June 30, 1959 N. S. DERRAH ET AL 2,892,297

BAGS AND BAG HANDLING MACHINES

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Fig. 1

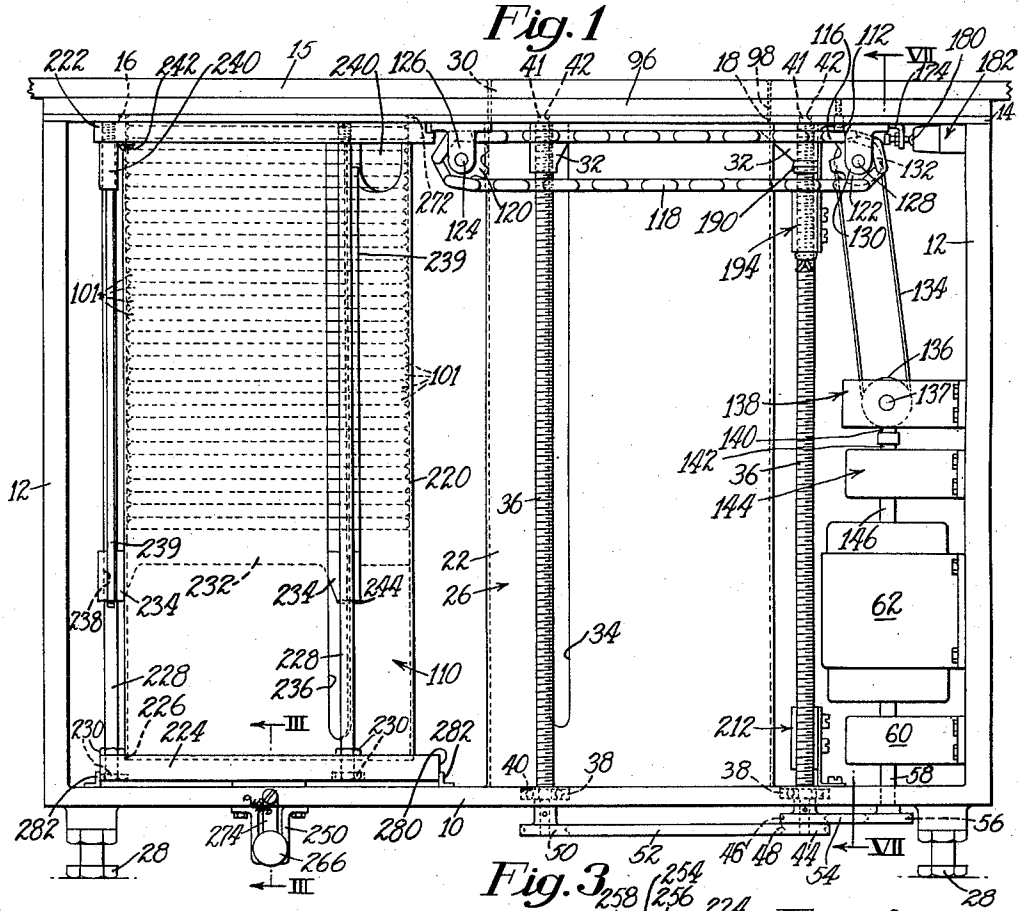


Fig. 2

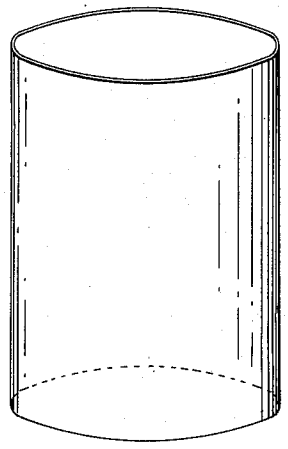


Fig. 3

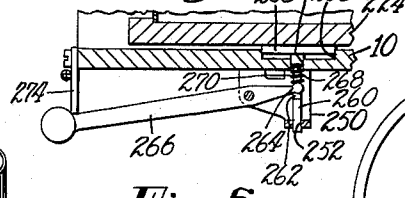


Fig. 4

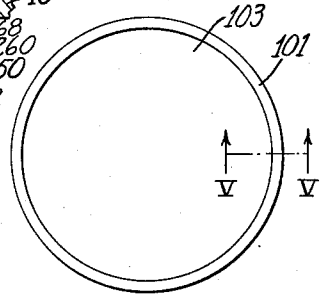
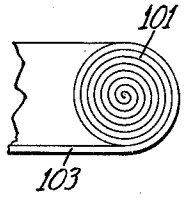


Fig. 5



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Fig.6

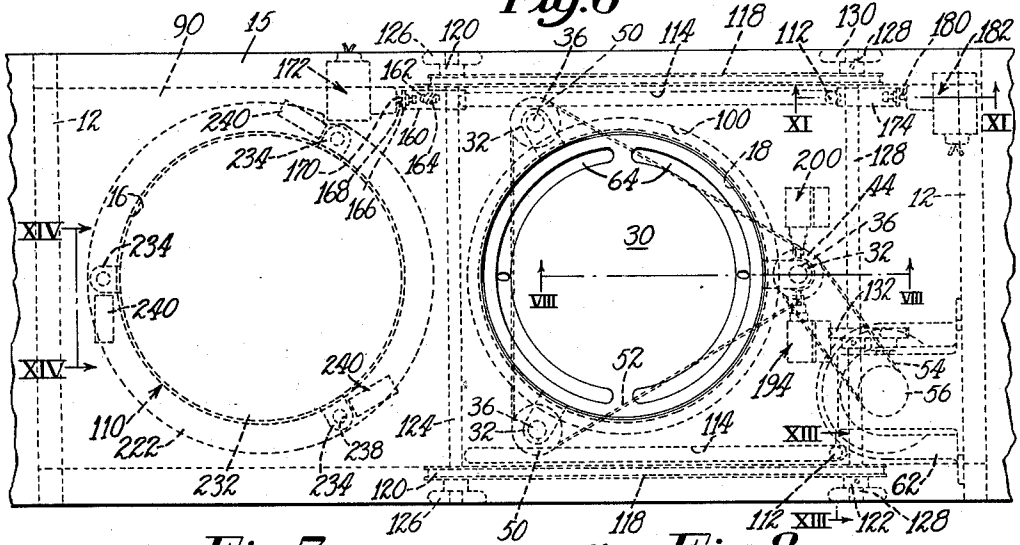


Fig.7

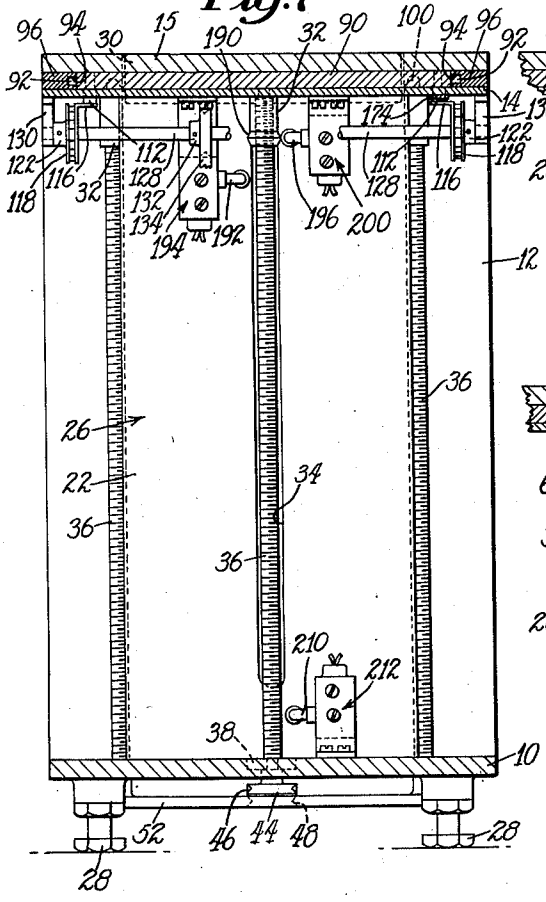


Fig.8

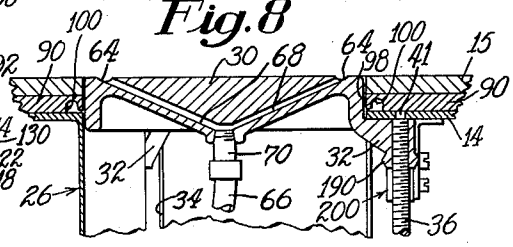
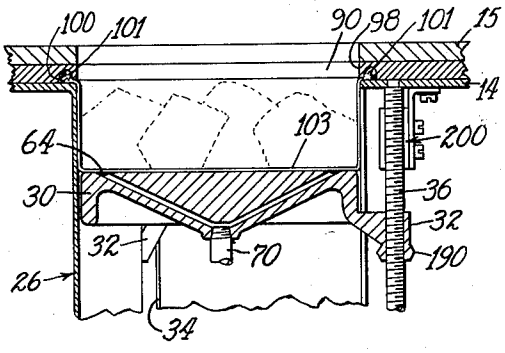


Fig.9



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BAGS AND BAG HANDLING MACHINES

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Fig.10

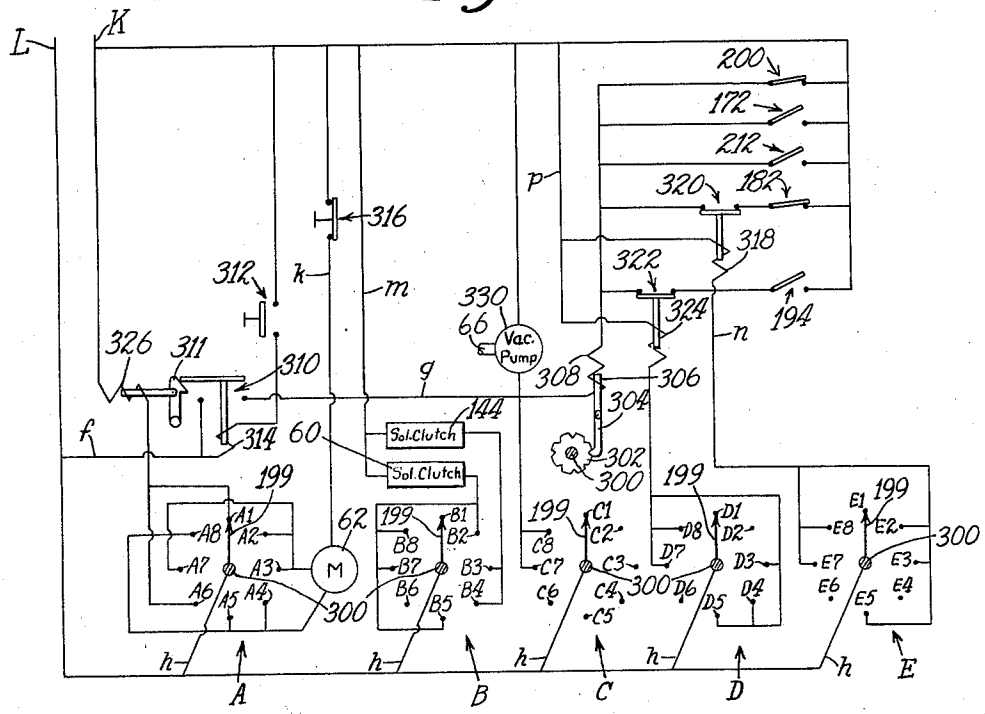


Fig.11

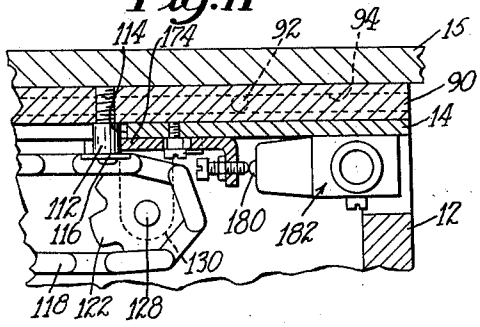


Fig.12

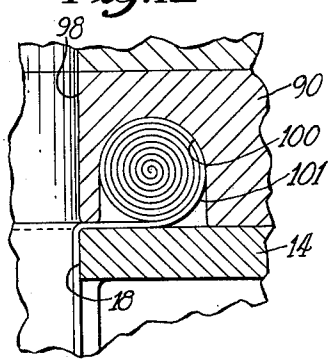


Fig.13

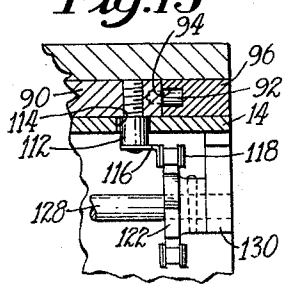
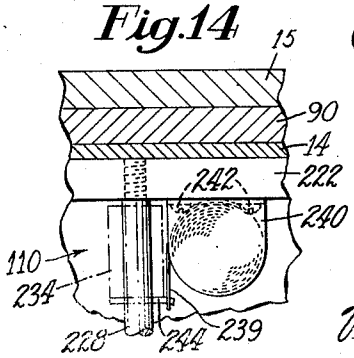


Fig.14



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2,892,297

BAGS AND BAG HANDLING MACHINES

Norman S. Derrah and Helen J. Derrah, Lynn, Mass.

Application February 28, 1956, Serial No. 568,238

17 Claims. (Cl. 53—186)

This invention relates to bags and to machines for automatically handling bags for packaging materials. More particularly the invention is related to a tubular bag closed at one end and compressed in a novel manner so as to be particularly adapted for automatic handling.

It has been a problem in the handling of bags to provide simple and reliable machinery for automatically handling bags of ordinary types. In order automatically to handle bags of the usual type it has been necessary to provide complex and expensive machinery. Due to the complexity of these machines it has heretofore been impractical to provide automatic machines for handling bags that are to be manually loaded such as might be used in stores dealing in groceries and general merchandise. By way of example, it has long been a problem in stores of the super-market type to facilitate the checking out and packaging of the customer's selections of merchandise. Many devices have been developed to speed up this vital operation but up to this time it has been impractical to provide automatic machinery to handle bags while they are loaded.

Accordingly it is an object of this invention to provide a novel bag which is particularly adapted for simple automatic handling. It is a further object of this invention to provide a machine for automatically handling the above novel bag.

In accordance with one feature of the invention there is provided a tubular bag closed at one end. The bag is capable of being compressed by having its wall rolled upon itself to form an annular ring at the closed end, the ring formed in this manner also being adapted to be unrolled to form a tubular bag.

In accordance with another feature of the invention a machine is provided for automatically handling the above novel bag. Accordingly, the machine is provided with a magazine adapted to store a plurality of compressed bags in such manner that they may be transferred one at a time to a loading position. A transfer slide is adapted to receive a compressed bag from the magazine and while confining the ring of the bag in an annular groove, the slide transfers the bag to a loading station. A loading platform provided with means for holding the bottom of the bag is arranged to be moved axially away from the confined bag ring as materials are loaded on the bottom of the bag thereby causing the ring to unroll and progressively form a wall around the materials on the bottom of the bag. Provision is also made in the machine for returning the platform and filled bag to a position suitable for removal of the filled bag. Control means are also provided for the machine to effect automatic transfer of a bag from the magazine to the loading position and to effect automatic operation of the loading platform so the bag is automatically unrolled as it is being filled.

While in the preferred form of the invention it is contemplated that the bag will be manually filled. It is to be understood that automatic means for filling could also be provided without departing from the scope of this

invention. It should also be understood that the scope of the invention also includes bag forms other than that illustrated as the preferred embodiment as long as the walls thereof are capable of being rolled to form a ring.

The above and other features of the invention including various details of construction and novel combinations of parts will now be described with reference to the drawings and thereafter pointed out in the claims.

In the drawings,

Fig. 1 is a front elevation of one form of machine embodying the invention;

Fig. 2 is a perspective view of one form of bag embodying the invention;

Fig. 3 is a sectional view on line III—III of Fig. 1;

Fig. 4 is a plan view of the bag illustrated in Fig. 2, but with the wall thereof rolled upon itself;

Fig. 5 is a sectional view on line V—V of Fig. 4;

Fig. 6 is a plan view of the machine;

Fig. 7 is a sectional view on line VII—VII of Fig. 1;

Fig. 8 is a sectional view on line VIII—VIII of Fig. 6;

Fig. 9 is a view similar to Fig. 8 but with the wall of the bag partially unrolled;

Fig. 10 is a diagrammatic view of the electrical circuits of the machine;

Fig. 11 is a sectional view on line XI—XI of Fig. 6;

Fig. 12 is a view in enlarged scale of a portion of the mechanism illustrated in Fig. 9;

Fig. 13 is a sectional view on line XIII—XIII of Fig. 6, and

Fig. 14 is a sectional view on line XIV—XIV of Fig. 6.

In the preferred form of the invention as illustrated in Figs. 2, 4 and 5, a novel bag is provided which has a flat circular bottom portion joined seamlessly around its periphery to a substantially cylindrical wall portion. The wall of the bag is adapted to be compressed by being rolled upon itself in a tight spiral toward the bottom so the wall assumes the form of an annular ring **101** with the bottom of the bag forming a diaphragm **103** across the ring. The bag is formed of flexible sheet material and when in its compressed condition, the wall is capable of being unrolled to its original shape forming a flat-bottomed cylindrical bag. When in its compressed condition, the bag is particularly suitable for automatic handling as in the novel machine presently to be described. While only one form of bag is illustrated it is to be understood that other forms could be utilized providing the wall of the bag is capable of being rolled upon itself to form a ring which may be subsequently unrolled.

For automatically handling the above described bag from its compressed condition to its unrolled condition suitable for containing materials loaded thereinto, the preferred form of machine comprises a magazine for supplying a number of compressed bags, a slide for transferring each bag from the magazine to a loading position, and a loading platform for lowering the bag bottom to cause the bag wall to unroll as the bag is being filled.

For mounting the various mechanisms of the machine and forming a box like structure, the machine is provided with a frame which comprises a base plate **10** (Fig. 1) having integrally secured thereto two upright end plates **12** which support at their upper ends an upper plate **14**. The plate **14**, as seen in Fig. 6, is provided with two large bores **16** and **18**, the purpose of which will presently appear. The under surface of the plate **14** has secured thereto concentric with the bore **18** the upper end of a cylindrical member **22** (Fig. 1), the lower end of which is fixed to the plate **10**, thus forming a smooth-walled well **26** which extends heightwise from the lower plate **10** through the bore **18** in the upper plate **14**, the inner wall of the well being of the same diameter and con-

centric with the bore 18. For leveling and adjusting the heightwise position of the frame, four leveling screws 28 are threaded into suitable bosses formed on the lower side of the plate 10.

For supporting and lowering the bottom of the bag while it is being filled, the machine is provided with a loading platform 30 (Figs. 6, 8 and 9) which is adapted to be moved heightwise within the well 26. The platform 30 is provided with three lugs 32 which extend radially from the platform through three slots 34 in the wall of the well 26. For supporting and moving the platform in heightwise directions, three vertical screws 36 having their axes parallel to the well are threaded through the lugs 32, the screws being supported at their lower ends against axial thrust and for rotation on the inner race of ball bearings 38 which are received in counterbores 40 in the lower plate 10 of the frame. The upper ends of the screws 36 are provided with pilots of reduced diameter which are received in bearing holes 42 in the upper plate 14 of the frame. One of the screws 36 has secured at its lower end a pulley 44 having two grooves 46 and 48, while the other two screws 36 have secured at their lower ends pulleys 50 alined with the lower groove 48 of the pulley 44. A belt 52 runs on the pulleys 50 and the groove 48 so that when the pulley 44 is driven the three screws 36 rotate in synchronized relation. To avoid belt slippage and thus prevent a loss of synchronization of the screws 36, the belt 50 is toothed. The pulley 44 and hence the three screws 36 are driven by a toothed belt 54 which runs on the upper groove 46 of the pulley 44 and a pulley 56 fixed on the lower end of a driven shaft 58 of a solenoid operated clutch 60. For rotating the screws 36 to raise or lower the platform 30, a reversible motor 62 is arranged to drive the shaft 58 at such times as the clutch 60 is energized in a manner subsequently to be described.

To ensure that the bottom of the previously described bag is carried downward by the platform 30, the upper surface of the platform is provided with two annular grooves 64 (Figs. 6 and 8) which communicate with a tube 66 through two passageways 68 in the platform and a conduit 70 which intercepts the passageways 68 and to which the tube 66 is connected. Thus, when the bag bottom diaphragm 103 is positioned on the upper surface of the platform, air is exhausted by a suitable vacuum pump (diagrammatically shown only in Fig. 10) through the tube 66 to hold the bag on the platform.

Cooperating with the platform 30 to position and hold the bag wall ring 101 so the wall will unroll as the platform is lowered, is a transfer slide 90 provided at opposite sides with rolls 92 (Figs. 11 and 13) which ride in grooves 94 formed in parallel guide bars 96 secured on the upper surface of the plate 14 of the frame. The slide 90 is provided with a bore 98 (Fig. 8) to accommodate the platform 30 and to provide access to the bag for filling. Concentric with the bore 98 and formed in the lower surface of the slide 90 is an annular groove 100 adapted to receive the wall ring 101 of the bag. As seen in Fig. 12, the lower surface of the slide 90 adjacent the groove is spaced above the plate 14 of the frame so that when the wall ring 101 is positioned in the groove 100, the bottom of the bag is accommodated freely in the space between the lower surface of the slide 90 and the upper surface of the plate 14, the clearance between the slide and plate being such that the wall ring 101 is confined in the groove 100, while the wall unrolls in the groove and slips out between the slide and the plate during the downward movement of the platform 30.

For loading a bag into the annular groove 100, the transfer slide 90 is arranged to be moved along the guide bars 96 from the position shown in Figs. 1 and 8 where it is alined with the loading platform 30 and the well 26 to a position where it is alined with a magazine 110. For moving the slide between these positions, the slide is provided with two depending pins 112 (Figs. 7, 11, and 13) which project downward from the slide 90 and through elongated slots 114 formed in the plate 14. At their lower ends the pins 112 are secured to two L shaped links 116 of chains 118 which run on idler sprockets 120 and driving sprockets 122. The sprockets 120 are carried by a shaft 124 which is parallel and extends transversely to the slide 90 and which is journaled in bearing members 126 secured to the underside of the plate 14. The sprockets 122 are fixed to a shaft 128 journaled in bearing members 130 also secured to the underside of the plate 14, the shaft 128 being fixed against axial movement by engagement of bosses on the sprockets 122 with the inner faces of the bearing members 130. The shaft 128 also has fixed thereto a pulley 132 which is driven by a belt 134 running from the pulley 132 to a pulley 136 fixed to an output shaft 137 of a speed reducer 138. An input shaft 140 of the reducer is connected to a driven shaft 142 of a solenoid operated clutch 144 having a driving shaft 146 connected to the reversible motor 62. Thus, when the clutch 144 is energized in a manner subsequently to be described, the slide 90 will be moved toward the magazine 110 by means of the speed reducer 138, pulleys 136, 132 and sprockets 122. The slide 90 is moved to the left as viewed in Fig. 6 until one of the pins 112 in the slide 90 contacts one end of a slide plate 160 having a slot 162 through which extends a shoulder screw 164 threaded into the underside of the plate 14, the plate 160 being adapted to slide within the limits of the slot 162. The plate 160 has depending at one end thereof an ear 166 having threaded thereinto an adjustable screw 168 adapted to engage a button 170 to close a switch 172 which, by means hereinafter described, causes the rotation of the motor 62 to be reversed. Reversal of the motor 62 causes the transfer slide 90 to be returned to its initial position alined with the loading platform 30 at which time the pin 112 of the slide 90 engages a slide plate 174 which is mounted on the plate 14 in the same manner as the plate 160 above described. The final return movement of the slide 90 acting through the slide plate 174 causes a switch button 180 (Figs. 6 and 11) to be depressed closing a switch 182, which by means subsequently to be described, causes the solenoid operated clutch 144 to be de-energized thus stopping the slide 90 in its initial position alined with the platform 30. When the slide 90 is at the opposite end of its movement as determined by closure of the switch 172, the bore 98 of the slide is axially alined with the magazine 110 at which time the ring 101 of a rolled bag is automatically inserted in the groove 100 and thereafter is carried by the slide 90 during its return movement to the loading position alined with and over the platform 30 and the well 26. To allow the slide 90 to be moved in its bag transferring cycle, the platform 30 is first caused to be lowered automatically until the upper surface of the platform clears the slide 90, the platform also being returned to its initial position in the bore 98 in the slide after the slide has positioned a rolled bag over the platform, and the bore 98 is alined with the platform.

To initiate the bag transferring cycle of the machine, the operator actuates a push button switch 312 which causes the motor 62 to rotate and the clutch 60 to be energized thus driving the screws 36 in a direction which lowers the platform 30. The platform is moved downward in the well 26 by rotation of the screws 36 until a cam 190 on one of the lugs 32 of the platform contacts a switch button 192 (Fig. 7) closing a switch 194. Closure of the switch 194 causes the clutch 60 to be de-energized thus stopping the movement of the platform 30, and causes the solenoid clutch 144 to be energized thus commencing the transfer cycle of the slide 90. When the movement of the pin 112 of the slide 90 closes the switch 182 at the end of its return movement as above described, closure of the switch 182, in addition

to stopping the movement of the slide 90 by de-energizing the clutch 144, also energizes the solenoid clutch 60. The motor 62 having been reversed for the return movement of the slide 90, continues to rotate in that direction and the energized solenoid clutch 60 drives the screws 36 in a reverse direction to raise the platform 30 until the cam 190 on the lug 32 of the platform contacts a switch button 196 (Fig. 7) closing a switch 200. Closure of the switch 200 causes the motor 62 to be stopped and the clutch 60 to be de-energized thus stopping the platform 30 in its initial position as shown in Fig. 8. The upward movement of the platform 30 after the slide 90 has transferred a bag to the loading position over the platform, causes the platform to engage the bottom diaphragm 103 of the bag and raise the diaphragm. By raising the bottom diaphragm of the bag, the platform also causes the ring 101 of the bag wall to unroll partially and slip out between the plate 14 and the slide 90. In this manner a bag is automatically transferred from the magazine to a position suitable for loading.

When it is desired to fill the bag positioned as above described, the operator again depresses the push button switch 312 causing the solenoid clutch 60 to be energized and the motor 62 to be rotated in the proper direction for rotating the screws 36 to lower the platform 30. During the bag loading cycle of the machine the switch 194 is rendered inactive, by means hereinafter described, so that the switch 194 is not effective at this time to cause reversal of the movement of the platform. The downward movement of the platform may be stopped at any position in the well 26 by the operator upon depression of a foot operated switch 316, the downward movement of the platform being resumed upon release of the switch. The platform continues to move downward carrying the bottom diaphragm 103 of the bag with it until the cam 190 on the platform lug 32 depresses a switch button 210 closing a switch 212, the air being evacuated from the tube 66 at this time to hold the diaphragm 103 on the platform while the platform is lowered. Closure of the switch 212 causes the rotation of the motor 62 to be reversed to raise the platform and the bag to its initial position at which time the cam 190 closes the switch 200 causing the motor to be stopped and the clutch 60 to be de-energized. During the downward movement of the platform and the bag, the wall ring 101 of the bag is unrolled in the groove 100 in the slide 90 the wall slipping out between the slide and the plate 14 to form a wall around the materials loaded on the bottom of the bag. In this manner the machine automatically handles a bag as it is filled, the bag progressively increasing in depth as it is filled under the complete control of the operator.

Thus it may be seen that the bag may be filled with material during its downward movement with the upper end of the bag never extending above the slide 90. When the bag is filled and the platform 30 is at its lowermost limit, the bag is automatically returned by the platform to an easily accessible position for removal, the air in the tube 66 at that time being returned to atmospheric pressure so the bag may be removed from the pltaform.

The magazine 110, adapted automatically to load a rolled bag into the groove 100 of the slide 90 when the groove is in alined position over the magazine, comprises a cylindrical container 220 (Fig. 1) having a flange ring 222 at its upper end and a base plate 224 at its lower end. The flange ring 222 is fixed to the upper end of the container and the base plate 224 has a counterbore 226 to receive the lower end of the container. The flange ring 222 has threaded thereinto the upper ends of three rods 228 which at their lower ends are secured to the base plate 224 by nuts 230. A platform 232 arranged for heightwise movement in the container 220 has formed thereon three lugs 234 which extend radially from the platform through elongated slots 236 in the wall of the container, the lugs having vertical bores 238 slideably riding on the rods 228. The platform 232 is urged upwardly in the container and along the rods 228 by spiral springs 239 (Fig. 14) secured at one end to spring casings 240 which are attached adjacent the rods 228 to the flange ring 222 by screws 242. The opposite ends of the springs 239 are detachably secured to hooks 244 on the lower ends of the lugs 234. The springs are so arranged that when the platform 232 is in its lowermost position the springs are unwound and exerting a greater force than when wound with the platform in its highest position. The container 220 of the magazine 110 is adapted to receive a number of rolled bags stacked upon each other with the lowermost bag resting on the platform 232. When the container is filled with rolled bags the platform 232 assumes its lowermost position. It should be obvious that the greater number of bags in the magazine, the lower will be the position of the platform 232 and the greater the force exerted by the springs 239 tending to raise the platform and the stack of bags. Thus as the bags are removed one at a time from the top of the stack of bags in the magazine the springs 239 raise the platform and the stack to maintain the uppermost bag at the top of the magazine.

Normally, the uppermost bag in the magazine is restrained against upward movement by engagement with the lower surface of the transfer slide 90, an unbroken portion of which normally extends over the magazine. As previously described, the slide 90, during a portion of its movement, moves to a position where the annular groove 100 in the slide is alined with the magazine 110. At this time, the uppermost bag in the magazine is moved upward by the springs 239 so that the wall ring 101 is received in the groove 100 which is of sufficient depth to receive only one bag. As the slide 90 returns to its initial position with a bag ring 101 in the groove 100, the next bag in the magazine is engaged by the undersurface of the unbroken portion of the slide 90. In this manner only one bag at a time is transferred by the slide 90 to loading position over the loading platform 30.

The magazine 110 is adapted to be removed as a unit from the machine for filling, and for this purpose a bracket 250 (Fig. 3) secured to the underside of the plate 10 is provided with a bore 252 which is axially alined with a bore 254 in the plate 10. The upper surface of the plate 10 has formed therein a counterbore 256 concentric with the bore 254, the counterbore being of sufficient diameter and depth to receive the head 258 of a pin 260. The bores 254 and 252 provide bearings for heightwise sliding movements of the pin. To move the pin 260 in heightwise directions to position or release the magazine, the lower end of the pin is of reduced diameter and has flats 262 formed thereon adapted to receive the forked end 264 of a hand operated lever 266. Constrained between a shoulder 268 on the pin and the upper side of the end 264 of the lever is a spring 270. By manually moving the opposite end of the lever 266 downward the pin is moved upward by means of the spring 270. The head 258 of the pin is adapted to engage the lower surface of the base plate 224 of the magazine when the magazine is placed on the plate 10. The flange ring 222 is provided at its upper side with a pilot 272 (Fig. 1) which is received in the bore 16 of the upper plate 14 of the frame when the magazine is moved upwardly by the lever 266 acting through the headed pin 260. The magazine 110 is moved upward by the lever 266 until the surface of the flange ring 222 adjacent the pilot 272 seats on the underside of the plate 14, further movement of the lever 266 serving merely to compress the spring 270. For maintaining the magazine in operating position with the flange ring against the plate 14, a latch 274 is provided to hold the lever 266 in its lower position. By releasing the latch 274 the lever 266 is released allowing the magazine to drop of its own weight to a position where it may be removed. For locating the

magazine so the pilot 272 can enter the bore 16, the base plate 224 of the magazine has parallel flats 280 formed thereon which are adapted to slide between two angle bars 282 secured to the upper side of the plate 10 of the frame. Another angle bar at right angles to the bars 282 is adapted to engage another flat on the base plate 224 thus accurately locating the magazine for entry of the pilot 272 in the bore 16. Thus, by releasing the lever 266 when the magazine 110 is empty of bags, the magazine may be easily removed from the machine for refilling. After refilling, the magazine may also be easily replaced and accurately positioned in the machine. So the platform 232 may be moved downward in the magazine to accommodate the rolled bags being loaded thereinto as the magazine is being refilled, the springs 239 are disconnected from the hooks 244 allowing the platform 232 to move freely downward. When the refilled magazine 110 is replaced in the machine the springs 239 are again connected to the hooks 244 to urge the platform 232 and the stack of bags upwardly towards the transfer slide 90.

The automatic operation of the machine is accomplished in two operator initiated stages, each stage being controlled by means of electrical circuits illustrated diagrammatically in Fig. 10. Before describing the circuits it should be noted that the closing of the various electrical circuits are controlled by multi-pole stepping relay switches A, B, C, D and E which are arranged to operate in unison due to their radial switching arms 199 being secured to a common shaft 300. For advancing the switching arms 199 step by step to each of their corresponding contacts, the shaft 300 has also fixed thereto a ratchet wheel 302 adapted to be rotated step by step by a pawl 304. The pawl 304 is pivotally secured to an armature 306 which is arranged to be moved in one direction by energization of a stepping relay coil 308, the pawl being moved in the opposite direction by a spring not shown. Thus, by energization of the coil 308, the movement of the pawl 304 rotates the ratchet wheel 302 one-eighth of a revolution to advance the switching arms 199 to the next contacts in the switches A, B, C, D and E, a suitable pawl preventing reverse movement of the shaft 300. The coil 308 is adapted to be energized by the closing of any one of switches 172, 182, 194, 200 and 212 which are arranged to close a circuit from a line wire L, wire *f*, relay switch 310, wire *g*, coil 308, and through any one of the switches 172, 182, 194, 200, 212 back to a line wire K. The circuit diagram illustrated in Fig. 10 shows the positions of the various electrical elements in their initial stopped position at which position the relay switch 310 is open thus preventing energization of the coil 308. Also, in stopped position the switching arms 199 are in engagement with the contacts A1, B1, C1, D1, and E1.

The operation of the machine will now be described together with the operation of the electrical system with reference to Fig. 10. In the initial position of the machine, the loading platform 30 is in its uppermost position level with the upper surface of a plate 15 overlying the machine and the position of the cam 190 on the platform lug 32 holds the switch 200 closed. To cause the machine to transfer a rolled bag from the magazine to the platform 30, the operator closes the push button switch 312 energizing a coil 314 by closing a circuit from the line wire L, wire *f*, coil 314 and the switch 312 back to the line wire K. Energization of the coil 314 closes the relay switch 310 to energize the coil 308 by closing a circuit from the line wire L, wire *f*, switch 310, wire *g*, coil 308 and switch 200 back to the line wire K. The latch 311 is effective at this time to hold the switch 310 closed. Energization of the coil 308 actuates the pawl 304 and ratchet wheel 302 to advance the stepping relay switching arms 199 to their second position to close the contacts A2, B2, C2, D2, E2 connecting these contacts to the line wire L through the switching arms.

The second positions of the switching arms start the motor 62 in clockwise rotation by closing a circuit from the line wire L, wire *h*, arm 199, contact A2, motor 62, wire *k*, and a normally closed foot switch 316 back to the line wire K. The second position of the arms also energizes and closes the solenoid clutch 60 by closing a circuit from line wire L, wire *h*, arm 199, contact B2, clutch 60, and wire *m* back to line wire K. Also in this position a coil 318 is energized by closing a circuit from line wire L, wire *h*, arm 199, contact E2, wire *n*, coil 318, and wire *p* back to the line wire K thus opening a relay switch 320 to render the switch 182 ineffective. Clockwise rotation of the motor 62 and closing of the clutch 60 drives the platform 30 down until the cam 190 closes the switch 194 to energize the stepping relay coil 308 moving the switching arms 199 to their third position closing the contacts A3, B3, C3, D3, E3.

The third position of the arms 199 causes continuation of the clockwise rotation of the motor 62 through the contact A3, opens the clutch 60, energizes and closes the clutch 144 through the contact B3, opens a relay switch 322 by energizing a coil 324 through contact D3, and continues to hold the switch 320 open through the contact E3. By opening the clutch 60, the platform 30 is stopped in a position below the transfer slide 90. Closure of the clutch 144 while the motor continues to rotate clockwise causes the transfer slide 90 to be driven to the left as seen in Fig. 6 until one of the driving pins 112 on the slide closes the switch 172 again energizing the stepping relay coil to advance the stepping switch arms 199 to their fourth position closing the contacts A4, B4, C4, D4, E4. At this time the position of the slide 90 is such that a rolled bag is loaded into the groove 100 from the magazine 110.

The fourth position of the arms 199 causes reversal of the rotation of the motor 62 through the contact A4, continues to hold the clutch 144 closed through contact B4, continues to hold the switch 322 open through the contact D4, but causes closure of the switch 320 by de-energizing the coil 318 thus rendering the switch 182 effective. Reversing the rotation of the motor 62 while holding the clutch 144 closed returns the transfer slide 90 with a bag carried thereby to loading position at which position the pin 112 of the slide closes the switch 182 to energize the stepping relay coil 308 thus moving the switching arms 199 to their fifth position closing the contacts A5, B5, C5, D5, and E5.

The fifth position of the arms 199 causes continuation of the reversed rotation of the motor through the contact A5, opens the clutch 144, closes the clutch 60 through the contact B5, and holds the switches 322 and 320 open through the contacts D5 and E5 respectively. Upon opening of the clutch 144 the transfer slide 90 is stopped in loading position. By closure of the clutch 60 while the motor continues to rotate in reversed direction, the platform is driven up to its initial position, the cam 190 being effective at this time to open the switch 194 and close the switch 200. Closure of the switch 200 once again energizes the stepping relay coil 308 to move the switching arms 199 to their sixth position closing the contacts A6, B6, C6, D6, and E6.

The sixth position of the switching arms energizes a coil 326 through the contact A6 to cause the latch 311 to retract and allow the switch 310 to open and de-energize the coil 308. At this position all other elements of the system are de-energized and the machine is stopped. During the upward return movement of the platform 30 the bag diaphragm 103 is engaged and moved up by the platform. The bag and machine are now in position ready for loading materials on the bag bottom and to start the second machine cycle for unrolling the bag as it is filled.

For commencing the second stage of the machine cycle during which the bag may be filled either manually or

automatically the operator again closes the push button switch **312** energizing the coil **314** to close the relay switch **310**. Closure of the switch **310** energizes the stepping relay coil **308**, the switch **200** being held closed at this time by the cam **190**. In this manner, the switching arms **199** are moved to their seventh position closing the contacts A7, B7, C7, D7 and E7.

The seventh position of the switching arms starts the motor **62** again but now in a clockwise direction through the contact A7, closes the clutch **60** through the contact B7, starts a vacuum pump **330** through the contact C7, opens the switches **322** and **320** through the contacts D7, and E7 respectively. Starting the vacuum pump **330** evacuates air from the tube **66** to hold the bag bottom diaphragm **103** on the platform **30** by suction applied to the diaphragm through the grooves **64** in the platform. Rotating the motor **62** clockwise and closing the clutch **60** drives the platform down in the well **26** together with the bag bottom diaphragm **103**. As the bag bottom moves down in the well the wall ring **101** unrolls in the groove **100** of the transfer slide and slips out between the slide and the plate **14** to form a wall around the materials loaded on the bottom diaphragm **103**. In this manner, the wall of the bag unrolls forming a cylindrical bag whose depth increases as the bag moves down in the well **26**. By opening the foot switch **316** in the motor circuit the downward progress of the bag and loading platform may be halted at any position in the well **26**. During the downward movement of the bag the well **26** serves to prevent diametrical spreading of the bag wall. When the platform **30** reaches its lowermost position the cam **190** closes a switch **212** energizing the stepping relay coil **308** to advance the switching arms **199** to their eighth position where the contacts A8, B8, C8, D8 and E8 are closed.

In this position of the switching arms the rotation of the motor **62** is reversed through the contact A8, the clutch **60** continues to be held closed through the contact B8, the vacuum pump **330** continues to operate through the contact C8, and the switches **322** and **320** are still held open through the contacts D8 and E8 respectively. In this manner the platform **30** is returned to its initial position by means of the motor **62** and the clutch **60** until the cam **190** closes the switch **200** energizing the stepping relay coil **308** to advance the switching arms **199** back to their initial position closing the contacts A1, B1, C1, D1 and E1. In this initial position the switch **310** is opened by being unlatched by energization of the coil **326** through the contact A1. Also in this position all other elements of the electrical system are de-energized and the machine is stopped with the unrolled and filled bag resting on the platform **30** at the level of the plate **15** where the filled bag may be removed. It should be noted that during the second stage of the machine cycle the switches **194** and **182** are rendered ineffective by the opening of the relay switches **322** and **320** respectively thus avoiding undesirable actuation of the stepping switch arms by these switches.

Having thus described the invention what we claim as novel and desire to secure by Letters Patent of the United States is:

1. In apparatus for packaging materials within a tubular bag closed at one end and initially having the wall thereof rolled upon itself in a spiral forming an annular ring at the closed end, means receiving and confining said ring thereby positioning the bag in a loading position to receive materials to be packaged, said receiving means being adapted to allow the ring to unroll while being confined, and means engaging the closed end of the bag and operable to move the closed end of the bag axially away from the confined ring thereby causing the ring to unroll and progressively form a wall around the materials received on the closed end of the bag.

2. In apparatus for packaging materials within a tubular bag closed at one end and initially having the wall thereof rolled upon itself in a spiral forming an annular ring at the closed end, means receiving and confining said ring thereby positioning the bag in a loading position for receiving materials to be packaged, said receiving means being adapted to allow the ring to unroll while confined, movable means engaging the closed end of the bag, and means for moving the movable means axially away from the ring confined in the receiving means as materials are loaded on the closed end of the bag thereby causing the ring to unroll and progressively form a wall around the materials received on the closed end of the bag, said moving means being arranged to return said movable means to its initial position.

3. In apparatus for packaging materials within a cylindrical flat-bottomed bag initially having the wall thereof rolled upon itself in a spiral to form an annular ring around the bottom, means receiving and confining said ring thereby positioning the bag in a loading position to receive materials to be packaged, said receiving means being adapted to allow the ring to unroll while being confined, movable means engaging the bottom of the bag, and means for moving the engaging means axially away from said ring confining means thereby causing the ring to unroll and progressively form a wall around the materials received on the bottom of the bag.

4. In apparatus for packaging materials within a compressed flat-bottomed cylindrical bag initially having the wall thereof rolled upon itself in a spiral to form an annular ring around the bottom, means receiving and confining said ring thereby positioning the bag in a loading position for receiving materials to be packaged, said receiving means being adapted to allow the ring to unroll while confined, movable means engaging the bottom of the bag, and means for moving the movable means axially away from said ring confining means as materials are loaded on the bag bottom thereby causing the ring to unroll and progressively form a wall around the materials received on the bag bottom, said moving means being arranged to return said movable means to its initial position.

5. In apparatus for packaging materials, a magazine for containing a plurality of compressed flat-bottomed cylindrical bags, each bag having its cylindrical wall rolled upon itself in a spiral to form an annular ring around the bottom, means for transferring one bag at a time from the magazine to a loading position, means receiving and confining the ring of said one bag in said loading position, said receiving means being adapted to allow the ring to unroll while confined, movable means engaging the bottom of said one bag, when in loading position, and means for moving the movable means axially away from said confining means as materials are loaded on the bag bottom thereby causing the ring to unroll and progressively form a wall around the materials loaded on the bag bottom.

6. In apparatus for packaging materials, a magazine for containing a plurality of compressed flat-bottomed cylindrical bags, each bag having its cylindrical wall rolled upon itself in a spiral to form an annular ring around the bottom, means for transferring one bag at a time from the magazine to a loading position, means receiving and confining the ring of said one bag in said loading position, said receiving means being adapted to allow the ring to unroll while confined, movable means engaging the bottom of said one bag, means for moving the movable means axially away from said receiving means as materials are loaded on the bag bottom thereby causing the ring to unroll and progressively form a wall around the materials loaded on the bag bottom, and means supporting the bag wall against diametrical spreading movement as the wall is unrolled.

7. In apparatus for packaging materials within a compressed flat-bottomed cylindrical bag initially having the wall thereof rolled upon itself in a spiral to form an

annular ring around the bottom, means receiving and confining said ring thereby positioning the bag in a loading position for receiving materials to be packaged, said receiving means being adapted to allow the ring to unroll while confined, movable means engaging the bottom of the bag, means for moving the movable means axially away from said ring confined in said receiving means as materials are loaded on the bag bottom thereby causing the ring to unroll and progressively form a wall around the materials loaded on the bag bottom, and means supporting the bag wall against diametrical spreading movement as the wall is unrolled.

8. A machine for handling tubular bags closed at one end and compressed by having the wall of each bag rolled upon itself to form an annular ring at the closed end thereof, means receiving the ring of a bag thereby positioning the bag in a position suitable for loading materials thereinto, said receiving means being adapted to confine the ring against bodily movement while allowing the ring to unroll, and means engaging the closed end of the bag and movable axially away from said ring receiving means as materials are loaded on the bag bottom thereby causing the ring to unroll and progressively form a wall around the materials loaded on the closed end of the bag.

9. A machine for handling tubular bags closed at one end and compressed by having the wall of each bag rolled upon itself forming an annular ring around the closed end thereof, a magazine for containing a plurality of compressed bags, means receiving the ring of one bag from the magazine and movable from the magazine to a loading position thereby transferring said one bag to said position, said means also confining the ring against bodily movement while allowing the ring to unroll, and means engaging the closed end of the bag when in said position and movable axially away from said ring receiving means as materials are loaded on the closed end of the bag thereby causing the ring to unroll and progressively form a wall around materials placed on the closed end of the bag.

10. A machine for handling cylindrical flat-bottomed bags which have been compressed by having the wall of each bag rolled upon itself forming an annular ring around the bottom thereof, a magazine for containing a plurality of compressed bags, means receiving the ring of one bag from the magazine and movable from the magazine to a loading position thereby transferring said one bag to said position, said means also confining said ring against bodily movement thereof while allowing said ring to unroll, means engaging the bottom of the bag in said position and movable axially away from said ring as materials are loaded on the bag bottom thereby causing the ring to unroll and progressively form a wall around materials placed on the bag bottom, and means confining the wall against diametrical spreading movement as the wall is unrolled.

11. A machine for handling cylindrical flat-bottomed bags which have been compressed by having the wall of each bag rolled upon itself forming an annular ring around the bottom thereof, a magazine for containing a plurality of compressed bags, a slide having an annular groove therein adapted to receive the ring of one bag from the magazine, means for moving the slide from the magazine to a loading position whereby the ring is confined in the groove and transferred to said position, the groove being adapted to allow the ring to unroll while confined against bodily movement in the groove, and means engaging and holding the bottom of the bag in said position and operable to move the bottom axially away from the ring as materials are loaded on the bag bottom thereby causing the ring to unroll and progressively form a wall around materials loaded on the bottom of the bag.

12. A machine for handling cylindrical flat-bottomed bags which have been compressed by having the wall of each bag rolled upon itself forming an annular ring around the bottom thereof, a magazine for containing a plurality of compressed bags, a slide having an annular groove therein adapted to receive the ring of one bag from the magazine, means for moving the slide from the magazine to a loading position whereby the ring is confined in the groove and transferred to said position, the groove being adapted to allow the ring to unroll while confined against bodily movement in the groove, a platform engaging the bottom of the bag in said position and operable to move the bottom axially away from the ring as materials are loaded on the bag bottom thereby causing the ring to unroll and progressively form a wall around materials loaded on the bottom of the bag.

13. A machine for handling cylindrical flat-bottomed bags which have been compressed by having the wall of each bag rolled upon itself forming an annular ring around the bottom thereof, a magazine for containing a plurality of compressed bags, a slide having an annular groove therein adapted to receive the ring of a bag from the magazine, means for moving the slide from the magazine to a loading position, whereby the ring is confined in the groove and transferred to said position, the groove being adapted to allow the ring to unroll while confined in the groove against bodily movement, a platform engaging the bottom of the bag in said position, vacuum means for holding the bag bottom on the platform, and means for moving the platform axially away from the ring confined in said groove as materials are loaded on the bag bottom thereby causing the ring to unroll and progressively form a wall around the materials loaded on the bottom of the bag.

14. A machine for handling cylindrical flat-bottomed bags which have been compressed by having the wall of each bag rolled upon itself forming an annular ring around the bottom thereof, a member having an annular groove therein adapted to receive the ring of a bag, the groove being adapted to allow the ring to unroll and to confine the ring against bodily movement from a position suitable for loading materials on the bottom of the bag, and a platform engaging the bottom of the bag and operable to move the bag bottom axially away from the ring as materials are loaded on the bag bottom thereby causing the ring to unroll and progressively form a wall around the materials loaded on the bottom of the bag, the platform also being operable to return to its initial position after the bag is filled.

15. A machine for handling cylindrical flat-bottomed bags which have been compressed by having the wall of each bag rolled upon itself forming an annular ring around the bottom of the bag, a member having an annular groove therein adapted to receive the ring of a bag, the groove being adapted to allow the ring to unroll and to confine the ring against bodily movement from a position suitable for loading materials on the bottom of the bag, a platform engaging the bottom of the bag and operable to move the bag bottom axially away from the ring as materials are loaded on the bag bottom thereby causing the ring to unroll and progressively form a wall around the materials loaded on the bag bottom, and a well adapted to receive the platform and bag for confining the wall against diametrical spreading movement as the wall is unrolled.

16. A machine for handling cylindrical flat-bottomed bags which have been compressed by having the wall of each bag rolled upon itself forming an annular ring around the bottom thereof, a magazine for containing a plurality of compressed bags, a slide having an annular groove therein adapted to receive the ring of a bag from the magazine, means for moving the slide from the magazaine to a loading position, whereby the ring is confined in the groove and transferred to said position, the groove being adapted to allow the ring to unroll while confined in the groove against bodily movement, a platform engaging the bottom of the bag in said position, and operator controlled means for moving the platform

axially away from the ring confined in said groove as materials are loaded on the bag bottom thereby causing the ring to unroll and progressively form a wall around the materials loaded on the bottom of the bag.

17. A machine for handling cylindrical flat-bottomed bags which have been compressed by having the wall of each bag rolled upon itself forming an annular ring around the bottom thereof, a magazine for containing a plurality of compressed bags, a slide having an annular groove therein adapted to receive the ring of a bag from the magazine, means for moving the slide from the magazine to a loading position, whereby the ring is confined in the groove and transferred to said position, the groove being adapted to allow the ring to unroll while confined in the groove against bodily movement, a platform engaging the bottom of the bag in said position, means for moving the platform axially away from the ring confined in said groove as materials are loaded on the bag bottom thereby causing the ring to unroll and progressively form a wall around the materials loaded on the bottom of the bag, and control means for effecting automatic operation of said slide moving means and said platform moving means.

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