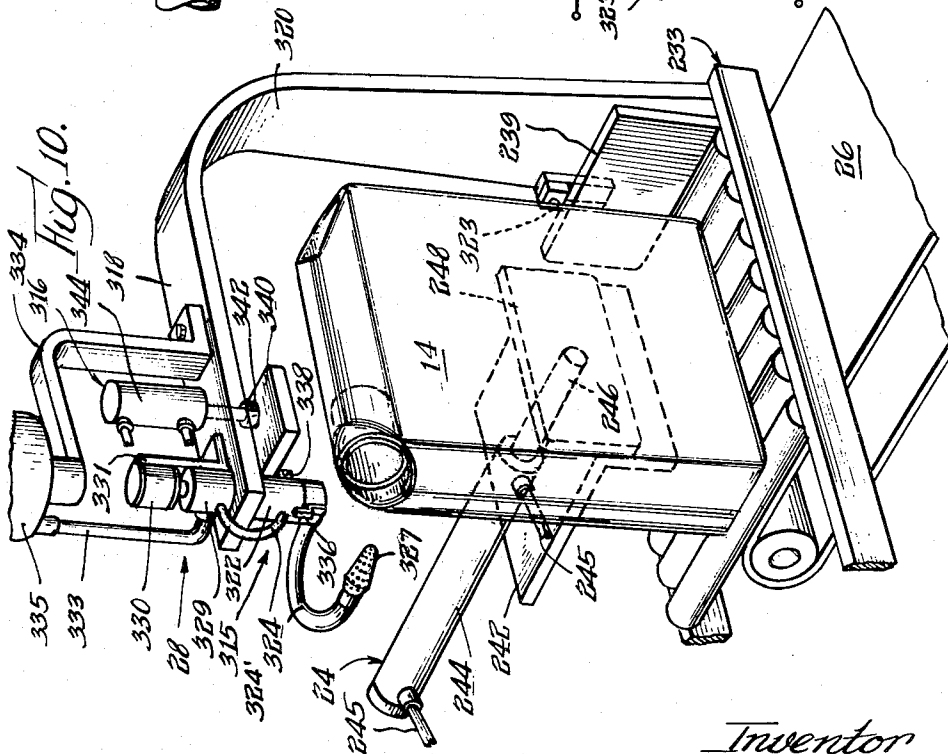
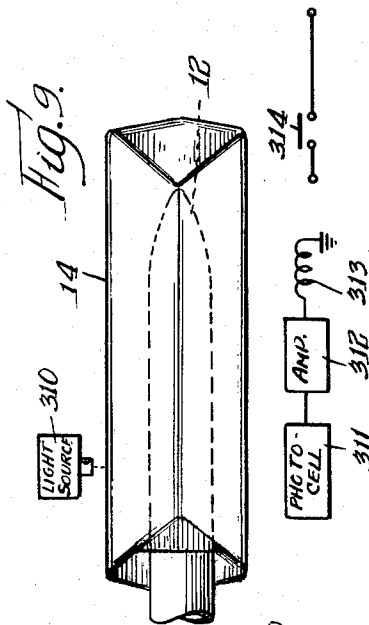
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BAG-FILLING AND HANDLING MACHINE

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Fig. 11.

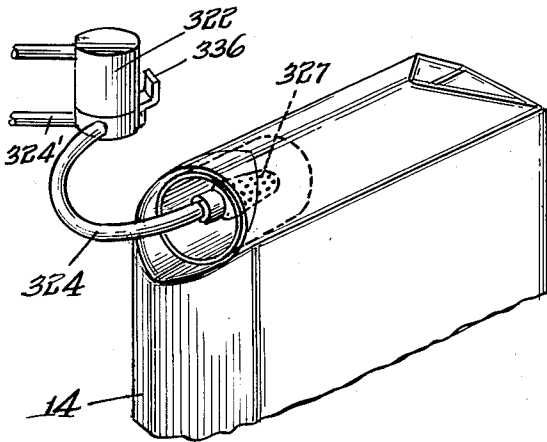


Fig. 14.

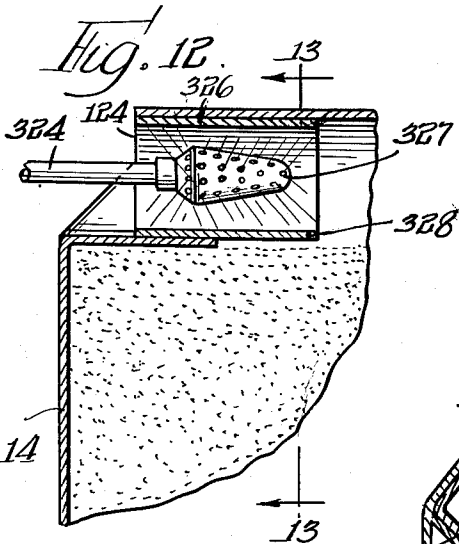
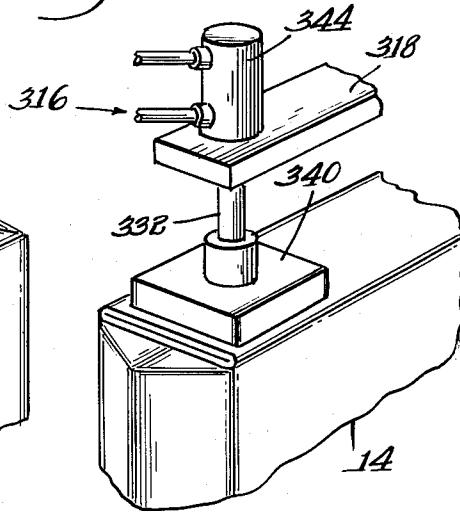


Fig. 15

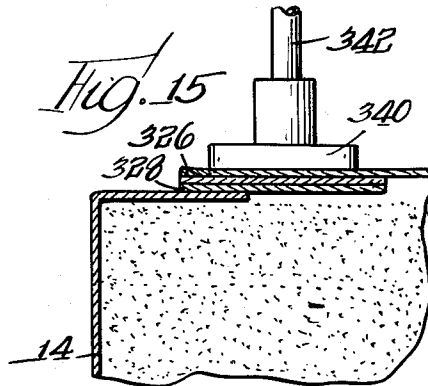
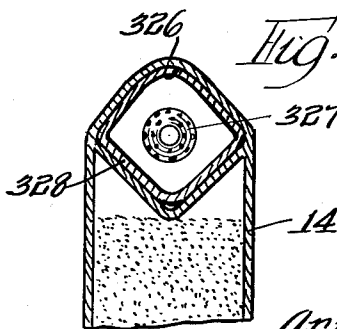


Fig. 13.



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BAG-FILLING AND HANDLING MACHINE

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Original application Sept. 10, 1957, Ser. No. 683,127. Divided and this application May 8, 1959, Ser. No. 812,074

6 Claims. (Cl. 53—76)

This invention relates to bag handling apparatus, and more particularly to a machine used for filling bags with pulverulent material, automatically conveying the same from a bag-filling station to a discharge station and sealing the bags after they are filled.

This application is a division of application Serial No. 683,127, filed September 10, 1957.

Bag-filling and handling machines of various sorts have been heretofore devised for automatically filling bags with pulverulent materials, the bag-filling portion of the machine including a weighing means for automatically controlling the quantity of material fed to the bag, and means for thereafter discharging the bag automatically from the machine. However, these machines left must to be desired from the standpoints of the simplicity, accuracy and reliability thereof and the limited functions performable thereby.

In its most preferred form, the machine of the present invention has a bag-filling station, a weight-checking station and a discharge station. The filling station includes a horizontally extending filling tube adapted to extend into a horizontally disposed filling opening in the top of the bag to be filled. A bag-holding or clamping means is provided for holding the bag against the filling tube so that the bag is suspended therefrom. The filling tube is carried by a suitable weighing means, preferably by the end of a balancing beam, which weighing means includes a control switch which is opened or closed when the bag carried by the filling tube reaches a predetermined weight to terminate the bag filling operation. Next, the bag is discharged from the filling tube and conveyed automatically to the weight-checking station.

The bag handling machine is arranged so that a number of operations may be carried on simultaneously. Thus, as a given bag reaches the weight-checking station, a finished bag limit switch is tripped which enables a new filling cycle to begin upon the application of a new bag to the filling tube. As the latter bag is being filled, the operator performs suitable checking operations at the checking station, such as checking the weight of the bag on the weighing scale. Preferably, the platform of the weighing scale is included and a gate or stop shoulder is provided at the bottom thereof which prevents the movement of the bag by force of gravity from the weighing scale platform. A fixed time interval after the initiation of a filling cycle, which interval is sufficient to enable an operator to perform the necessary checking operations but which is less than the time it takes to fill a bag, the above mentioned gate at the bottom of the weighing scale platform is automatically lowered so that the bag thereon is carried by force of gravity to the discharge station. The bag which was previously at the discharge station must be discharged before the last mentioned bag at the checking station is conveyed thereto. Accordingly, bag-discharging means is provided at the discharge station which is timed with the beginning of the filling cycle to discharge the bag thereat before the next bag is conveyed thereto. As will appear, according to the most preferred form of the invention, the discharge station includes bag sealing means for automatically sealing the bags thereat.

Heretofore, particularly in the packaging of carbon black, the bags had a filling opening defined by a tuck-in

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sleeve which is tucked-in by the operator of the machine after the bag is filled. Perfect closure of such bags was not possible with this type of bag so that during the handling of the bags in transit to the ultimate user some of the pulverulent material therein often escaped in the form of fine dust through the limited opening of the bag. In accordance with the present invention, a novel bag sealing means is provided which automatically completely closes a modified type of bag preferably at the discharge station of the machine, which now also becomes a sealing station as well as a discharge station. The bag utilized with this invention does not have a tuckable sleeve, and the horizontally-disposed opening at the top of the bag is defined by opposed or confronting collapsible walls of bag material which are normally in an uncollapsed or at most a semi-collapsed state. A control switch is provided at the sealing or discharge station which is actuated when the bag is initially conveyed thereto. Automatic gluing means is provided at the sealing and discharge station which is rendered operative upon actuation of said control switch for automatically applying a quick-drying glue or cement to the inner surface of at least one of said opposed collapsible walls of the filling opening of the bag involved. This gluing means may comprise a glue-discharge tube supported for movement between a non-operating position and an operating position where the end of the tube extends into the filling opening to discharge glue upon at least one of said opposed collapsible walls. Upon retraction of the glue discharge tube from the bag opening, a sealing ram is momentarily brought against the top of the bag to collapse said opposed confronting walls of the bag filling opening to glue the same together and seal the bag opening. Upon retraction of the sealing means, the above mentioned bag-discharging means is rendered operative to push the bag onto another suitable conveyor or the like.

Other features of the invention relate to various details of construction of the machine and of the control circuits therefor, and these together with other objects and advantages of the invention will become apparent upon making reference to the specification to follow, the claims and the drawings wherein:

FIG. 1 is a side elevation view of the bag-filling and handling machine of the present invention;

FIG. 2 is a plan view of the machine of FIG. 1 as seen along line 2—2 in FIG. 1;

FIG. 3 is an enlarged, fragmentary, vertical, longitudinal sectional view through the machine, taken along section line 3—3 in FIG. 2;

FIG. 4 is a transverse vertical sectional view through the machine, taken along section line 4—4 in FIG. 3;

FIG. 5 is a transverse vertical sectional view of the machine, taken along section line 5—5 in FIG. 3;

FIG. 6 is an end elevational view of the bag jolting and lifting means of the machine, taken along line 6—6 in FIG. 1;

FIG. 7 is an end elevational view of the weight-checking station of the machine, taken along line 7—7 in FIG. 2;

FIG. 8 is a schematic diagram of the electrical and hydraulic control circuits for operating all but the bag sealing and discharging means at the discharge station of the machine;

FIG. 9 is a diagram of a photo-cell control circuit for starting a bag-filling operation;

FIG. 10 is a perspective view of the discharge station showing the gluing and bag-closing apparatus for automatically sealing a bag;

FIG. 11 is a fragmentary perspective view of a bag at the discharge station of the machine showing the gluing apparatus inserted into the filling opening of the bag;

FIG. 12 shows a vertical, longitudinal sectional view

through the bag and the glue-applying apparatus shown in FIG. 11;

FIG. 13 is a vertical, transverse sectional view through the bag and glue-applying apparatus shown in FIG. 11, taken along section line 13—13 therein;

FIG. 14 is a fragmentary perspective view of the bag sealing apparatus with the sealing ram thereof in an extended position where it closes the mouth of the bag;

FIG. 15 is an enlarged fragmentary vertical sectional view of the bag sealing apparatus of FIG. 14; and

FIG. 16 is a simplified schematic diagram of the control circuit for operating the glue-applying and sealing apparatus.

As shown most clearly in FIGS. 1 and 2, the machine has a bag filling station 4, a checking station 6, and a sealing and discharge station 8. At the bag filling station 4, there is apparatus generally indicated by a reference numeral 10 which automatically supplies the proper quantity of material through a horizontally-extending filling tube 12, from which is supported a bag 14 to be filled with the material. Supported below the filling station is bag jolting and lifting apparatus generally indicated by reference numeral 16 and bag-discharging apparatus 18 by means of which a filled bag may be automatically pushed from the filling tube 12 onto an inclined conveyor means 20 which conveys the bag to the checking station 6 which preferably has weighing scale apparatus generally indicated by reference numeral 22. At the checking station, the operator may visually check the actual weight of the contents of the bag delivered thereto. At the proper time the checked bag is released automatically from the checking station to the discharge station 8.

The discharge station 8 includes pusher mechanism 24 for discharging the bag delivered to the discharge station to suitable conveyor means such as a transverse belt type conveyor 26. The discharge station also includes glue-applying and sealing apparatus generally indicated by reference numeral 28. This apparatus applies glue to the opening of the bag, and seals the bag by pressing the glued walls of the opening shut.

Now that the basic components making up the most preferred form of the invention have been briefly outlined, the structural and operating details of these various components will now be described.

Referring now most particularly to FIGS. 1 through 6 showing the apparatus at the bag filling station of the invention, this apparatus includes a hopper 29 supported upon the upper platform 30 of a roller-carrying framework 31. The hopper holds a supply of the pulverulent material 35 (FIG. 3), such as carbon black, to be delivered to the filling tube 12. An inlet pipe or conduit 32 connects with the top of the hopper 29 through which conduit fresh supplies of pulverulent material may be fed when necessary. The hopper has a perforated inclined bottom wall 34 whose bottom end leads to a hopper outlet opening 36. The perforations in the wall 34 are sufficiently small to inhibit passage of the pulverulent material therethrough. An air pressure inlet chamber 38 is located below the perforated bottom hopper wall 34, and this chamber has an inlet opening 40 connected to an inlet air pressure line 44'. A solenoid-operated valve to be described is opened to apply air pressure at the start of a bag filling cycle to the line 44'. This air pressure is applied to the hopper interior through the perforated bottom wall 34 thereof which air pressure forces pulverulent material in the hopper through the outlet opening 36 thereof.

Hopper 29 has a cylindrical extension 43 surrounding the outlet opening 36 at the bottom thereof and a collapsible conduit 44 of rubber or other similar material is applied over the extension 43 and held securely thereupon by a split-ring clamp 46. The other end of the collapsible conduit 44 is stretched over one of the projecting ends of a short connecting tube 48 passing through

and fixed to a vertical backing plate 50 supported upon the platform 30. The conduit 44 is locked upon the end of the tube 48 by a split-ring clamp 52. One end of a short section of collapsible conduit 58 made of rubber or similar material is stretched over and secured around the other projecting end of the connecting tube 48 by a clamp 60 and the other end of this short section of flexible conduit 58 is secured around the rear end of the filling tube 21 by a clamp 62.

The backing plate 50 has a vertical bore 64 formed therein which communicates at its top with an air pressure inlet line 66 connected to a suitable solenoid-operated valve to be described which feeds a source of air pressure just before the bag 14 is removed from the filling tube 12 to the bore 64. The bore 64 at its bottom communicates with the interior 54 of the connecting tube 48. As will appear, the application of air pressure to the tube interior will effect a blow-out operation which cleans the filling tube 12 of any material remaining therein at the end of a bag-filling operation.

The flow of pulverulent material from the hopper 29 to the filling tube 12 is controlled by feed control means supported upon the platform 30 of framework 31 and generally indicated by reference numerals 70 and 72, shown most clearly in FIGS. 2 and 4. Feed control means 70 may comprise an air cylinder 74 having a piston (not shown) horizontally movable therein for extending and retracting a transverse ramrod 76. In the retracted position of the ramrod 76, the ramrod only lightly engages the collapsible conduit 44 in its normal or expanded condition. In its extended position the ramrod 76 has the position shown in dotted lines in FIG. 4 where it almost completely collapses the conduit 44. Sufficient clearance is then left in the flexible conduit 44 to enable only a very slow feeding of material therethrough, which provides a dribble feed. A solenoid valve to be described controls the movement of the piston within the air cylinder 74 in a well known manner.

The other feed control means 72 is mounted on the opposite side of the conduit 44 and has a similar air cylinder 78 with a piston, not shown, movable therein under control of a solenoid valve to be described. The piston in the cylinder 78 is connected to a transverse ramrod 80 which is movable from a retracted position where it makes light contact with the collapsible conduit 44 to an extended position shown in dotted lines in FIG. 4 where it partially collapses the conduit 44. When both ramrods 76 and 80 are in their fully extended positions, the conduit 44 is completely collapsed so that no material can be fed therethrough from the hopper.

The weight of the filling tube 12 and the bag 14 connected thereto during a bag-filling operation is carried by suitable weighing means generally indicated by reference numeral 82 (FIG. 3). This weighing means includes a balancing beam 84 extending through an opening at the bottom of the backing plate 50 and pivoted upon a knife edge 86 carried upon a suitable base 88. The base 88 is supported upon the bottom wall 90 of a support head assembly indicated by reference numeral 92. The backing plate 50 forms a rear wall for the support head assembly. The support head assembly 92 has a pair of horizontally spaced apart side walls 94—94 extending upwardly from the aforementioned bottom wall 90 and the rear end of the filling tube 12 is located between the side walls 94—94.

Supported below the rear end of the balancing beam 84 is a weight limit switch 101 (see FIG. 3). The limit switch 101 may be supported in any suitable manner for vertical adjustment upon the vertical leg of an angle bar 104 fixed to the framework 29. The limit switch 101 has an upstanding outwardly spring-urged switch-actuating pin 106 which is held in a given depressed contact opening position by the balancing beam until a given selected weight is applied to the front end of the balancing beam 84. Then the rear end of the beam is

raised to a position where a set of contacts to be described are closed by the pin 106. It can be seen that the weight at which the limit switch is tripped can be adjusted by varying the vertical position of the limit switch 101 with respect to the balancing beam 84 for a given weight supported thereby.

The forward end of the balancing beam 84 carries the weight of a vertically extending slide plate 108 resting upon a knife edge 109. The plate 108 is guided for vertical movement in guide slots 110—110 respectively formed on the inner surfaces of the side walls 94—94 of the support head assembly 92. The filling tube 12 passes through and is carried by the slide plate 108.

Surrounding the filling tube 12 in front of the slide plate 108 is an annular housing 113 having a rear wall 115 (FIG. 3) bolted or screwed to the slide plate 108 and a front wall 117 having a large circular opening 118 through which the filling tube 12 extends. The annular housing 113 has an opening 120 in the top thereof to which is connected a flexible conduit 122 leading to a source of vacuum which draws dust through the housing opening 118 which may escape from the bag 14 as it is being filled.

The filling tube 12 extends into a horizontally extending opening 124 formed in the top of the bag 14 (FIG. 3). The bag has a horizontally extending opening 124 into the bag interior. The filling tube 12 has a pointed front end, the point being at the top of the filling tube. The bag 14 is suspended from the filling tube. Bag holding means generally indicated by reference numeral 127 is provided for securely holding the bag upon the filling tube. This bag-holding means may include a vertical air cylinder 129 in which is supported for vertical movement a piston, not shown. Cylinder 129 is supported by means of a bracket 131 from the front wall 117 of the annular housing 113. An air line 133 leads to the top of the cylinder 129 and the air pressure therein is controlled by means of a solenoid valve to be described. Connected to the piston in the latter cylinder is a clamping head 134 which in its extended or lowered position engages the top wall 14' of the bag and presses it securely against the top of the filling tube 12. The latter piston may be normally urged upwardly by a spring or the like, not shown, and the application of pressure to the top of the cylinder 129 forces the piston and thus the clamping head down against the top of the bag 14.

Referring now more particularly to FIGS. 1 and 6, the jolting and lifting apparatus generally indicated by the reference numeral 16 is provided to shake the bag 14 during most of the time the bag is being filled. As the bag approaches its full weight, the shaking of the bag 14 is terminated so that the weighing means 82 may accurately weigh the contents of the bag. The jolting and lifting means 16 is mounted upon a separate roller-carrying frame structure generally indicated by reference numeral 136.

Extending upwardly from the corners of the frame structure are vertical cylindrical posts 138. Each of the posts is provided with corresponding vertically-spaced horizontal bores 140 adapted to selectively receive stop pins 142 which project beyond the associated posts 138 near the bottom ends thereof. A frame assembly 144 is supported for vertical movement upon the posts 138 and includes tubular members 146 telescoping over the posts 138. A horizontal metal plate 148 is supported between intermediate portions of the tubular members 146 and the plate rests upon the head 150 of an upwardly and downwardly moveable rod 152 extending from a piston-containing air cylinder 154. An air pressure line 156 extends to the bottom of the cylinder 154 and, by means of solenoid valves to be described, air pressure is applied to line 156 to raise the piston within the cylinder 154 and thereby lift the head 150 of the rod 152. Raising of the head 150 moves the frame assembly 144 and those parts connected thereto upward with it.

Extending between the upper ends of the tubular members 146 is a support platform 158 on the bottom of which is mounted an electric motor 160. The shaft of the motor 160 extends above the platform 158 and carries on the end thereof cam ring 161. The vertical extent of the upper surface of the cam ring 161 varies around the ring and riding upon the upper surface of the cam ring is a follow roller 162 extending from a cylindrical depending portion 164 of a platform 166. Platform 166 has upwardly extending side walls 168—168 and open-bottomed cylindrical extensions 170 extend downwardly from the corners of the platform 166. Each of the cylindrical extensions 170 overlies the open upper ends of one of the tubular members 146. The platform 166 is resiliently supported upon compression springs 172, the upper portions of which fit within the cylindrical extensions 170 and the bottom portions of which fit within the corresponding tubular members 146. The bottoms of these springs rest upon the tops of the associated posts 138.

As the cam ring 161 is rotated by the motor 160, the roller 162 will follow the undulations of the upper surface of the cam ring 161 and thereby vibrate the platform 166 up and down relative to the frame assembly 144.

When the rod 152 associated with the cylinder 154 is in its fully retracted and lowered position, the tubular members 146 rest upon the stop pins 142 extending from the posts 138. The lowermost position of the frame assembly 144 can be adjusted by adjusting the elevation of the pins 142. To enable the plate 148 which rests upon the head 150 of the rod 152 to rest upon the latter head for the various adjusted elevations of the frame assembly 144, the plate 148 may be adjustably mounted upon the frame assembly 144 in any suitable way so that it may assume a number of different vertical positions corresponding to the different positions of the stop pins 142. Alternatively, spacer discs may be provided which can be mounted upon the top of the head 150 upon which the plate 148 rests.

The desired lowermost elevation of the frame assembly 144 is determined by the size of the bag 14 being used with the machine. It is important that the bottom of the bag 14 be free of contact with the platform 166 when the frame assembly 144 is in its lowermost position. When the rod 152 is in its extended or raised position, platform 166 is raised to a position where it engages and lifts the bottom of the bag 14 even when the roller 162 rides on the lower section of the cam ring. Then, the vibrating movement applied thereto will shake the bag so as to compact the material therein during most of the filling period.

Referring more particularly to FIG. 1, a switch-actuating arm 173 extends from one of the tubular members 146 of the frame assembly 144. In the upper position of the frame assembly 144, the switch-actuating arm 173 engages the switch-actuating pin 175 of a limit switch 177. During the filling of the bag 14, the actuation of the switch 177 forms no useful function. As the bag approaches a filled condition, the jolting and lifting apparatus 16 is lowered so that the bottom of the bag 14 is not touching the platform 166, thereby enabling the weighing means to accurately weight the contents of the bag. As soon as the bag is filled, however, the limit switch 101 associated with the weighing means 82 is actuated and the clamp disc 134 is raised to unclamp the bag from the filling tube. Also in a manner to be explained, the frame assembly 144 is raised for a second time. As the frame assembly reaches the top of its travel this second time, switch-actuating arm 173 again actuates the limit switch 177 and this time the switch is operative to initiate movement of pusher apparatus 18 which pushes the bag 14 off the platform 166 while the weight of the bag 14 is off the filling tube.

The bag pushing apparatus 18 may comprise a cylinder 180 supported upon a platform 181 on the framework

31. The cylinder contains a horizontally moveable piston, not shown. Hydraulic lines 181—181 extending to opposite ends of cylinder 180 control the fore and aft movement of the piston and of an arm 182 connected thereto. The end of the arm 182 carries a pusher plate 184 which, in its fully extended position, occupies the position shown in the dotted lines in FIG. 1, where the bag 114 is completely pushed from the filling tube 12 and the platform 166 onto the conveyor means 20.

The conveyor means 20 may also be supported upon the roller-carrying framework 136 which carries the jolting and lifting apparatus 16. The conveyor means 20 comprises a support frame 187 carrying a number of horizontally oriented rollers 189, the upper extremities of which extend in a plane inclining from the front end of the platform 166 in the uppermost position of the frame assembly 144 to a bottommost point at the level of the high side of an inclined platform 190 of the weighing scale 22. The elevation of the support frame 187 is preferably vertically adjustable so that the conveyor means 20 may be utilized with bags of different lengths. As above indicated, as the length of the bag varies, the elevation of the platform 166 in its raised position is accordingly varied.

A limit switch 191, sometimes referred to as a finished bag switch, extends in the path of travel of the bags at the front end of the conveyor means 20 so that it will be actuated as a bag leaves the conveyor means and passes to the checking station 22. As will appear, actuation of the switch 191 will enable the machine to start a new bag-filling cycle initiated by the operator placing a new bag upon the filling tube 12 and either depressing the start pushbutton of an on-off switch or interrupting the light beam of a photo cell. As soon as a new filling cycle begins, the operator checks the weight of the previously filled bag then at the weight-checking station 6.

During a period beginning with the start of a bag filling operation and ending with the movement of the bag past the finished bag limit switch 191, a red light 193 mounted upon a panel 194 supported on the framework 31 is lit. The above-mentioned on-off switch may be supported on the panel 194, the switch being identified by reference numeral 196. After the bag passes by the limit switch 191, a green light 195 on the panel 194 is lit and the red light is extinguished. As soon as a new bag-filling cycle begins, the red light 193 is again lit and the green light is again extinguished.

Referring now most particularly to FIGS. 1 and 7, the checking station 6 includes the above-mentioned weighing scale 22. The weighing scale may be supported upon a roller carrying framework 198 having a support post 200 carrying a weight-indicating head 202 having an index pointer 204 thereon movable over a calibrated scale 206. The weighing scale further includes a platform 208 which is connected to the weighing mechanism, not shown, and which carries the weight to be measured. Platform 208 supports thereabove the inclined platform 190 upon which are rotatively mounted rollers 212 whose upper extremities extend in a plane which is a continuation of the plane of the inclined plane at the top of the rollers 189 of the conveyor means 20. The elevation of the roller carrying frame 210 is variable in any suitable way for the same reasons that frame 187 of the conveyor means 20 is adjustable in elevation.

At the lower or forward end of the inclined platform 190, there is supported for vertical movement a gate plate 216 which acts as a bag stop. The bag delivered to the checking station is carried by the rollers 212 to the bottom end of the inclined platform 190 so as to bear against the gate plate 216. The gate plate 216 has a depending neck portion 218 (FIG. 7) which is supported for vertical sliding movement in a suitable guide piece 220. A bar 221 supported in spaced relation to the end and below the platform 190 forms a guide slot for the movement of the plate 216. The gate plate is moved

up and down by means including an operating rod 222 which is pivoted between its ends upon a pivot bracket 224. One end of the rod 222 is pivotally secured to the neck 218 of the gate plate 216 and the other end thereof is secured to the end of operating rod 226 connected to a piston, not shown, vertically movable in a cylinder 228.

Air lines 230—230 extend to opposite ends of the cylinder 228 and are connected to solenoid valves to be described which control the movement of the piston within the cylinder 228. As will appear, after the completion of a bag filling operation, the last mentioned solenoid valve is actuated to effect the raising of the rod 226 and the consequent lowering of the gate plate 216 below the level of the platform 190, so that the bag then at the checking station will be discharged by force of gravity to the discharge station 8.

Aside from the bag sealing apparatus 28 to be described in detail later on in the specification, the discharge station 8 includes an inclined roller-carrying framework 233 having four vertical posts 235 at the corners thereof and supporting an inclined roller-carrying platform 237 forming a continuation of the inclined scale platform 190. The elevation of the roller-carrying platform 237 is accordingly vertically adjustable. A fixed stop wall 239 extends upwardly from the lower forward end of the platform 237 to hold the bag delivered thereto from rolling off the platform. The previously mentioned bag-discharging means 24 is supported on one side of the platform 237 by a bracket plate 242 or the like secured to the platform 237. The bracket plate 242 carries a cylinder 244 in which is mounted a horizontally movable piston, not shown. Air lines 245—245 extend to opposite ends of the cylinder 244 and are controlled by suitable solenoid valves to be described which move the piston in the cylinder 244 back and forth.

A push rod 246 is connected to the piston at one end and carries a ram plate 248 at the other end. Some time before the lowering of the gate plate 216 at the weight-checking station 6, the piston within the cylinder 244 is moved in a direction which brings the ram plate 248 against the bag 14 at the discharge station to push the same upon the above mentioned conveyor belt 26 which passes through the opening between the vertical support posts 235 of the framework 233.

The control circuits for controlling the various above mentioned solenoid valves will now be described in connection with the electrical and air circuit diagram in FIG. 8. However, before describing this circuit in detail, it will be helpful to review the various operations to be performed by the control circuit and the sequence of operation of the various parts of the machine. These operations are as follows:

(a) At the beginning of a bag-filling cycle when the on-off switch 196 (FIG. 1) is actuated, the control circuit: (1) effects the lowering of the clamping head 134 (FIG. 3) of the bag-holding means 127 against the top of the bag 14 which has been slipped over the filling tube 12; (2) applies air pressure to the air pressure chamber 38 at the bottom of the hopper 29; and (3) energizes the red light 193 and de-energizes the green light 195.

(b) Five seconds after the beginning of a bag-filling cycle, the jolting and lifting apparatus 16 is raised in position so that the bottom of the bag is engaged by the vibrating platform 166 and vibrated to compact the pulverulent material being fed thereto.

(c) Ten seconds after the beginning of the bag-filling cycle, solenoids are actuated which: (1) effect the lowering of the jolting and lifting apparatus 16 to enable the weighing means to accurately weigh the contents of the bag; (2) effect the lowering of the gate plate 216 at the weight-checking station 6 to deliver the bag 14 thereat to the discharge station 8; and (3) effect the extension of the dribble feed ramrod 76 to partially collapse the collapsible conduit 44.

(c) When the bag receives its full weight of material, solenoids are actuated which: (1) effect the movement

of the shut-off ramrod 80, which completely collapses the conduit 44; (2) shuts off air pressure to the air pressure chamber 38 at the bottom of the hopper; (3) effect the raising of the jolting and lifting apparatus 16 to take the weight of the bag 14 off of the filling tube; (4) effect the retraction of the clamping head 134 to release the bag from the filling tube; (5) effect the raising of the gate plate 216 at the weight-checking station; and (6) prepare a circuit associated with the limit switch 177 for operation.

(d) When the jolting and lifting apparatus 16 is in its fully raised position, and the activating arm 173 actuates the limit switch 177, a solenoid is actuated which effects the forward movement or extension of the pusher plate 184 which pushes the bag off the platform 166 of the jolting and lifting apparatus 16 and onto the conveyor means 20.

(e) As the bag passes the finished bag limit switch 191, the machine is ready for a new bag-filling cycle and the red light 193 is extinguished and the green light 195 is lit. In the schematic diagram of FIGURES 10a and 10b, the contacts of the various relays shown therein are in their normal positions, that is their positions when the associated relays are de-energized.

The main source of power for energizing the various relays and solenoids may be a source of alternating or direct current voltage available on power lines 250 and 252, the latter being a grounded line. Line 250 extends to the on-off switch 196. Switch 196 has a normally-open depressable push button "on" switch 254 and a normally-closed push button "off" switch 256. When the "on" push button switch 254 is depressed, a circuit is completed which extends from the power line 250 to the then momentarily closed push button switch 254, line 257, the #8 normally-closed contacts of a control relay R-1 and line 258 leading to the coil R-2' of a relay R-2. The energization of relay R-2 results in the closure of the #1 normally-open contacts thereof which constitute holding contacts which connect the coil R-2' to the line 250 by a circuit including line 260, the #7 normally-closed contacts of the relay R-1, line 262, the #2 normally-closed contacts of the weight limit switch 101, and line 264 leading to the normally-closed push button "off" switch 256 connected to the line 250.

The voltage applied to the coil R-2' is also applied via a main branch line 258' and a line 266 to one end of a solenoid S-1 whose other end is grounded through a common ground line 267. Solenoid S-1 controls a valve V-1 which, upon energization of the solenoid S-1 connects an air pressure conduit 268 to the top of air cylinder 129 which lowers the piston in the cylinder 129 of the bag-holding means to bring the clamp head 134 against the top of the bag 14. The air line 268 has a shut-off valve 268a to disconnect the line from a main air header line 268b extending to the output of an air compressor, not shown. The line 268 also has a pressure adjusting and regulating means 268a.

The common line 266 feeding the solenoid S-1 also is connected to one end of solenoids S-5 and S-6 whose other ends are connected to the common ground line 267. Energization of the solenoid S-5 opens a valve V-5 which connects an air pressure line 268c to the air chamber 38 at the bottom of the hopper 29. Line 268c is connected to head liner 268b through a pressure adjusting and regulating means 268d and a shut-off valve 268d. Energization of the solenoid S-6 closes valve V-6, which is a normally open valve, to disconnect the air line 268 from air cylinder 78 which, through suitable spring or other means, not shown, effects the retraction of the shut-off ramrod 80.

Upon energization of relay R-2, another branch circuit is energized which extends from main branch line 258' through a sub-branch line 258'', the #2 normally-closed contacts of a relay R-3, and a line 265 leading to a dribble-feed solenoid S-4 which is grounded through common

ground line 267. Energization of solenoid S-4 closes a normally-open valve V-4 disconnecting the air pressure line 268 from the dribble feed air cylinder 74 which, through suitable spring means or the like in the cylinder, retracts the ramrod 76.

Simultaneously with the energization of relay R-2, the coil R-4' of a five second time delay relay R-4 is energized through connection of one end of this coil to the line 258. The other end of the coil is grounded. Five seconds after the coil R-4' is energized, its #1 set of normally closed contacts open and its #2 set of normally-open contacts close.

The energization of the relay R-2 also results in the energization of the red light 193. The energization circuit for the latter light can be traced from ground line 252 through line 271, light 193, line 271', the #3 normally-open but then closed set of contacts of the relay R-2, line 260 and the normally-open but then closed #1 set of contacts of the latter relay which lead to the energized line 258'. When the red light 193 is energized, the green light 195 is de-energized. The circuit for energizing the green light 195 can be traced from the line ground 252 through line 273, the green light 195, line 273' the normally-closed #2 set of contacts of the relay R-1, line 275, normally-closed contacts 277 of the finished bag limit switch 191, line 279 and the #2 set of normally-closed but then open contacts of the relay R-2 leading to line 250 through the normally-closed "off" push button switch 256.

Five seconds after the start of the bag-filling cycle, the above mentioned five-second relay R-4 pulls-in to open its #1 set of normally-closed contacts and close its #2 set of normally-open contacts. Closure of the #2 set of normally-open contacts completes an energization circuit extending from the then energized line 258 through the latter #2 set of contacts and line 281 leading to the coil R-5' of a five second time delay relay R-5 which will pull-in ten seconds after the beginning of the bag-filling cycle. The pulling-in of the five second time delay relay R-4 also energizes a relay R-6 through a circuit extending from the energized line 258 and through the then closed #2 set of contacts of time delay relay R-4, line 283, the #1 set of normally-closed contacts of relay R-1, line 283' the #1 set of normally-closed contacts of relay R-5, and line 283'' leading to the grounded coil R-6' of relay R-6. The relay R-6 immediately operates to close its #1 set of normally-open contacts and open its #2 set of normally-closed contacts.

The closure of the #1 set of contacts establishes an energization circuit extending from the ungrounded side of relay coil R-6' through the latter #1 set of contacts and line 285 leading to a solenoid S-9 grounded through the common ground line 267. The energization of solenoid S-9 opens the normally-closed valve V-9 to connect air pressure line 268 to the bottom of vertical air cylinder 154 to effect the raising of the jolting and lifting apparatus 16 against the bottom of the bag 14. As above indicated, shaking of the bag 14 is generated by the riding of roller 162 over the bag-vibrating cam ring 161.

The opening of the #2 set of normally-closed contacts of the relay R-6 performs no control function because the line 287 connected to the latter contacts extends to the then open #5 set of normally-open contacts of relay R-1.

Five seconds after the energization of the five second time delay relay R-4, which is ten seconds from the beginning of the bag-filling cycle, relay R-5 pulls-in to open its #1 set of normally-closed contacts. Opening of the #1 contacts opens the energization circuit to the coil R-6' of relay R-6. The consequent immediate opening of the normally-open #1 set of contacts of the latter relay de-energizes solenoid S-9 to close the valve V-9 which shuts off air pressure from the bottom of air cylinder 154 controlling the elevation of the jolting and lifting apparatus 16, which results in the lowering of the latter apparatus to

enable the weighing apparatus to accurately measure the weight of the bag contents. Closure of the #2 set of normally-closed contacts of the relay R-6 has no effect on the circuit because the line 287 connected thereto is de-energized through the #5 set of normally-open contacts of the relay R-1. When the latter #5 contacts close, this prepares the pusher apparatus 18 for operation when the jolting and lifting mechanism 16 is again raised to bring the switch-actuating arm 173 thereof against the limit switch 177. The closure of the limit switch 177 during the first raising of the jolting and lifting apparatus had no effect because of the latter #5 set of normally-open contacts.

Closure of the #2 set of contacts of the time delay relay R-5 ten seconds after the beginning of a bag-filling cycle completes an energization circuit for the coil R-3' of relay R-3. This energization circuit can be traced from the latter coil through line 288, the then closed #2 set of contacts of the relay R-5 and a line 288' extending to the energized branch line 258'. This opens the #2 set of normally-closed contacts of the relay R-3 to interrupt the line 265 leading to the solenoid S-4 which controls the valve V-4. De-energization of the solenoid S-4 opens the valve V-4 to apply air pressure to the dribble feed air valve 76 which effects the extension of the ramrod 76 to partially collapse the collapsible conduit 44, resulting in a substantial reduction in the feeding rate of material to the filling tube. This enables a more accurate weighing operation to be carried out.

Closure of the #2 set of normally-open contacts of relay R-5 completes a circuit extending from energized branch line 258' and through the latter #2 set of controls, a line 289 and a solenoid S-10 grounded through ground line 267. Solenoid S-10 controls a normally-closed valve which is opened upon energization of solenoid S-10 to apply pressure to the bottom of air cylinder 228, which raises arm 222 (FIG. 7) and lowers the gate 216 to discharge the bag at the checking station to the discharge station.

When the weight of the contents of the bag reaches the desired value, the weight limit switch 101 is tripped which results in the closing of the #1 set of contacts thereof and the opening of the #2 set of contacts thereof. The opening of the #2 set of contacts of the limit switch 101 opens or de-energizes the series connected lines 262 and 260 extending through the #7 set of contacts of the relay R-1 to the #1 holding contacts of the relay R-2. The holding circuit of relay R-2 is thus broken which de-energizes the latter relay. The line 258' associated with the interrupted circuit just described also becomes de-energized which results in the de-energization of solenoids S-1, S-5, and S-6 associated with the line 258. Line 258 which branches from line 258' also becomes de-energized to thus immediately de-energize and operate relay R-4 connected thereto. De-energization of relay R-4 also immediately de-energizes and operates relay R-5 as the #2 set contacts of R-4 open. De-energization of solenoid S-1 closes the valve V-1 which effects the raising of the clamp disc 134 of the bag-holding means to unclamp the bag from the filling tube. The de-energization of solenoid S-5 closes the valve V-5 to disconnect air pressure from the air pressure chamber 38 at the bottom of the hopper 29. The de-energization of the solenoid S-6 opens the normally-open valve V-6 which applies pressure to one end of the shut-off air cylinder 78 which effects the extension of the ramrod 80 to fully collapse the collapsible conduit 44.

As the relay R-5 becomes de-energized, its #2 set of contacts open as above indicated so as to open the line 289 extending to the solenoid S-10. De-energization of solenoid S-10 closes the normally-closed valve V-10 disconnecting air pressure from the air cylinder 228 controlling the movement of the gate 216. At the instant involved, the piston in the cylinder 228 will drop, thereby raising the gate 216 into its bag-stopping position.

The de-energization of the relay R-2 and the consequent closing of its #4 set of normally-closed contacts establishes an energization circuit for the coil R-1' of relay R-1 extending from the latter coil through a line 292, the #4 set of contacts of relay R-2, a line 294, the then closed #1 set of contacts of the weight limit switch 101 and line 264 extending to the normally-closed stop push button switch 256 connected to the power line 250. With the energization of the relay coil R-1', a holding circuit for relay R-1 is established extending from line 292 and through the #3 set of contacts of relay R-1, line 275, the normally-closed finished bag limit switch contacts 277, line 279, the #2 set of normally-closed contacts of relay R-2, and line 279' leading to the "off" push button switch 256 connected to power line 250. This holding circuit for the relay R-1 is required because, as soon as the bag is discharged from the filling tube, the #1 set of contacts of the weight limit switch 101 will open, thereby breaking the previously mentioned energization circuit for relay R-1.

Energization of the relay R-1 also results in the opening of the #1 set of normally-closed contacts thereof. The opening of these contacts does not form any immediate function because they extend to the coil of the delay relay R-5 which is already de-energized through the open #2 set of contacts of relay R-4.

When the relay R-1 is energized, the #2 set of normally-closed contacts thereof open a circuit in series with the green light 195 to keep this light shut off until the current bag filling and handling cycle is complete, and the #4 set of normally-open contacts close to keep the red light 193 on through the previously traced energization circuit therefor. Also, the #5 set of normally-open contacts of relay R-1 close to energize a solenoid circuit extending from the then energized line 292 and through the last-mentioned contacts, line 287, the #2 set of normally-closed contacts of the de-energized relay R-6, line 285, and the grounded solenoid S-9 controlling the valve V-9. Energization of the solenoid S-9, as previously indicated, effects the opening of the normally-closed valve V-9 which applies air pressure to the bottom of the cylinder 154 which raises the jolting and lifting apparatus 16 to bring the platform 166 thereof against the bottom of the bag 14 which removes the weight of the bag from the filling tube. When the jolting and lifting apparatus is raised to its uppermost position, the switch-actuating arm 173 thereof closes the limit switch 177 to complete a circuit to solenoids S-7 and S-8 controlling air pressure from the end of the cylinder 180 controlling the pusher plate 184. This energization circuit can be traced from the upper ends of the solenoids S-7 and S-8, which respectively control normally-open and normally-closed air valves V-7 and V-8, through a line 302, the limit switch 177 and the then energized line 297. Energization of the solenoids S-7 and S-8 applies air pressure to the left hand side of air cylinder 180 which results in the extension of pusher plate 184 which pushes the bag 14 loosely held on the filling tube off the platform 166 upon the conveyor means.

A blowout solenoid S-2 becomes energized simultaneously with the solenoids S-7 and S-8 since solenoid S-2 is connected to the same line 302 to which the latter solenoids are connected. This closes a normally-open valve V-2 which normally connects air pressure line 268c to the left end of an air valve cylinder 303 having a piston valve 303' spring-urged to the left. When air pressure is applied to the left hand end of the cylinder 303 the piston valve is pushed to the right to uncover a port 304 leading to an air pressure accumulation tank 305. The pressure builds up in the tank to a given air pressure under control of a pressure regulator 306. When solenoid S-2 is energized, the valve V-2 is closed, whereupon the spring-urged piston valve 303' is pushed to the left of the port 304 so that the air pressure in the tank 305 is applied through a port 307 in the right end of the cylinder 304 to the base of the filling tube 12 which blows out

any material remaining therein into the mouth of the bag 14 as it is being pushed off the filling tube.

The energization of relay R-1 also opens the normally-closed #7 and #8 sets of contacts thereof which respectively open a circuit in series with the #1 set of holding contacts of the relay R-2 and open the line 256 in series with the start push button switch 254 to prevent the beginning of a new filling cycle until relay R-1 is de-energized upon opening of the finished bag limit switch 191.

The finished bag limit switch is momentarily opened as a bag passes from the conveyor means 20 to the weighing station 6 of the machine. This brakes the holding circuit to the relay coil R-1' which de-energizes the same. This therefore closes the #7 and #8 sets of contacts of the latter relay to prepare the machine for a new operating cycle upon the depression of the start push button 254.

The filling of a bag can be stopped at any time by depression of the stop push button switch 256 which results in the breaking of the holding contacts for the relay R-2.

As previously indicated, instead of having a push button type of start switch for initiating a bag-filling operation, such an operation may be automatically effected by means of a photo-cell control circuit. To this end, referring more particularly to FIG. 9, a light source 310 may be mounted in any suitable manner upon the framework 31 on one side of and below the filling tube 12, so that the light beam thereof will be blocked by a bag 14 suspended from the filling tube. A photo-cell 311 is supported from the framework 31 on the opposite side of and below the filling tube 12 so that the photo-cell will be in the path of the light of light source 310 when the filling tube is without a bag. When a bag is inserted upon the filling tube 12, the light beam from the light source 310 is interrupted by the bag and this effects a sudden change in the output of the photo-cell 311 which change is amplified by an A.C. amplifier 312 to produce a signal which energizes momentarily a start relay 313. The relay 313 has a set of contacts 314 which momentarily close during the momentary energization of relay 313. Contacts 314 take the place of the start push button switch 254 in the circuit diagram of FIG. 8.

In accordance with the present invention, a glue-applying apparatus 315 and sealing apparatus 316 are provided for gluing and closing the filling opening of the bag. Preferably, the glue-applying apparatus and the sealing apparatus are positioned at the discharge station 8 of the machine. The gluing and sealing apparatus may be supported from an arm 318 extending from a support post 320 mounted in any suitable way upon the outside end of the framework 233 at the discharge station of the machine. The arm 318 extends rearwardly therefrom over the discharge station.

The glue-applying apparatus may comprise a rotary type solenoid 322 which is energized when a bag 14 is conveyed to the discharge station. To this end, a limit switch 323 is provided at the discharge station which is operated by the bag. A U-shaped glue-applying tube 324 is mounted on the armature of the solenoid for rotary movement between a position (FIGS. 11-13) where the end of the tube 324 extends into the filling opening 124 of bag 14 during the energized state of the solenoid, and a position (FIG. 10) where the tube is pivoted away from the bag during the de-energized state of the solenoid.

The filling opening 124 of the bag 14 extends horizontally and is formed by a pair of opposed collapsible wall portions 326-328. The end of the tube 324 has a series of nozzle holes 327 through which glue may be forced under pressure generally radially outwardly so that glue is applied to the inner surfaces of the opposed wall portions 326 and 328 of the bag 14. A conduit 324' in communication with the inner end of the tube 324 extends to a glue control valve 329 controlled by a solenoid 330. The valve and solenoid are mounted upon a bracket 331

secured to the arm 318. A conduit 333 connects the valve 329 to a pressurized elevated glue storage tank 335 supported from a bracket 334 supported upon the arm 318. When the glue-applying tube 324 is inserted into the bag opening 124, an arm 336 carried by the armature of the rotary solenoid contacts a switch 338 mounted on the casing of the solenoid which energizes solenoid 330 to open the valve 329 which applies glue to the nozzles openings 327 at the end of the glue-applying tube 324. The control circuit for the solenoid 322 is such that tube 324 remains in the opening for only a sufficient time to expel the glue.

When the glue-applying tube is retracted from the bag opening 124, sealing means 316 is operated. The sealing means may comprise a pressure plate 340 mounted for vertical movement upon a rod 342 connected to a piston, not shown, within an air cylinder 344. Air lines extend to opposite ends of the cylinder 344 and are controlled by a solenoid-operated valve, not shown. As soon as the glue-applying tube 324 is retracted from the bag 14, air pressure is fed to the cylinder 344 to force the pressure plate 330 downwardly against the top of the bag (FIGS. 14 and 15) so as to bring the upper wall 326 of the bag 14 against the bottom wall 328, so that the glue may secure the two walls together. Pressure plate 340 is lowered for only a moment, and, after it is raised, the previously mentioned bag-pushing apparatus 24 is rendered operative to push the bag 14 off the discharge station upon the conveyor 26.

The control circuit which controls the sequence of operation of the glue-applying and bag closing operations just discussed is shown in FIG. 16. The limit switch 323 whose contacts are normally open are connected between the power line 250 and a small motor 350 connected to the ground line 252. The motor 350 is also connected to power line 250 through an alternate branch including a normally-closed set of contacts 354 which are open momentarily once every revolution of the motor by a cam projection 356' of a cam 356 driven by the motor 350. The motor 350 also drives cams 358, 360 and 362 having respective cam projections 358', 360' and 362'. These cam projections occupy different circumferential positions on these cams so that the cams are sequentially operative to close respective contacts 358'', 360'' and 362''. Cams 358, 360 and 362 make one revolution for each revolution of the cam 356. Contacts 358'' are connected between power line 250 and the coil of solenoid 322 connected to the ground line 252. Contacts 360'' are connected between power line 250 and a grounded solenoid 364 which controls a valve not shown, which applies air pressure either to the upper or lower line of the air cylinder 334 controlling the raising and lowering of the pusher plate 340. Contacts 362'' are connected between power line 250 and a grounded solenoid 366 which controls a valve, not shown, controlling the feeding of air pressure to the air cylinder 244 of bag-discharging means 24.

The control circuit also includes the limit switch 338 operated by the arm 336 carried by the armature of solenoid 322. The contacts of limit switch 338 are connected between power line 250 and the solenoid 330 which is connected to ground line 252. Solenoid 330, as above explained, controls the glue valve 329. Solenoid 322, as above explained, controls the movement of the glue-applying tube 324.

Upon the initiation of the energization of motor 350 by the closure of limit switch 323, cam 358 closes the contacts 358'' to energize the solenoid 322 to bring the tube 324 into the bag opening 124. When the armature of the solenoid 322 reaches the position which closes the above mentioned limit switch 338, solenoid 330 is energized. This opens the glue valve 329 which feeds glue to the glue-applying tube 324. When the contacts 358' leave the cam projection 358', solenoid 322 becomes de-energized which results in the retraction of the tube 324 from the bag opening 124.

Next, the cam projection 360' of the cam 360 closes contacts 360'' to complete a circuit which energizes a solenoid 364 which controls a valve not shown, which applies pressure to the upper air line leading to the air cylinder 344 so as to lower the pusher plate 340 to close the bag opening. When the cam projection 360' leaves the contacts 360'', solenoid 364 becomes de-energized which results in the operation of the associated valve which feeds air pressure to the lower line which raises the pusher plate 340.

Next, the cam projection 362' of the cam 362 closes the contacts 362'' to complete a circuit to the solenoid 366 which feeds air pressure to the rear air line 245 of the cylinder 244 (FIG. 10) to cause the piston therein to move the pusher plate 248 forwardly and push the bag off the conveyor. When the bag is pushed off the discharge station, the limit switch 323 opens. However, the motor 350 is still energized through contacts 354 which are not open until cam 356 reaches its starting position where its cam projection 356' separates the contacts 354 and terminates an operating cycle for the motor. The motor is then de-energized and remains de-energized until the next bag is delivered to the discharge station, whereupon the limit switch 323 in series with the motor 350 is closed.

The period of the operating cycle for the bag sealing and discharging operation just described may be equal to or less than the time which elapses from the beginning of the operating cycle of the machine when "on" push button 254 is depressed and the new bag is filled and conveyed to the weight-checking station 6.

It should be understood that numerous modifications may be made of the preferred forms of the invention above described without deviating from the broader aspects of the invention.

What I claim as new and desire to protect by Letters Patent of the United States is:

1. An automatic bag filling and sealing machine for a bag enclosed on all sides including the top and bottom walls thereof except for a horizontally-disposed filling opening at the top of the bag formed by opposed, collapsible walls of material, said machine comprising: a horizontally-disposed filling tube adapted to extend into said filling opening, means for feeding a predetermined quantity of pulverulent material through said filling tube into said bag, means for automatically separating said filling tube and bag following the filling of the bag, means following separation of said filling tube and bag for automatically conveying said bag to a sealing and discharge station, automatic adhesive-applying means at said sealing and discharge station for automatically applying a quick-drying adhesive to the inner surface of at least one of said opposed collapsible walls as a bag is delivered to said sealing and discharge station, said automatic adhesive-applying means including an adhesive-discharge tube supported for movement between a non-operating position and an operating position where the end of the discharge tube extends into said filling opening in a position to discharge an adhesive material upon at least one of said opposed collapsible walls thereof, control means responsive to the movement of a bag to said sealing and discharge station for momentarily moving the end of said discharge tube from said non-operating to said operating position within said bag-filling opening and for effecting the discharge of adhesive material through said discharge tube and onto at least said one collapsible wall, and sealing means for collapsing said confronting walls of said bag-filling opening to bring the same together following the application of adhesive material thereto, whereby the collapsible walls are sealed together to close the filling opening, and bag-discharging means at said sealing station for discharging the bag from said sealing station following the sealing operation.

2. An automatic bag sealing machine for a bag enclosed on all sides including the top and bottom walls

thereof except for a horizontally-disposed filling opening at the top of the bag formed by a horizontally-disposed sleeve of flexible material having opposed, collapsible walls, said machine comprising: adhesive-applying means for automatically applying adhesive to the inner surface of at least one of said opposed collapsible walls, said adhesive-applying means including an adhesive-discharge tube for discharging adhesive laterally thereof and supported for movement between a non-operating position where the tube is outside the bag and an operating position where the end of the discharge tube extends into said filling opening in a position to discharge an adhesive material upon at least one of said opposed collapsible walls thereof, control means for momentarily moving the end of said discharge tube from said non-operating to said operating position within said bag-filling opening and for effecting the discharge of adhesive material through said discharge tube and onto at least said one collapsible wall, and sealing means for collapsing said confronting walls of said bag-filling opening to bring the same together following the application of adhesive material thereto and removal of said discharge tube therefrom, whereby the collapsible walls are sealed together to close the filling opening.

3. An automatic bag filling and sealing machine for a bag enclosed on all sides including the top and bottom walls thereof except for a horizontally-disposed filling opening at the top of the bag formed by a horizontally-disposed sleeve of flexible material having opposed, collapsible walls, said machine comprising: a filling tube adapted to extend into said filling opening, means for feeding a predetermined quantity of pulverulent material through said filling tube in said bag, means for automatically separating said filling tube and bag following the filling of the bag means following separation of said filling tube and bag for automatically conveying said bag to a sealing station at random, adhesive-applying means at said sealing station for automatically applying an adhesive to the inner surface of at least one of said opposed collapsible walls when a bag is delivered to said sealing station, said adhesive-applying means including an adhesive-discharge tube for discharging adhesive laterally thereof and supported for movement between a non-operating position and an operating position where the end of the discharge tube extends into said filling opening and is in a position to discharge an adhesive material upon at least one of said opposed collapsible walls thereof, control means responsive to the movement of a bag to said sealing station for momentarily moving the end of said discharge tube from said non-operating to said operating position with said bag-filling opening and for effecting the discharge of adhesive material through said discharge tube and onto at least said one collapsible wall, and sealing means for collapsing said confronting walls of said bag-filling opening to bring the same together following the application of adhesive material thereto and removal of said discharge tube therefrom, whereby the collapsible walls are sealed together to close the filling opening.

4. An automatic bag sealing machine for bags each enclosed on all sides including the top and bottom walls thereof except for a horizontally-disposed filling opening at the top of the bag formed by a horizontally-disposed sleeve of flexible material having opposed, collapsible walls, said machine comprising means for automatically conveying said bags to a sealing station at random, automatic adhesive-applying means at said sealing station for automatically applying a quick-drying adhesive to the inner surface of at least one of said opposed collapsible walls as a bag is delivered to said sealing station, said automatic adhesive-applying means including an adhesive-discharge tube supported for pivotal movement about a vertical axis and having a generally circumferentially extending outer discharge end which has nozzle holes for directing adhesive laterally therefrom and which

is pivotable between a non-operating position outside of the bag and an operating position where the outer end of the discharge tube extends into said filling opening in a position to discharge an adhesive material upon at least one of said opposed collapsible walls thereof, control means responsive to the movement of the bag to said sealing station for momentarily pivoting said discharge tube from said non-operating to said operating position within said bag-filling opening and for effecting the discharge of adhesive material through said discharge tube and onto at least said one collapsible wall, and sealing means for collapsing said confronting walls of said bag-filling opening after removal of said discharge tube from said filling opening to bring the same together following the application of adhesive material thereto and removal of said discharge tube therefrom, whereby the collapsible walls are sealed together to close the filling opening.

5. An automatic bag sealing machine for a bag enclosed on all sides including the top and bottom walls thereof except for a horizontally-disposed filling opening at the top of the bag formed by a horizontally-disposed sleeve of flexible material having opposed, vertically collapsible walls, said machine comprising conveyor means for automatically conveying said bag to a sealing station, automatic adhesive-applying means at said sealing station for automatically applying a quick-drying adhesive to the inner surface of at least one of said opposed collapsible walls as a bag is delivered to said sealing station, said automatic adhesive-applying means including an adhesive-discharge tube for dispensing adhesive laterally thereof and supported for movement between a non-operating position and an operating position where the end of the discharge tube extends into said filling opening in a position to discharge an adhesive material upon at least one of said opposed collapsible walls thereof, control means responsive to the movement of the bag to said sealing station for momentarily moving the end of said discharge tube from said non-operating to said operating position within said bag-filling opening and for effecting the discharge of adhesive material through said discharge tube and onto at least said one collapsible wall, sealing means above said sealing station for engaging only the top of

said bag and collapsing said confronting walls of said bag-filling opening downwardly to bring the same together following the application of adhesive material thereto and removal of said discharge tube therefrom, whereby the collapsible walls are sealed together to close the filling opening, and bag-discharging means at one side of said sealing station for engaging the side of said bag and pushing the same off said conveyor at said sealing station following the sealing operation.

6. An automatic bag sealing machine for a bag enclosed on all sides including the top and bottom walls thereof except for a horizontally-disposed filling opening at the top of the bag formed by a horizontally-disposed sleeve of flexible material having opposed vertically collapsible walls, said machine comprising: adhesive-applying means for automatically applying adhesive to the inner surface of at least one of said opposed collapsible walls, said adhesive-applying means including an adhesive-discharge tube for discharging adhesive laterally thereof and supported for movement between a non-operating position where the tube is outside the bag and an operating position where the end of the discharge tube extends into said filling opening in a position to discharge an adhesive material upon at least one of said opposed collapsible walls thereof, control means for momentarily moving the end of said discharge tube from said non-operating to said operating position within said bag-filling opening and for effecting the discharge of adhesive material through said discharge tube and onto at least said one collapsible wall, and sealing means for engaging only the top of said bag and collapsing said confronting walls of said bag-filling opening downwardly to bring the same together following the application of adhesive material thereto and removal of said discharge tube therefrom, whereby the collapsible walls are sealed together to close the filling opening.

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