

J. C. PETREA ET AL
BAG APPLYING MACHINE

Original Filed March 10, 1955

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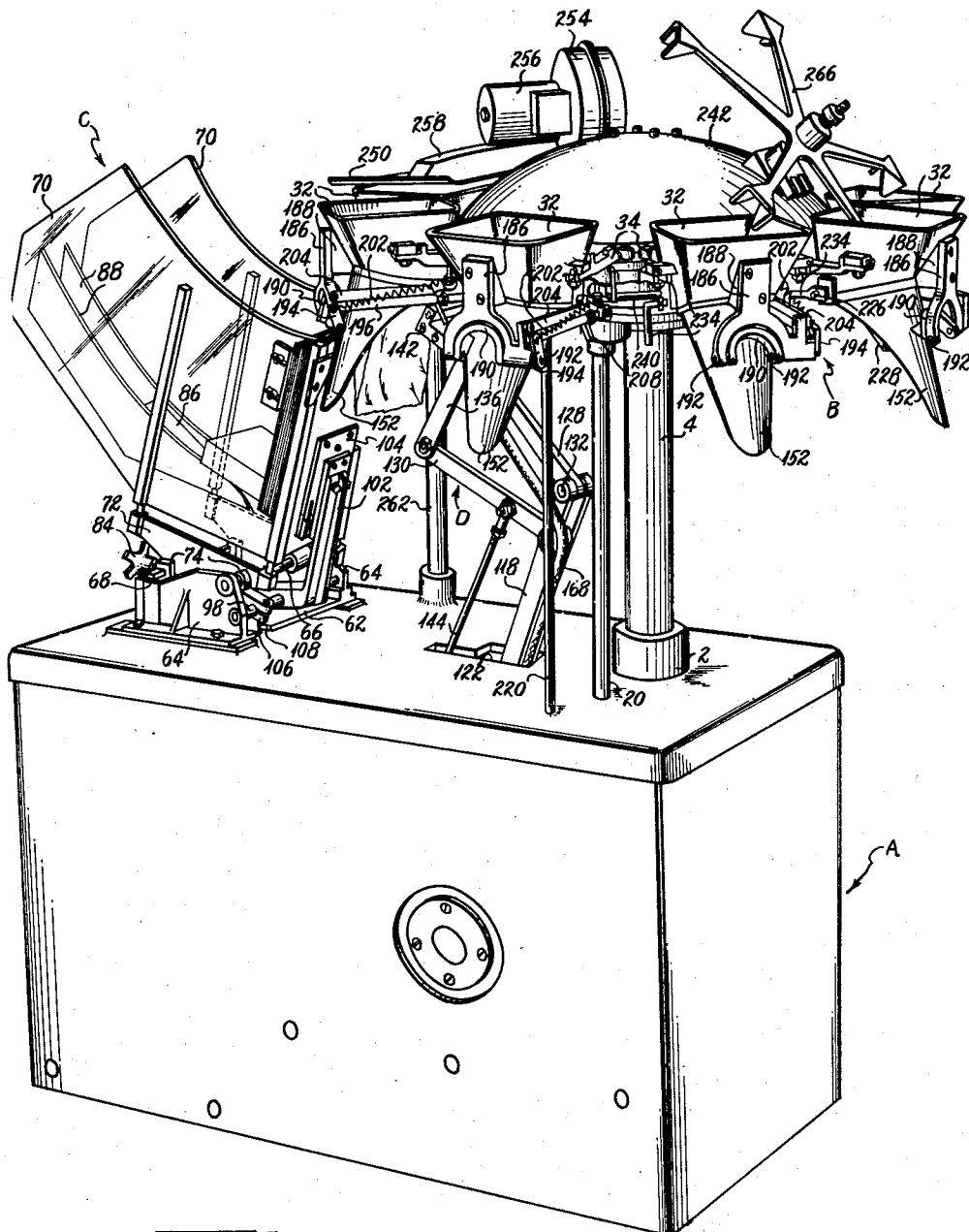


Fig. 1.

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2,833,097

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Fig. 2.

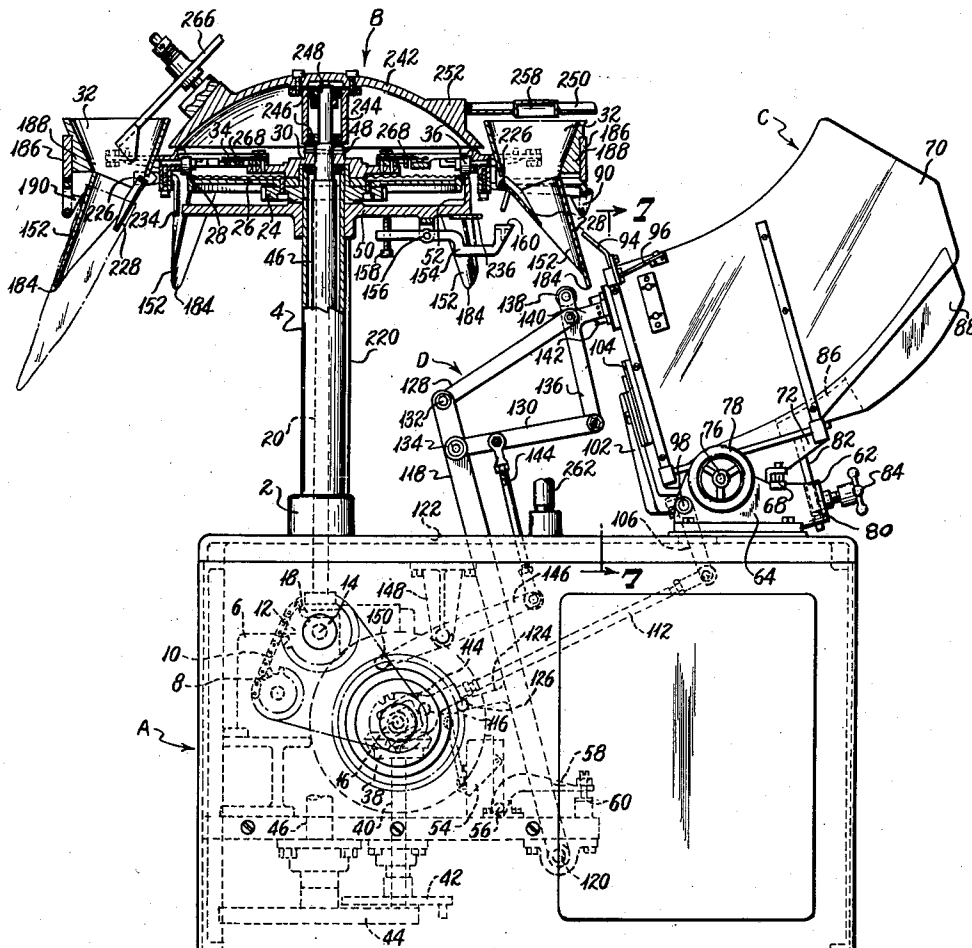
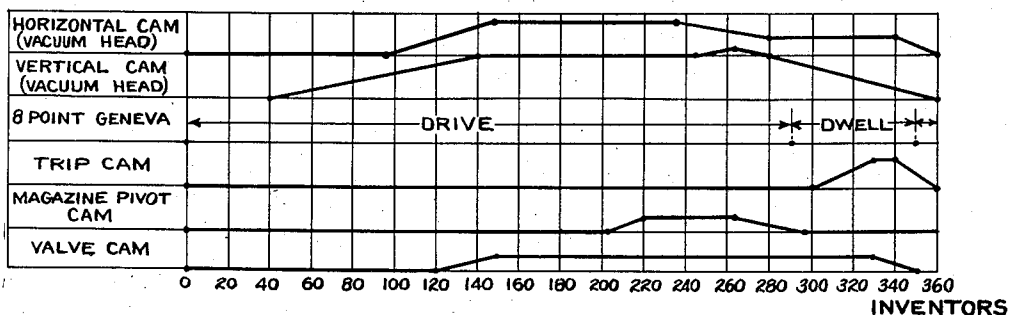


Fig. 10.

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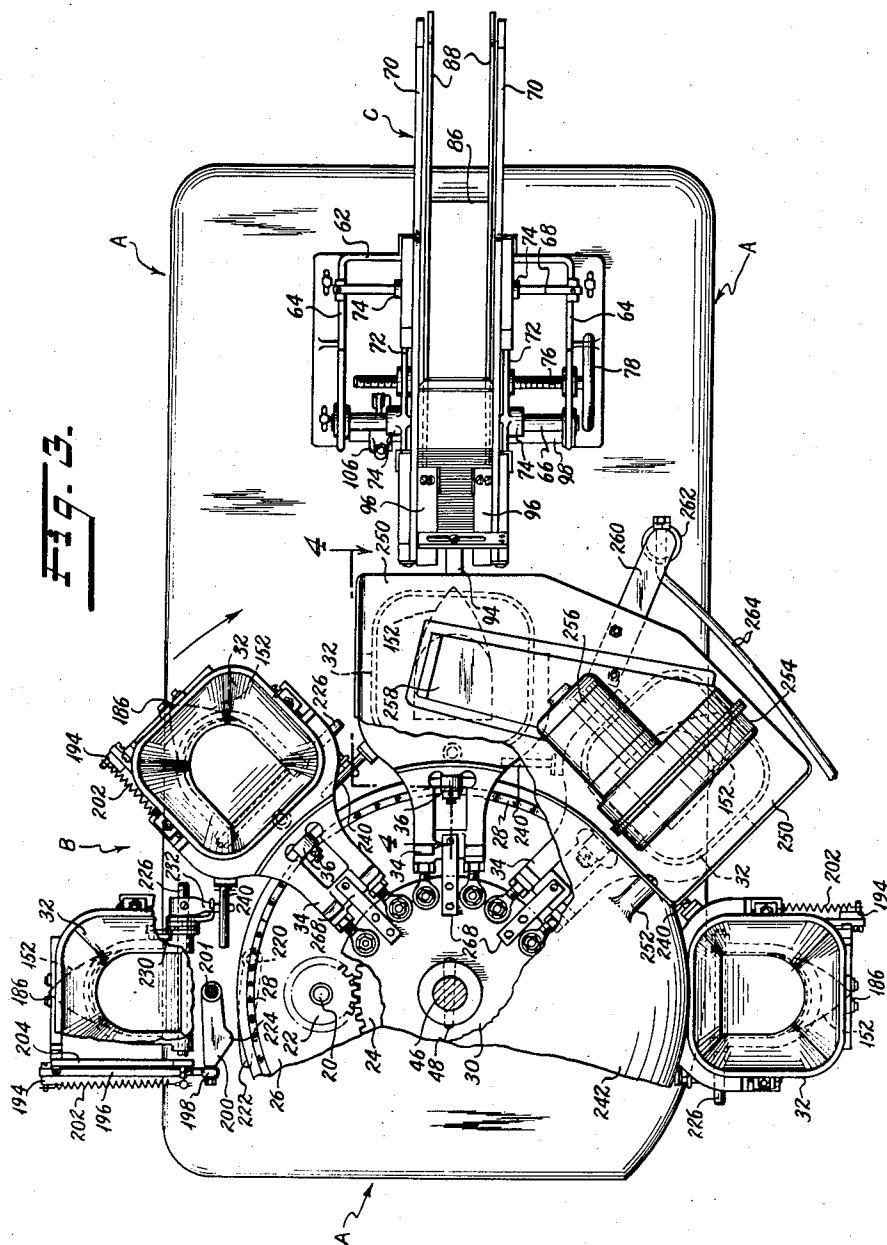
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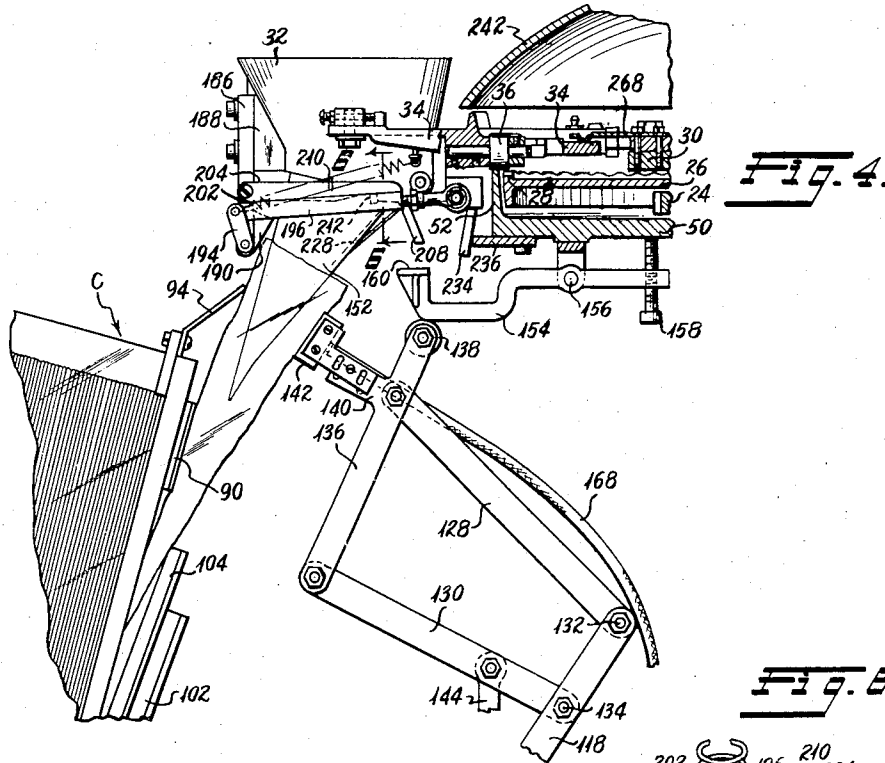


FIG. 6.

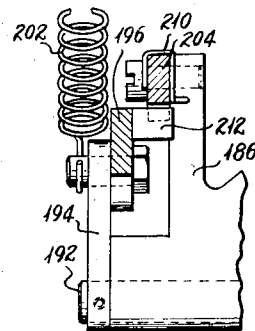
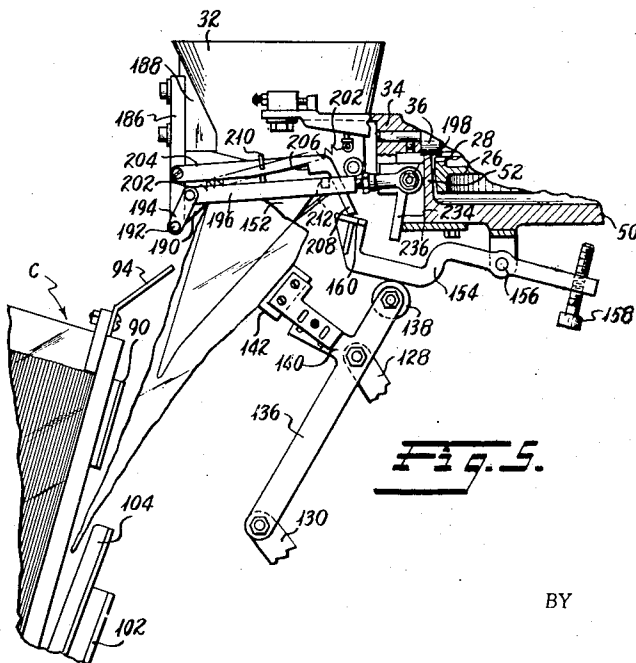


FIG. 5.

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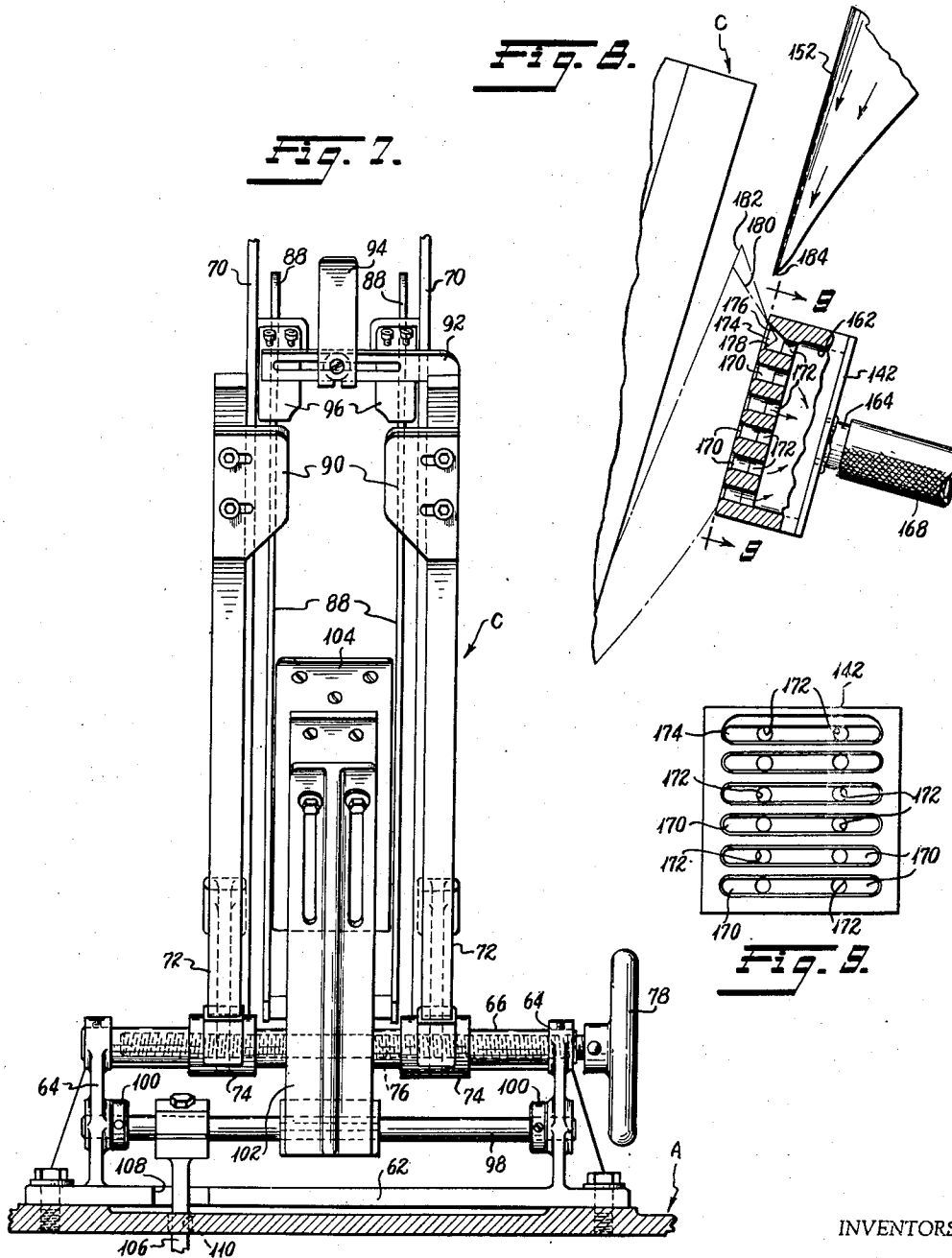
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BAG APPLYING MACHINE

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Original application March 10, 1955, Serial No. 493,505.
Divided and this application March 5, 1957, Serial No. 643,970

15 Claims. (Cl. 53—188)

This application is a division of the copending application of James C. Petrea and James W. Howe, Jr., Serial No. 493,505, filed March 10, 1955, for "Bag Applying and Filling Machine."

This invention relates to machines for taking one bag from a stack or supply of flattened bags and slipping the open end thereof over material-guiding funnels or chutes of a bag filling machine or other bag holding device. More particularly, the invention relates to a machine embodying novel bag magazine structure, novel bag gripping and applying mechanism, and novel means for clamping and opening a bag on the material delivery chute of a bag filling machine or the like.

In general, the machine shown and described herein includes a turret structure driven intermittently to position material delivery chutes, arranged on the periphery thereof, sequentially at successive predetermined stations. The machine includes a magazine for holding a stack of flattened bags to be filled and a gripper mechanism adapted to cyclically grip the foremost bag of the stack, withdraw it from the magazine and slip the open end of the bag over the end of a material delivery chute at the bag applying station and to then trip a bag clamping mechanism to securely clamp the bag to the chute for support during the bag filling operation at a subsequent station. The machine also includes air delivery means to direct a stream of air into a bag being applied to the filling machine to assist in opening the bag and to thereafter direct a stronger blast of air into the bag at a subsequent station to billow the bag to fully opened condition. The machine includes a drive means for intermittently rotating the turret carrying the chutes and for operating the bag gripping and applying mechanism in timed relation thereto. The machine further includes constantly driven mechanism for vibrating the bags and their supporting means during and after the filling operation and means thereafter releasing the bags for delivery to a conveyor or the like.

While the drawings and description herein are directed to a combined machine including both the bag supporting turret and the bag applying mechanism, it is to be understood that the invention is not limited thereto but that the novel features of the bag applying mechanism may be incorporated in a separate machine adapted to be used in conjunction with a similar or other bag filling mechanism.

It is therefore an object of this invention to provide a bag applying mechanism adapted to apply a bag to a material guiding chute and thereafter effect clamping of the bag to the chute.

Another object of this invention is to provide a novel bag gripping and applying mechanism arranged to partially fold one wall of a flattened bag, near its open end, to facilitate application of the bag over a supporting structure.

It is still another object of this invention to provide a novel suction-operated gripper for a flat bag to effect the above-noted objective.

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A further object of this invention is to provide a novel actuating mechanism for moving and guiding a bag gripper in a cyclical manner to withdraw successive bags from a magazine and sequentially apply them to successive bag supporting devices.

It is a still further object of this invention to provide a bag handling apparatus having a novel form of bag holding magazine.

Another further object of this invention is to provide a novel bag holding magazine having a movable front wall and means to move that wall outwardly in timed relation to withdrawal of a bag therefrom.

An additional object of this invention is to provide a novel arrangement for applying and partially opening a flattened bag.

Another additional object of this invention is to provide a novel method of gripping a flattened bag and applying the same to a bag supporting device.

Further and additional objects and advantages will become apparent to those skilled in the art as the description proceeds with reference to the accompanying drawings, wherein:

Fig. 1 is a perspective view of a bag applying and filling machine embodying the present invention;

Fig. 2 is a side elevational view of the machine shown in Fig. 1 but with certain parts shown in section;

Fig. 3 is a fragmentary top plan view of the machine of Fig. 1;

Figs. 4 and 5 are fragmentary side views, with parts shown in section, of a portion of the bag applying mechanism and bag filling machine showing the parts thereof in successive positions during a bag-applying cycle;

Fig. 6 is a fragmentary sectional view taken substantially along the line 6—6 of Fig. 4, but on an enlarged scale;

Fig. 7 is a fragmentary sectional view taken substantially along the line 7—7 of Fig. 2 and showing particularly the front of the bag holding magazine;

Fig. 8 is a fragmentary sectional view through the suction gripper of the present invention showing the manner of operation thereof to fold the front wall of the bag;

Fig. 9 is a face view of the suction gripper of Fig. 8, as viewed along the line 9—9 of Fig. 8; and

Fig. 10 is a timing diagram showing the sequence of operation of the principal cams and driving elements of the machine.

Referring first to Figs. 1 and 2, the machine comprises a base housing A having suitable drive mechanism housed therein and which will be described in detail later. The housing A supports a turret B of a bag filling machine, a bag holding magazine C, and bag applying mechanism D. The drive mechanism in the housing A includes means for cyclically operating the bag applying mechanism D to be described in more detail later. The turret B and its associated mechanisms is similar in many respects to the corresponding turret shown and fully described in the patent to Petrea, 2,691,476, and dated October 12, 1954. It is to be understood that the bag applying mechanism of the present invention may be constructed as a separate machine and used in conjunction with the bag filling machine of said Patent 2,691,476 or other similar machines.

The housing A is provided with a supporting boss 2 on its upper wall which secures a tubular support 4 in fixed relation to the housing A. A suitable drive motor 6 (Fig. 2) is mounted in the housing A and is provided with an output sprocket 8 driving a sprocket chain 10. The sprocket chain 10 is trained over a driven sprocket wheel 12 on shaft 14 and over a second driven sprocket wheel (not shown) on a cam shaft 16 journaled in the housing A. The sprocket wheel on cam shaft 16 is not fixed thereto but is connected to the driving member of a

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suitable 1-revolution clutch, the driven member of which is fixed to the cam shaft 16. The 1-revolution clutch is not shown or described herein since it may be any conventional or well-known clutch of that type suitable for the purpose, but is preferably provided with solenoid operated means to "trip" the clutch for one cycle of operation.

The shaft 14 drives, through bevel gears 18, to a vertical shaft 20 (see also Fig. 1) extending upwardly through the top of the housing A laterally of the tubular support 4. At its upper end the shaft 20 carries a pinion 22 (see Fig. 3) meshing with a gear 24 journaled on the outer surface of the tubular support 4. The gear 24 has a vibrator plate 26 fixed thereto and provided with an upstanding annular peripheral edge 28, the upper edge of which is of wavy or undulating configuration. Thus the vibrator plate 26 is continuously driven in rotation about the axis of the tubular support 4.

A turret hub 30 (Fig. 2) is journaled about the upper end of the tubular support 4 and supports a plurality of hoppers 32, circumferentially spaced therearound. Each of the hoppers 32 is mounted on an arm structure 34 pivotally supported at its inner end on the turret hub 30 in the manner fully described in Patent No. 2,691,476. Each of the arms 34 is provided with a roller 36 journaled thereon directly over the undulating edge 28 of the vibrator plate 26. The spacing of the undulations on the edge 28 is such that one of the rollers 36 rests on a crest of the flange 28 while an adjacent roller lies in a trough between crests. Since motor 6 continuously drives the shaft 20 and vibrator plate 26, rotation of the latter relative to the turret 30 and arms 34 will cause the latter to vibrate vertically and adjacent arms 34 and their associated hoppers 32 vibrate in out-of-phase relation to each other. That is, when one hopper is at its highest point, an adjacent hopper is at its lowest point.

The cam shaft 16, which is intermittently driven through the 1-revolution clutch, drives through bevel gears 38 to a shaft 40 having a Geneva driver 42 fixed to its lower end. The Geneva driver 42 drives a Geneva gear 44 fixed to the lower end of a shaft 46 extending upwardly through the tubular support 4. Adjacent its upper end the shaft 46 extends through the central portion of turret hub 30 and is keyed thereto by means of a through-pin 48. Thus every time shaft 16 rotates through one revolution, the Geneva gear 44 and turret 30 are driven through one rotational step. Since there are eight hoppers on the turret 30 to be successively positioned at each station of the machine, each actuation of the Geneva gear causes the shaft 46 and turret 30 to turn through $\frac{1}{8}$ of one complete turn and the turret remains stationary thereafter until the 1-revolution clutch is again tripped for another cycle of operation.

A generally circular horizontal plate 50 is fixed to supporting tube 4 immediately below the gear 24 and is thus held in fixed position on the machine. The plate 50 is provided with an upstanding flange 52 throughout a portion of its periphery, which flange extends upwardly above the upper surface of the crests on the vibrator flange 28. The upstanding flange 52 extends circumferentially about the periphery of the plate 50 through the bag discharging and bag applying and opening stations of the machine to engage and support the rollers 36 free of the vibrator at those stations. Thus continuous rotation of the vibrator flange 28 will have no effect on the rollers 36 and their associated hoppers 32 located at those particular stations.

The cam shaft 16 is provided with a plurality of cams to be described later and the housing A has mounted therein a brake comprising a brake shoe 54 engaging the periphery of one of the cams on shaft 16. The brake shoe 54 is supported from a rock shaft 56 having an arm 58 fixed thereto. A suitable adjustable spring means 60 urges the brake shoe 54 against the periphery of its cam to resist "coasting" of the cam shaft 16 after disengage-

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ment of the one-way clutch. In effect the brake 54 holds the turret in its successively indexed positions with the hoppers 32 at the required stations. The Geneva driver 42 and Geneva gear 44 are of conventional construction including the usual interengaging means to lock the gear 44 against rotation between driving cycles.

The bag-holding magazine C comprises a bracket structure 62 (Figs. 2, 3 and 7) mounted on the upper wall of the housing A and having upstanding side portions 64. A guide rod 66 extends between the upstanding portions 64 at the inner or forward ends thereof. A rear guide rod 68 extends across the space between the portions 64 and the guide rods 66 and 68 slidably support side walls 70 of the bag magazine. The side walls 70 are preferably of transparent material mounted on supporting plates 72 (see also Fig. 1) having transverse bearings 74 thereon slidably mounted on the respective guide rods 66 and 68. Between the guide rods 66 and 68 a transverse adjusting screw 76 is mounted for rotation in one of the upstanding portions 64 of the bracket 62 and threadedly engages each of the supporting plates 72. The portion of the adjusting screw engaging one supporting plate 72 is of opposite hand from that portion of the screw engaging the other supporting plate whereby rotation of the screw 76 causes the supporting plates, and consequently the side walls 70 of the magazine to move toward or away from each other along the guide rods 66 and 68 to effect width adjustment to accommodate bags of different widths. The arrangement is such that both side walls 70 are always equal distances from the longitudinal center line of the magazine. A hand wheel 78 is fixed to the adjusting screw 76 on the outer side of the upstanding portion 64 in which the screw 76 is journaled whereby the screw may be manually turned to readily adjust the width of the magazine.

The rear central portion of the bracket structure 62 is provided with a generally vertical socket 80 (see Fig. 2) slidably receiving a rod 82. A hand screw 84 is threaded through the bracket structure in position to engage the rod 82 to lock the same in any selected position of vertical adjustment in the socket 80. At its upper end the rod 82 carries a block 86 fixed thereto and to the sides of which bag supporting rails 88 are fixed. The bag supporting rails are provided with upper edges of downwardly and forwardly curved configuration to engage and support the bottom of a stack of bags arranged in the magazine between the side walls 70. The upper edges of the rails 88, engaging the bags at spaced points, offer very little frictional resistance to gravity feed of the stack of bags toward the front end of the magazine.

Referring now to Fig. 7, the front edge portions of the side walls of the magazine support inwardly extending ears 90, extending a short distance inwardly of the inner faces of the side walls 70 adjacent the upper edge of the magazine and one of the side walls 70 supports a transverse bracket 92 to which a guide finger 94 is adjustably fixed whereby the guide finger may be positioned centrally of the magazine in any position of adjustment of the side walls 70. The guide finger 94 is so directed that when the foremost bag of a stack is withdrawn from the front of the magazine and carried upwardly, it is deflected by the guide finger 94 toward the wall of an adjacent bag supporting chute (see also Fig. 2). The side walls 70 of the magazine further support hold down fingers 96 (see also Fig. 2) to insure that the tops of all bags in the magazine are positioned at the same level as the supply of bags moves forwardly.

A rock shaft 98 is journaled at its ends in the upstanding portions 64 of the bracket structure 62 and held in centralized position therebetween by collars 100 (Fig. 7). An arm 102 is fixed to the rock shaft 98 and extends forwardly and upwardly therefrom to a position in front of the open forward end of the magazine C. The arm 102 carries at its upper end a suitable plate 104 constituting a front end wall or closure for a portion of the

bag magazine. When in the position shown in Figs. 2 and 7, the plate 104 lies substantially in the plane of the open end of the bag magazine to support the stack of bags therein. Gravity acting on the supply of bags in the magazine forces them downwardly and forwardly into engagement with the inner face of the plate 104. A lever 106 is also fixed to the rock shaft 98 and extends downwardly therefrom through a slot 108 in the bracket structure 62 and an aligned slot 110 in the top wall of the housing A. At its lower end, within the housing A, the lever 106 is pivoted to one end of a link 112 (Fig. 2) having a fork 114 at its other end embracing a portion of the cam shaft 16. The fork 114 is also provided with a cam follower 116 engaging a cam groove in one face of a cam mounted on the shaft 16. The cam groove referred to is so configured that upon one rotation of the cam shaft, the lever 106 and rock shaft 98 are oscillated through a small angle to move the plate 104 forwardly away from the bags in the magazine C, and immediately thereafter to return the plate 104 to the position of Fig. 2, which is the position it assumes when cam shaft 16 is at rest after each cycle of operation.

A supporting lever 118 is pivoted, at 120, to a fixed position of the machine frame within the housing A and extends upwardly therefrom through a slot 122 (see also Fig. 1) in the top wall of the housing A. At a position opposite the cam shaft 16, the lever 118 is provided with a lateral extension 124 having a cam follower 126 at its extremity in position to engage a cam groove in the face of a cam (not identified) on the cam shaft 16. A pair of rearwardly extending links 128 and 130 are pivoted on spaced axes at 132 and 134, respectively, to the upper end portion of the lever 118. The rearmost ends of the links 128 and 130, respectively, are pivoted to a gripper support bar 136 which carries a roller 138 at its upper end and a forward extension 140 intermediate its ends. The extension 140 supports a suction gripper 142 to be described in detail later.

A link 144 is pivoted at its upper end to the link 130 rearwardly of the pivot 134 and extends downwardly through the slot 122 to a position within the housing A where it is pivoted to one end of a rock lever 146 which, in turn, is pivotally mounted, intermediate its ends, on a bracket 148 in the housing A. The other end of the rock lever 146 carries a cam follower 150 engaging a cam groove in a face of a further cam fixed to the shaft 16.

The cam grooves with which the cam followers 116 and 150 engage are so configured that, upon one complete revolution of the cam shaft 16, the levers 118 and 144 are actuated in timed relation to first draw the suction gripper 142 forwardly from the front end of the magazine C and then move that head upwardly and forwardly along the inner portions of the chutes 152 secured to the hoppers 32 on the turret 30. Continued rotation of the cam shaft 16 causes the head to move upwardly to an extreme upper position wherein roller 138 on the gripper support 136 engages a trip lever 154 and to thereafter move the gripper 142 downwardly and rearwardly back to the position shown in Fig. 2 at the end of one complete revolution of the shaft 16.

The trip lever 154 is pivoted, at 156, to a bracket secured to the fixed plate 50 and is provided with an adjusting screw 158 and a trip head 160. The right hand portion of the trip lever 154 (Fig. 2) is heavier than the portion on the other side of pivot 156 so that the lever is urged by gravity to move in a clockwise direction as seen in Fig. 2. The screw 158 may be adjusted to predetermine the position of rest of the trip lever 154.

The pivoted closure plate 104 at the front of the magazine C, previously described, is periodically oscillated by the shaft 98 to move away from the bags in the magazine. The cam on shaft 16 actuating link 112 to oscillate shaft 98 is so configured and positioned in relation to the cams operating the followers 116 and

150 that the plate 104 is swung outwardly away from the magazine for a short interval of time just after the gripper 142 starts to move away from the magazine and starts its upward movement. The withdrawal of the plate 104 from the foremost bag which is being withdrawn upwardly at that time by the suction head 142, relieves the foremost bag of the weight of the stack of bags in the magazine and thus facilitates its upward withdrawal. The ears 90 at least partially restrain the stack of bags in the magazine from "following" the plate 104. The inner face of the plate 104 is preferably covered with a suitable antifriction material such as polytetrafluoroethylene, commonly known by the trade name "Teflon". If desired, the Teflon facing may consist of a plurality of spaced vertical ribs to further reduce friction between the foremost bag and the closure 104. As clearly evident from Fig. 7, the closure 104 terminates at its upper end some distance below the upper portion of the magazine front so that the suction head 142 may engage the foremost bag above the closure 104. Upon withdrawal of the suction head 142 outwardly from the magazine the upper side edges of the bag are first pulled past the inwardly extending ears 90 and at about that time the closure 104 moves forwardly and then the bag is withdrawn upwardly by the mechanism already described.

Referring now to Figs. 8 and 9, the suction gripper 142 comprises a head having a chamber 162 therein and a nipple 164 leaving therefrom into communication with a tube 168 connected to a suitable source of vacuum (not shown). The application of vacuum to the chamber 162 is controlled by a valve (not shown) operated by the cam shaft 16 in timed relation to the cyclical movement of the gripper mechanism. The gripping face of the suction head 142 is provided with a plurality of transverse grooves 170 and openings 172 extending from the bottoms of the grooves into the chamber 162. The grooves 170 are relatively narrow and extend substantially across the face of the gripper head. The uppermost transverse groove 174 is considerably wider than the grooves 170 and is provided with an inwardly inclined upper face 176. The parts are so positioned and adjusted that the upper groove 174 of the suction head 142 moves into contact with the outer face of the front wall of the foremost bag in magazine C a short distance below the uppermost edge of that front wall. Upon the application of vacuum to the chamber 162, the grooves 170 effect a tight grip on the front face of the bag whereas vacuum applied to the groove 174, which is of substantial width, draws a portion of the bag wall downwardly into the groove, as shown at 178. This drawing in of a portion of the bag wall results in a partial folding of the front wall of the bag along a line generally parallel to its upper edge and turning the upper edge portion 180 inwardly toward the rear wall 182 of the bag. Because of the partial folding of the front wall of the bag, its uppermost edge is drawn downwardly relative to the uppermost edge of the rear wall 182 of the bag, leaving a portion of the inner surface of the rear wall of the bag exposed forwardly. As clearly evident from Fig. 8, after the bag has been gripped by the suction head and partially folded in the manner described, outward movement of the suction head 142 away from the magazine C causes the front wall of the bag to move outwardly away from the rear wall and then draws the entire top portion of the bag forwardly. The supporting rails 88 of the magazine C are so adjusted that the top edges of the bag walls are positioned at a predetermined level above the lowermost tip 184 of the chute 152 at the bag applying station (Fig. 8). Upon withdrawing the bag forwardly from the magazine (to the right as viewed in Fig. 8) the exposed inner face of the upper edge portion of the rear wall 182 engages the tip 184 of the chute 152 to restrain the rear wall against forward movement. Continued forward movement of the suction head 142 a short distance separates the front and rear walls

of the bag and the cams are so configured that the suction head then begins to move upwardly to slip the open end of the bag over the material guiding chute 152. Figs. 4 and 5 illustrate the relationship of the parts during the upward movement of the suction head 142.

Each of the chutes is of generally U-shape in horizontal section with the open side facing inwardly of the turret of the bag filling machine, the outer sides thereof presenting a continuous outer surface. Brackets 186 (Fig. 1) of generally inverted Y-shape are secured to bosses 188 on the outer sides of the hoppers 32 and pivotally support generally U-shaped bag clamps 190 on horizontal axes 192 at the lower extremities of the brackets 186. The pivotal support for one side of each clamp 190 extends through the corresponding leg of its bracket 186 and has a short lever 194 (see Figs. 4 and 5) fixed thereto and extending in an upward direction. A link 196 is pivoted to the upper extremity of each lever 194 and extends radially inwardly of the turret along one side of its associated funnel and chute. At their inner ends the links 196 are connected by means of a ball and socket joint 198 (see Fig. 3) to an end of a further lever 200 pivoted on a vertical axis 201 to the associated arm 34 which supports the hopper 32. A tension spring 202 is anchored at one end to the arm 34 and at its other end to the upper extremity of lever 194 whereby the spring 202 tends to move the upper or bight portion of the bag clamp 190 inwardly to the adjacent surface of the chute 152. A latch 204 is pivoted to the bracket 186 and is provided with a detent shoulder 206 (Fig. 5) and a downwardly extending inner extremity 208. A spring 210, suitably anchored in the bracket 186, bears on the latch 204 to urge that latch downwardly. The link 196 is provided adjacent its inner end with a laterally extending abutment 212 below the lower edge of the latch 204 (see Fig. 6).

With the parts in the position shown in Fig. 4, the bag clamp 190 is swung to its outer position against the tension of spring 202 sufficiently to position the abutment 212 on link 196 outwardly of the detent shoulder 206 on latch 204 and the latch is held downwardly by spring 210 to hold its detent shoulder 206 behind the abutment 212 and hold the bag clamp 190 in retracted position away from the surface of chute 152.

As the suction gripper 142 moves upwardly to the position of Fig. 5, the roller 138 on the gripper support 136 engages trip lever 154 and pivots the outer end of the same upwardly to the position of Fig. 5 when the suction head 142 reaches its uppermost position. In this uppermost position the bag has been slipped over the chute 152 to the full desired extent. As the lever 154 approaches the position of Fig. 5 its trip head 160 engages the downwardly extending end portion 208 of the latch 204 and swings the latch itself upwardly to remove detent shoulder 206 from engagement with abutment 212 and thus release the link 196 and bag clamp 190 to the action of spring 202 whereupon the bag clamp 190 is swung to the position of Fig. 5 to engage and securely clamp the rear wall of the bag against the outer face of the chute 152. The suction is then cut off from tube 168 and the suction head 142 continues its cyclic movement back to its starting position and releases trip lever 154 to its normal position (as shown in Fig. 2) but the lowermost edge of the latch 204, inwardly of detent shoulder 206, merely drops onto the upper surface of the abutment 212 and is ineffective to release the bag clamp 190.

Following application of a bag to the chute 152 as described, the turret is indexed to successive stations where the bag is filled and vibrated and ultimately reaches the discharge station shown at the top of Fig. 3.

The cam shaft 16 is provided with a further actuating cam and suitable linkage (not shown) effective once during each cycle of operation to oscillate vertical shaft

220 (see Figs. 1 and 3) extending upwardly through the upper wall of housing A to a position adjacent the lever 200 (Fig. 3) at the bag discharging station. The shaft 220 carries a release lever 222 fixed to its upper end and projecting laterally therefrom at the same level as lever 200. As each chute 152 reaches the discharge station with the bag thereon in filled condition, the cam shaft 16 operates to rock shaft 220 in a clockwise direction as seen in Fig. 3 through a sufficient angle to cause the lever 222 thereon to engage projection 224 of lever 200, and swing lever 200 in a clockwise direction about its pivot 201 and push link 196 outwardly to the position of Fig. 4. The described outward movement of link 196 results in releasing bag clamp 190 and permitting the filled bag to drop from the chute to a suitable receiving means and also moves abutment 212 outwardly a sufficient distance for latch 204 to move downwardly to position its shoulder 206 against the inner face of abutment 212 and thus latch the bag clamp 190 in its released position.

Referring now particularly to Figs. 2 and 3, the chutes 152 have been described of generally U-shape in horizontal section with the open sides facing inwardly of the turret. At the upper ends of the chutes 152 and adjacent the juncture between the chutes and their associated hoppers 32, a transverse shaft 226 is journaled to extend across the open side of each chute 152 and fixed to that shaft between the sides of the chute is a bag spreader member 228. A suitable torsion spring 230 (Fig. 3) surrounds a portion of the shaft 226 outside the chute 152 and bears at one end against an arm 232 fixed to and extending inwardly from one end of the shaft 226, the other end of the spring 230 being anchored to a portion of the hopper 32. The spring 230 normally rocks the shaft 226 and bag spreader 228 counterclockwise as seen at the left side of Fig. 2 to the position shown there wherein the lower end of the spreader is swung inwardly toward the center of the turret to engage the inner face of the inner wall of a bag on the chute 152 and to spread the open end of the bag to fully open condition. The spreader 228 is in the form of a plate extending substantially all the way across the open side of chute 152 and thus assists in guiding material from hopper 32 into the open end of a bag. The arm 232 fixed to the shaft 226, and against which the spring 230 acts, is provided with a downwardly directed terminal portion 234 (see also Figs. 4 and 5). The stationary plate 50 of the machine is provided with a cam plate 236 fixed to its lower edge and extending radially outwardly at the bag applying station in position to engage the downwardly extending terminal portion 234 of the arm 232 to swing the shaft 226 counterclockwise as seen at the right hand side of Fig. 2 to swing the spreader inwardly of the sides of chute 152, to the position shown in Fig. 4. In this inner position the spreader 228 does not interfere with application of a bag to the chute. As stated, the cam plate 236 is positioned at the bag applying station and may extend to the bag release station shown at the top of Fig. 3 but terminates immediately below the bag applying station as viewed in Fig. 3. Thus, when the turret is indexed to move a chute 152 clockwise as seen in Fig. 3 out of the bag applying station, the downward extension 234 of arm 232 passes off the end of cam 236 and the spreader is thus released to the action of spring 230. Spring 230 then swings the lower end of the spreader toward the center of the turret to engage and spread the open end of the bag just then applied to the chute 152.

As described earlier, the upwardly extending flange 52 of stationary plate 50 extends upwardly above the upper edge of the vibrator 28 throughout certain of the stations of the machine. Those stations are the bag release station shown at the top of Fig. 3 and the next three stations shown in that figure extending clockwise from the

bag releasing station. In other words, the hoppers 32 and chutes 152 are not vibrated at the releasing station and vibration is not imparted thereto until the hopper has passed through the bag filling station and the station immediately thereafter. After the hoppers pass the station immediately following the bag applying station, they enter the bag filling station shown at the bottom of Fig. 3 and prior to reaching that station, the rollers 36 move off the cam 52 and are lowered to the undulating periphery of the vibrator disc 26. Since that disc rotates constantly, the hoppers and chutes are vertically vibrated while positioned at the filling station and at stations subsequent thereto. As best shown in Fig. 3, each arm 34 is provided, on the side opposite its spreader actuating arm 232, with a fixed rod 240 extending toward the adjacent arm 34 and over the arm 232 associated with the spreader on that adjacent arm. The hopper 32 at the filling station and the hopper immediately in advance thereof (not shown in Fig. 3) are, therefore, both being vibrated by the vibrator 28 and, as previously described, adjacent hoppers vibrate vertically in out-of-phase relation. The arms 232 on spreader shafts 226 and the rods 240 are so related that an arm carrying a rod 240 is moving downwardly at the same time an adjacent hopper is moving upwardly so that the rod 240 engages arm 232 to oscillate the spreader actuated thereby through a small angle and to permit return of the spreader on the second half of the cycle of vibration. In this manner the spreaders 228 are vibrated in oscillation about the axes of their shafts 226 to impart vibration to the walls of the bags being filled to assist in "settling" material already deposited or being deposited therein. Each of the hoppers 32 is vibrated vertically by vibrator 28 and their spreaders are vibrated in oscillation throughout the entire time a hopper is at the filling station and in transit between stations from the filling station to the station immediately in advance of the discharge station shown at the top of Fig. 3, thus assuring proper settling of all material in the bag.

Referring now to Fig. 2, a hood 242 of generally spherical configuration is provided with a central hub 244 supported by bearings 246 on an upward extension 248 of the turret drive shaft 46. The upper end of the drive shaft extension 248 bears against the inner surface of the hood 242 to provide a vertical support therefor while the bearings 246 maintain the hood in centralized position over the turret and in predetermined vertical position. An air baffle 250 is secured to bosses 252 on the hood 242 and closely overlies the upper open ends of the hoppers 32 at the bag applying station and at the station immediately thereafter (see Fig. 3). A blower 254 driven by a motor 256 is mounted on the baffle 250 immediately over a hopper at the station between the bag filling station and the bag applying station and is arranged to direct air delivered by the blower downwardly through the baffle 250 into a hopper therebelow to billow and fully expand the bag mounted on the associated chute 152. The outlet of the blower 254 at the billowing station is connected by a passageway 258, formed in the baffle 250, with the space above the hopper 32 at the bag applying station. It will be recognized that air delivered by the blower into a bag at the billowing station will develop some back pressure at the discharge of the blower 254 and that back pressure causes some of the air to travel along passageway 258 into the hopper at the bag applying station and downwardly through its associated chute 152. This rather gentle stream of air at the bag applying station assists the suction gripper 142 in opening and applying a bag to the chutes at the bag applying station. A bracket 260 (Fig. 3) is fixed to the baffle 250 and extends outwardly therefrom to an upstanding brace or rod 262 (see also Fig. 1) to which it is secured. The rod or brace 262 is fixed to the upper wall of the housing A and, through its attachment to bracket 260, baffle 250 and hood 242, acts to retain hood

242 against rotation with turret drive shaft 46 and thereby maintains the baffle 250 at all times over the bag applying and bag billowing stations. The rod 262 has affixed thereto a guide rod 264 extending a short distance generally concentrically about the axis of the turret outwardly of the chutes 152 and somewhat therebelow. As the blast of air is directed into a bag clamped to a chute 152 at the billowing station, its pressure tends to swing the bag outwardly about an axis defined by the point of engagement of the bag clamp 190 and the bag. The function of the guide rod 264 is to prevent such swinging movement and maintain the bag being billowed against such outward movement and in the desired position on its chute.

A star wheel 266 is rotatably mounted on the hood 242 and its legs enter and are driven by the hoppers 32 as the turret rotates to insure passage of all material deposited in the hoppers downwardly through the chutes into the bags. The structure and operation of the star wheel 266 is fully and completely described in Patent No. 2,691,476. The turret hub 30 is further provided with cantilever springs 268 (see Figs. 2 and 3) fixed thereto and extending over and bearing on portions of the arms 34. The springs 268 thus act to resiliently maintain the rollers 36 in contact with the vibrator 28 or the cam flange 52, as the case may be.

In operation, the machine of the present invention is intended to be used in combination with a suitable weighing or measuring machine arranged to weigh or measure a predetermined quantity of material and to sequentially deliver weighed quantities to the hopper 32 at the bag filling station of the present machine. The solenoid previously described as controlling operation of the 1-revolution clutch on cam shaft 16 may be under the control of the weighing or measuring machine so that completion of a weighing cycle and delivery of a weighed or measured quantity of material to a hopper 32 at the bag filling station results in actuation of the solenoid to engage the 1-revolution clutch for a single cycle of operation. During a single rotation of the cam shaft 16, each hopper 32 is moved one step forward to the next succeeding station. As the bags are filled they are vibrated and conducted past the star wheel 266 to insure movement of all the weighed material into the bag. As each filled bag reaches the bag release station, the shaft 220 is operated, as previously described, to release the bag clamp 190 and permit the filled bag to drop from the chute 152 at that station into or onto a suitable receiving means and at the same time move bag clamp 190 sufficiently far from its associated chute 152 to permit latch 204 to hold the bag clamp in retracted position. As the hopper and chute move to the next station, the associated bag expander 228 is withdrawn by the action of cam 236 and the hopper is thereafter moved to the bag filling station during the succeeding indexing step. After reaching the bag filling station, continuation of the same cycle of operation of cam shaft 16 causes suction to be applied to gripper 142 and causes the bag applying mechanism to withdraw a bag from magazine C, in the manner described, and apply that bag to the chute 152, in the manner described. Thereafter the chute carrying the applied bag is positioned at the billowing station where its bag is blown to fully open condition and the chute is thereafter moved to the filling station.

While a single specific embodiment of this invention has been shown and described herein, it is to be understood that other embodiments may be resorted to within the scope of the appended claims.

We claim:

1. In a bag applying machine wherein open-ended material guiding chutes are sequentially positioned at a bag applying station; a bag applying member at said station and having means thereon for gripping one wall of a bag, said bag applying member being mounted for movement along a predetermined path at said station to slip the open end of a bag gripped thereby over the open end of said chute, clamping means movably mounted on said chute

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for clamping a bag thereto, said clamping means being in retracted position, and clamp actuator means responsive to movement of said member to bag applying position to actuate said clamping means to bag clamping position.

2. A machine as defined in claim 1 wherein said clamping means comprise a clamp element mounted on said chute for movement toward and from an external surface thereon, resilient means urging said clamp element toward said surface to clamp the wall of a bag therebetween, and latch means holding said clamp element retracted from said surface, said clamp actuator means being positioned in the path of movement of said bag applying member to be moved thereby and to release said latch and permit said clamp element to move to said surface.

3. A machine as defined in claim 1 wherein said chutes are sequentially moved through a bag releasing station before being positioned at said bag applying station, release means at said bag releasing station for moving said clamping means to said retracted position to thereby release a filled bag from said chute.

4. A machine as defined in claim 2 wherein said chutes are sequentially moved through a bag releasing station before being positioned at said bag applying station, and release means at said bag releasing station for moving said clamp element away from said surface to thereby release a filled bag from said chute and to activate said latch means to thereafter hold said clamp in retracted position.

5. A machine as defined in claim 2 wherein said clamp actuator means comprises a member movably mounted on said machine at said bag applying station, a portion thereof being engageable with said latch means to release the same when said clamp actuator means is moved by said bag applying member.

6. In a bag applying machine wherein open-ended, downwardly directed material guiding chutes are sequentially positioned at a bag applying station; means holding a supply of flattened open-ended bags at said station with the open ends thereof uppermost and closely adjacent the lowermost end of a chute at said station, a gripper adapted to grip the outer wall of the foremost bag of said supply adjacent the open end thereof, said gripper including means for partially folding the outer wall of said bag to move the upper edge thereof downwardly while leaving the rear wall of said bag projecting upwardly thereabove, and means mounting said gripper for movement to withdraw a gripped bag from said supply and move the same along such a path as to engage the inner face of said upwardly projecting wall with one side of the lower end of a chute at said station and then upwardly to position said bag around said chute.

7. A machine as defined in claim 6 wherein said gripper comprises a suction head having suction-responsive means thereon for partially folding said outer wall.

8. A machine as defined in claim 6 wherein said means for partially folding said outer wall is arranged to draw a portion thereof, adjacent said upper edge, away from said rear wall and to partially fold said portion to direct the upper edge of said outer wall toward the inner face of said rear wall.

9. In bag handling apparatus wherein successive bag holding devices are sequentially moved through a bag applying station and a bag billowing station, means at said bag applying station for removing a flattened bag from a supply and for at least partially opening said bag and applying it to a bag holding device, means at said bag billowing station for directing a stream of air into a partially opened bag on a holding device at said billowing station for billowing said bag to fully open condition, and means for diverting a portion of said stream of air from said billowing station to said applying station to assist in partially opening a bag being applied to the holding device at said applying station.

10. In a bag applying and filling machine, indexing means for supporting and sequentially moving successive bag holding devices through a plurality of stations including a bag applying and a bag filling station, said bag hold-

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ing devices each comprising a downwardly extending chute of generally U-shape in horizontal section and adapted to extend into the mouth of a bag, means for clamping a bag wall against the outer face of the closed side of said chute, a bag expander pivoted to said chute and arranged to swing to a position within said chute or to swing outwardly through the open side thereof to expand a bag thereon, means normally urging said expander to move outwardly to bag expanding position, means at said bag applying station for holding said expander in retracted position but operable upon movement of said holding device out of said applying station to release said expander to move to bag expanding position, and shaking means at said bag filling station for relatively rapidly oscillating said expander through a small angle about its pivot to vibrate the walls of a bag on its associated holding device.

11. A machine as defined in claim 10 wherein said bag holding devices are mounted on said indexing means for independent vertical vibration, said shaking means comprising means for vertically vibrating said bag holding devices in out-of-phase relation, and cooperating means on the bag holding device at said filling station and an adjacent bag holding device for oscillating the expander at said filling station in response to said out-of-phase vibration of said bag holding devices.

12. In a bag applying and filling machine, a rotatable turret, circumferentially spaced bag holding devices mounted for vibration on said turret, indexing means for rotating said turret to successively position said bag holding devices at each of a plurality of stations, means at one of said stations for cyclically removing bags from a supply and applying said bags to a bag holding device at said one station, a cam shaft, cam means on said shaft for operating said bag applying means, said indexing means comprising a Geneva drive driven by said cam shaft, power means, continuously operating means, driven by said power means, for continuously vibrating said bag holding devices at certain of said stations, and means, including a one-revolution clutch, for driving said cam shaft from said power means whereby said turret indexing means and bag applying means may be selectively operated through one cycle of operation.

13. In a method of opening a flattened open-ended bag for insertion therein of a bag holder, the steps of: gripping a portion of the front wall of a flattened bag in a zone adjacent but spaced from the open end thereof, drawing the gripped portion away from the rear wall while folding that portion between the gripped portion and the open end inwardly toward the rear wall to draw the open end edge of said front wall inwardly of and to expose the inner face of the corresponding edge portion of the rear wall, moving said bag to engage said exposed inner face of the rear wall with an end portion of the bag holder, and drawing the gripped front wall of said bag away from said rear wall to open said bag.

14. In a method of opening a flattened open-ended bag for insertion therein of a bag holder, the steps of: applying vacuum to a limited area of the outer face of the front wall of said bag, adjacent to but spaced from the open end thereof, to draw said area of said front wall away from the rear wall of said bag, and holding a portion of said front wall, between said area and said open end, against movement away from said rear wall whereby the portion of said front wall between said area and said open end is folded toward said rear wall and exposes the inner face of the open end edge thereof, moving said bag to engage said exposed face with an end portion of the bag holder, and drawing the front wall of said bag away from said rear wall to open said bag.

15. In a bag applying machine having a bag holding member therein; a bag applying member having means thereon for gripping one wall of a bag, said bag applying member being mounted for movement along a predetermined path to slip the open end of a bag gripped thereby

over an end of said bag holding member, clamping means movably mounted on said bag holding member for clamping a bag thereto, said clamping means being in retracted position, and clamp actuator means responsive to movement of said bag applying member to bag-applying position to actuate said clamping means to bag clamping position.

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