

June 13, 1961

L. J. NOWAK, JR

2,987,863

BAG OPENER

Filed June 6, 1958

7 Sheets-Sheet 1

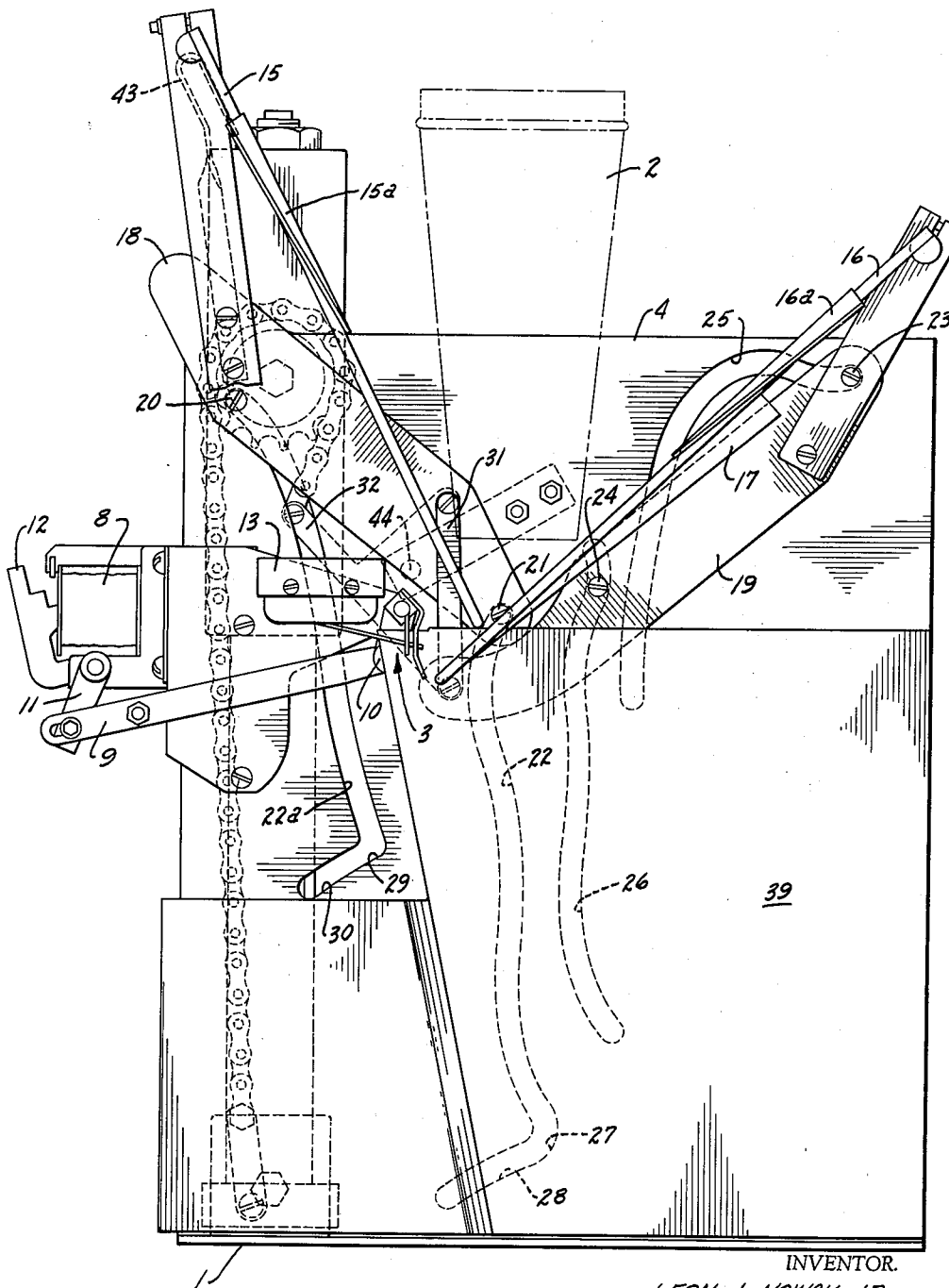


fig. 1.

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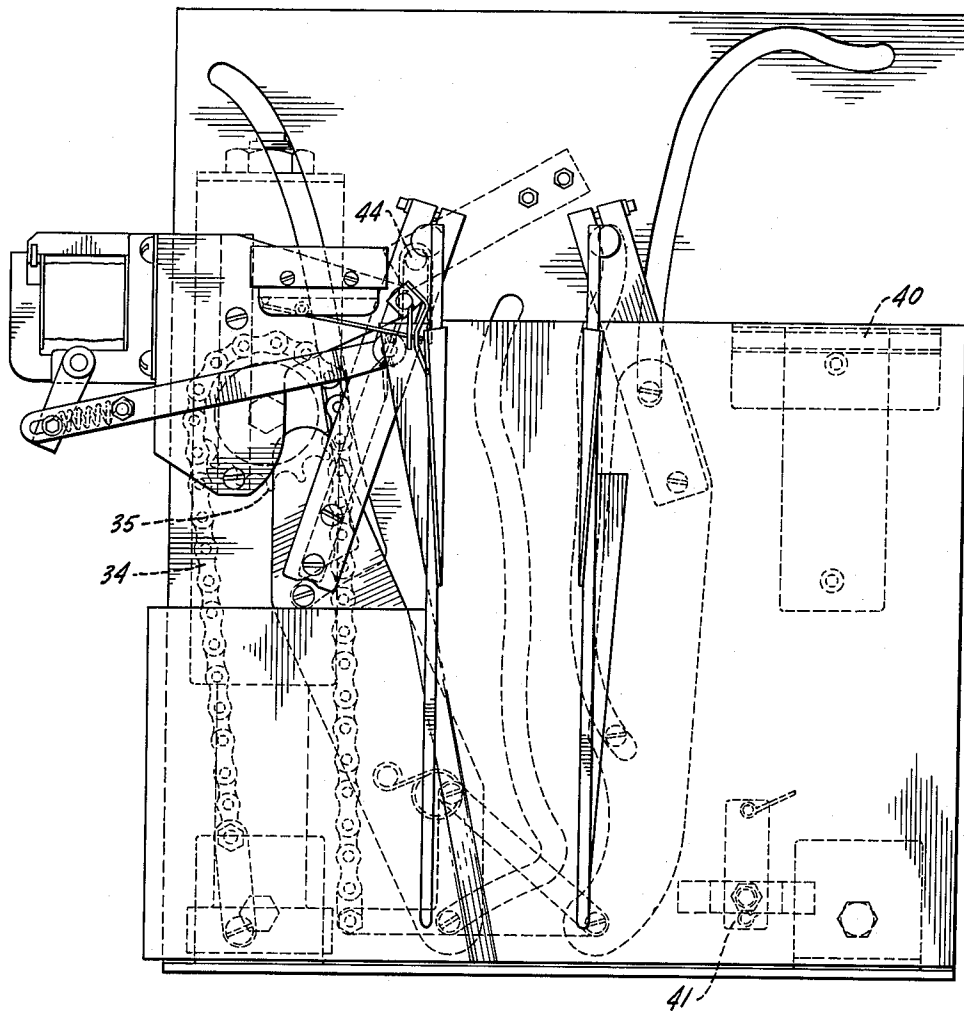


Fig. 2.

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fig.3.

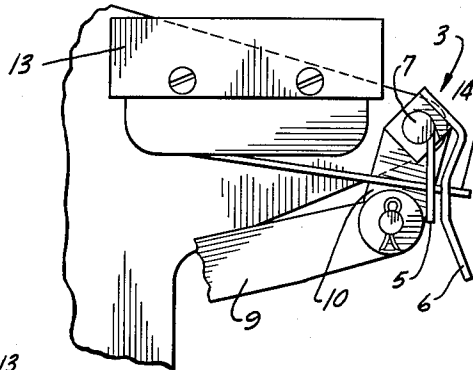
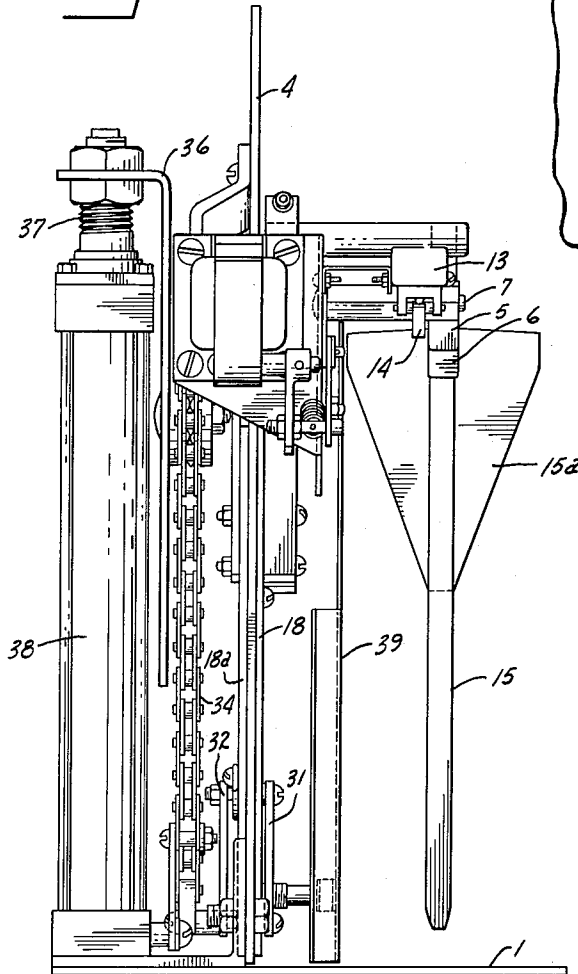
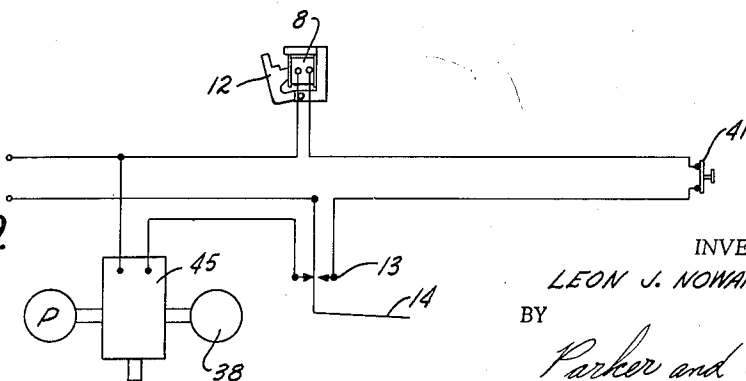


fig.4.

fig.9.



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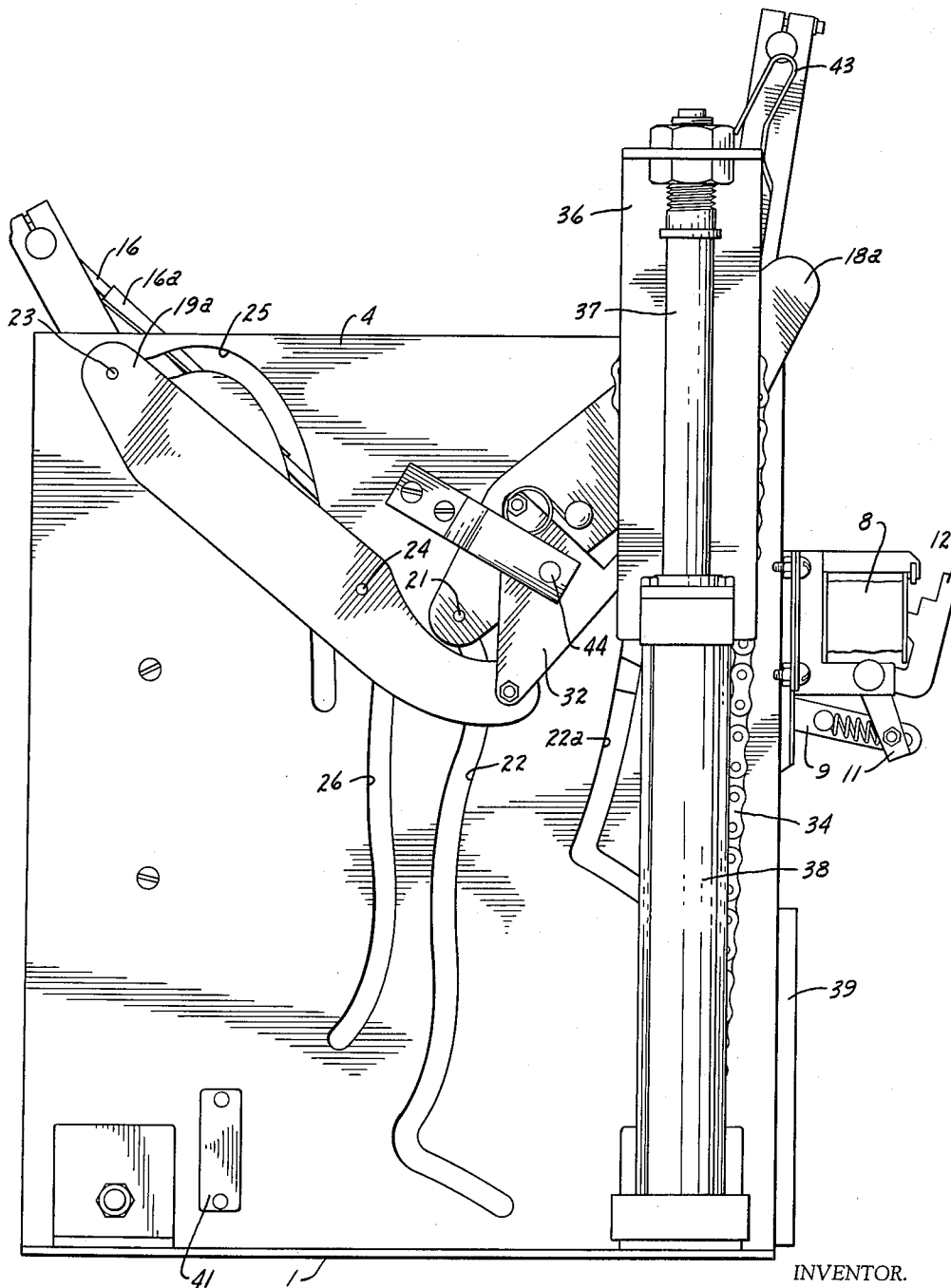


FIG. 5.

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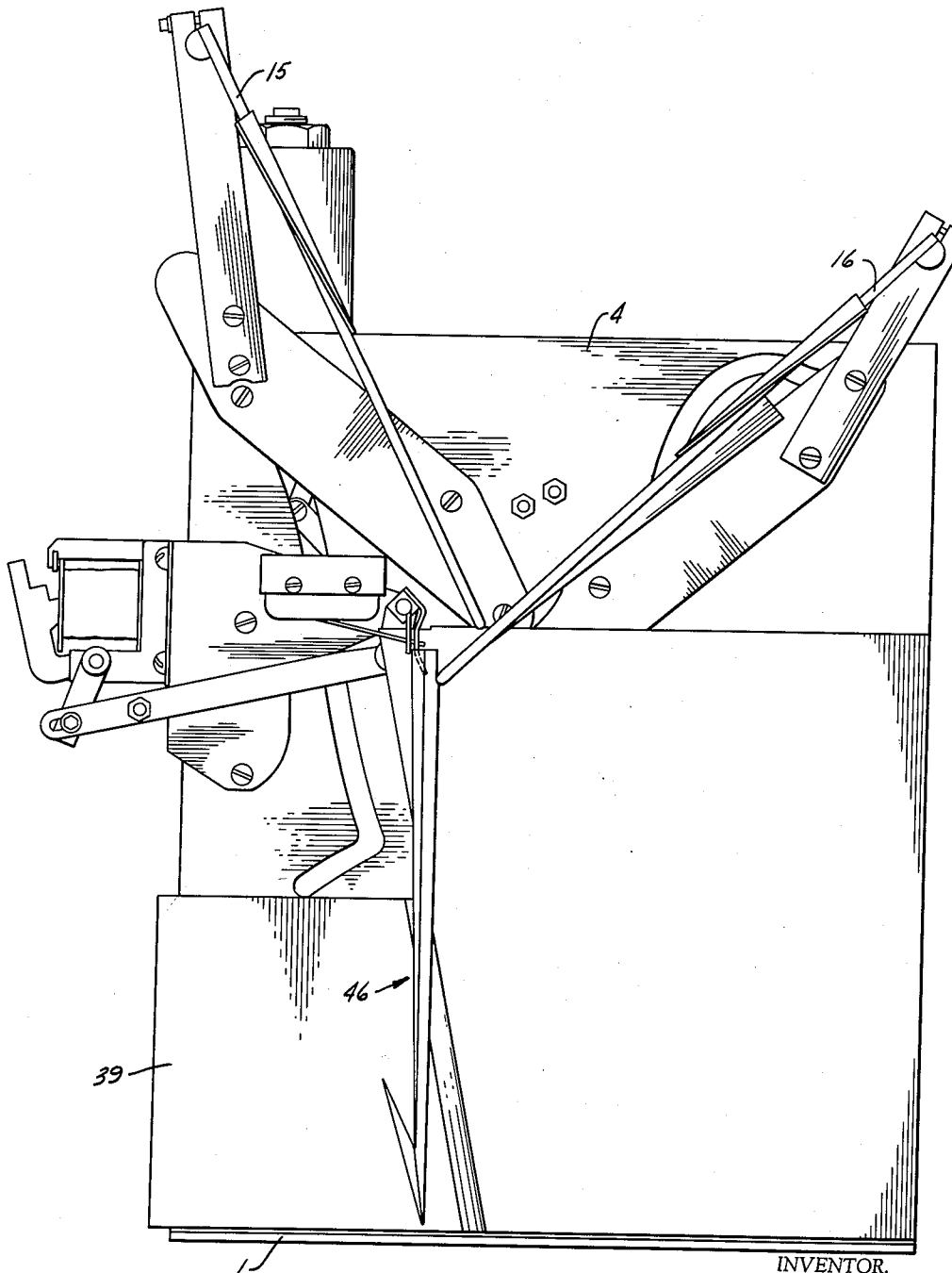


Fig. 6.

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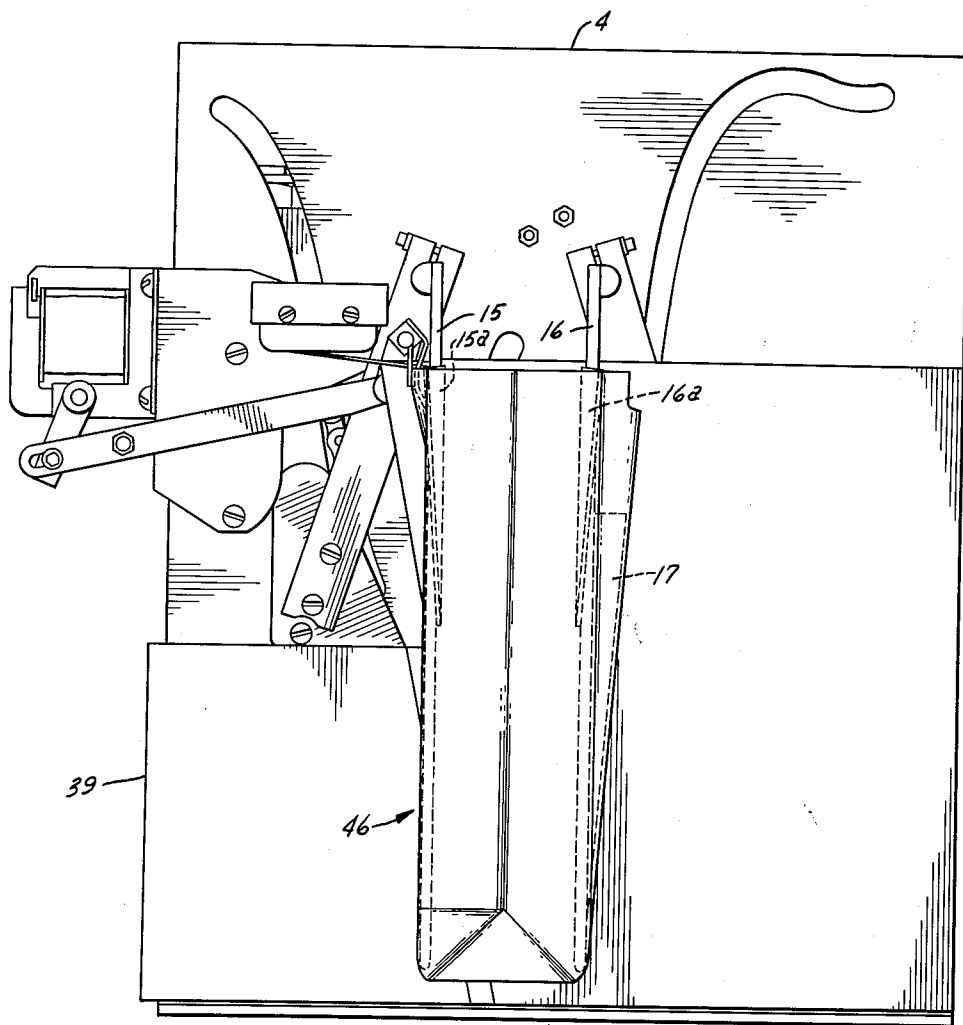


fig. 7.

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2,987,863

BAG OPENER

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Filed June 6, 1958, Ser. No. 740,231

16 Claims. (Cl. 53-384)

The present invention is directed to an improved bag opening machine which is adapted to open a bag and hold it in a position to receive material, which may be granular material, such as coffee.

One type of bag with which it may be used is the automatic bottom bag. Automatic bottom bags are characterized by a generally rectilinear cross-section when open and are so constructed that they may be collapsed into a flat position. Typical bags of this class have the bottom of the bag hinged to the side walls thereof with one side wall having a fold spaced a short distance above the bottom wall. Thus when the bag is to be collapsed the lower portion of the foldable side wall is folded about the fold line and the bottom hinges at its point of connection at the other side wall so that the two side walls move together and the bottom wall overlies the side wall in a flat position. Bags of this type have the primary advantage of a flat bottom when the bag is in the open position; thus the bag is self-supporting in an upright position and is conveniently conveyed on any conveyor belt. In some prior art machines bag opening machines or bag opening blades are adapted to enter the closed bag and open it by expanding the blades outwardly in a direction transverse to the axis of the blades. These prior art machines have the disadvantage of a mechanical structure that requires a large amount of working space.

One of the primary objects of the present invention is the creation of a bag opening mechanism which greatly reduces the vertical height required for the complete bag-opening and filling mechanism.

Another purpose of the present invention is the provision of an improved method and apparatus for opening an automatic bottom bag.

Another purpose of the present invention is the provision of a simplified bag opening mechanism.

Another purpose of the present invention is the provision of a bag-opening mechanism with improved means for holding and releasing an automatic bottom bag.

Another purpose of the present invention is the provision of improved bag-opening blades for an automatic bottom bag opening mechanism.

Another purpose of the present invention is the creation of an improved bag-opening mechanism that is readily adaptable to existing material feeders and weighers.

Other purposes may appear from time to time in the course of the ensuing specification and claims.

I illustrate my invention more or less diagrammatically in the accompanying drawings wherein:

FIGURE 1 is a front elevation of the mechanism comprising the present invention;

FIGURE 2 is a front elevation of the bag-opening mechanism illustrated in FIGURE 1 but illustrating another operative position of the element shown in FIGURE 1;

FIGURE 3 is a side elevation of the mechanism shown in FIGURES 1 and 2;

FIGURE 4 is an enlarged detailed view of a portion of the mechanism illustrated in FIGURES 1 and 2;

FIGURE 5 is a rear elevation of the mechanism illustrated in FIGURE 1;

FIGURE 6 is a front elevation, with the bag still closed but not clamped;

FIGURE 7 is a similar elevation, with the bag opened;

FIGURE 8 is a diagrammatic layout view illustrating the sequence of movements in the opening of a bag used with the mechanism of the invention, and showing the thrust against the bottom of the bag; and

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FIGURE 9 is a wiring diagram of the invention.

Like parts are indicated by like symbols throughout the specification and drawings.

Referring specifically now to the drawings and, in the first instance, to FIGURE 1, 1 designates a base which may be disposed beneath the material delivery chute of a material feeding mechanism as is diagrammatically represented at 2. The feeding mechanism may, for example, take the form of a gravity discharge chute which delivers a pre-selected charge or weight of material to a container positioned beneath the chute.

Designated generally at 3 is a bag-gripping mechanism which may be mounted on an upstanding supporting plate 4. The bag-gripping mechanism (see FIGURE 4) includes a fixed member 5 and a movable member or finger 6. The member 5 may be fixedly mounted on a pin 7 projecting from a bracket on the plate 4. The movable finger 6 is swingably mounted on the pin 7 and is actuated by a linkage interconnected with a solenoid 8. The linkage, for example, may include a link 9 connected to a crank arm 10 for the movable finger 6 and a crank arm 11 which is rockable with the rockable plunger 12 of solenoid 8. When the solenoid 8 is energized and the plunger 12 is retracted from the position illustrated in FIGURE 1, the result is a shifting of the link 9 to the left and attendant movement of the finger 6 toward the fixed finger 5 so as to grip a wall of a bag therebetween.

An actuating switch 13 is mounted on the support and includes a blade 14 which is positioned to be contacted by the edge of the bag when the bag is positioned between the fingers 5 and 6 and to be moved upwardly thereby. When the switch blade 14 moves upwardly, the switch 13 closes to energize solenoid 8 and thus move finger 6 toward finger 5 and grip the wall of a bag securely between the fingers.

A pair of bag-opening blades or members 15 and 16 is mounted for movement with relation to the bag held by the fingers 5 and 6. The blades may take the form of elongated rods provided with upwardly divergent spreading portions 15a and 16a, respectively. The spreading portions of the blades appear most clearly in FIGURE 3. The lower portions of the blades are relatively small so that they may readily enter a closed bag. The spreading portions 15a and 16a are so positioned on the members 15 and 16 that when the members 15 and 16 are positioned in a bag the spreading portions 15a and 16a are disposed in the upper portion of the bag to insure that the opposed side walls of the bag are spread for the subsequent filling operation. It should be noted that the member 16 includes a portion 17 which is inclined outwardly and upwardly with respect to the lower portion of the member 16.

The blades 15 and 16 are constrained for movement between an upper position, which is illustrated in FIGURE 1, and which, as will be seen in FIGURE 1, has the blades 15 and 16 disposed in an upwardly divergent position with the lower end of the blade 16 positioned adjacent to the bag-gripping mechanism 3, and the other blade 15 having its lower end portion spaced above the lower end portion of the blade 16. In the lowermost position of the blades 15 and 16 the blades are positioned generally parallel to one another in a spaced-apart condition, as illustrated in FIGURE 7. In this position the blades are spaced by distance generally equal to the width of the opening in the bag to be filled. It should be noted from FIGURE 7 that the blade 15, in this position, is positioned closely adjacent to the bag-gripping mechanism 3, and that the uppermost portions of the spreading surfaces 16a and 15a are disposed on a level approximating the level of the upper edge of the bag.

The blades 15 and 16 are constrained for movement together between the upper and lower positions illustrated

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in FIGURES 1 and 2. The blade 15 is mounted at its upper end on a supporting link 18, whereas the blade 16 is supported at its upper end at the upper end portion of a link 19. In the form of the invention illustrated, the links 18 and 19 take the form of a pair of members mounted on opposite sides of the supporting plate 4 and are connected together by cam rollers. The two links 18 and 18a may, for example, be connected by rollers 20 and 21 which are adapted to ride in grooves 22 and 22a. The two plates 19 and 19a may be connected by rollers 23 and 24 which are adapted to ride in the camming grooves 25 and 26 in the plate 4.

The lower roller 24 guides the lower portion of the blade 16 downwardly, while the roller 23 guides the upper portion of the blade through a path that extends transversely toward the feeding chute 2 and then downwardly. The movement of blade 16 is such as to insure that it clears the blade when it moves downwardly to the bag-filling position illustrated in FIGURE 7.

The lower roller 21 for the blade 15, in the course of its downward movement in the camming groove 22, passes through a path that moves inwardly toward the gripping mechanism 3, then outwardly toward the other blade and then downwardly to a point designated at 27 where the camming groove 22 constrains the roller to movement abruptly away from the other blade and in a downward direction, as is represented by the portion 28 of the groove. The groove 22a proceeds in a downward direction toward the groove 22 to a bend 29, where the direction of the groove proceeds downwardly and outwardly at 30 along a path generally parallel to the path of the portion 28. Thus, the roller 20 will follow a downward path and then an outwardly and downwardly inclined path at the end of the downward movement on the order of the path of the roller 21.

The links 18 and 19 are pivotally interconnected as by a link 31. The link 31 is pivoted to the member 19 at the lowermost end portion thereof, whereas it is pivotally connected to the member 18 at a point spaced upwardly from the lowermost end of the member 18. The link 31 includes a portion 32 that is connected to one end of a drive mechanism which, in the embodiment shown, takes the form of a chain drive. The link may, for example, be connected to one end of a chain 34 which is passed about a sprocket 35 journaled on a member 36 which is carried by the piston 37 of a pneumatic motor 38. When the motor 38 is supplied with air under pressure behind the piston, the piston 37 moves upwardly and thus lifts the link 32, the links 18 and 19, and blades 15 and 16, to the uppermost position. When air is exhausted behind the piston in the pneumatic motor, the blades, links and piston may fall by gravity and go through the sequence of motion defined by the camming grooves 22, 22a, 25 and 26.

In order to protect the operator from injury, a shield plate 39 is pivotally mounted as at 40 on the support 4. The shield 39 depends from the hinge 40 and extends between the blades 15 and 16 and the links 18 and 19. A switch member 41 is positioned for actuation by the shield 39 when the shield is moved inwardly about the pivot 40 and toward the supporting plate 4, for purposes to be pointed out more fully hereafter.

In FIGURE 1 it will be seen that the upwardly extended portion of the lever or link 18 carries a hook-shaped member 43 which is adapted to slide over a pin 44. When the blade 15 is in its lower stages of movement, the hook-shaped member 43 and pin 44 serve to stabilize the movement of the blade 15 in the lower stages thereof.

FIGURE 8 is a diagrammatic sequential showing of the forces applied to a bag 46 held by the gripping mechanism 3 during the later stages of movement of the bag opening blades 15 and 16. These are shown in nine positions, lettered sequentially from a to i. During the initial stages of the movement of the blade from the

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position illustrated in FIGURE 1 the blade 16 first enters the bag held by the gripping mechanism 3 followed by entry of the blade 15. The blades then enter the bag and move downwardly, applying an outwardly expanding opening force to the upper portion of the bag until the blades reach the position illustrated in the first step in FIGURE 8. At this point the blades 15 and 16 are upwardly divergent and the upper portion of the blades have expanded the upper portion of the bag outwardly. At this point the blade 16 is at its downward limit of movement. The upper portion of the blade 16 is generally aligned with the side wall 47 of the bag, which is opposite to the foldable side wall 48. In this position the guide rollers 21 and 20 for the blade 15 are just commencing entry into the cam portions 28 and 30. At this point the bottom 49 of the bag is still folded about the hinge point 50 and the side wall 48 is folded at its hinge point 51. It should also be noted that the bottom of the blade 15 is positioned adjacent to the hinge point 51.

As the movement of the blade 15 continues the lowermost extremity contacts the bottom of the bag and applies a downward and outwardly moving force to the side wall 48 of the bag at the hinge point 51 thereof. The path of movement taken by the lower portion of the blade 15 is generally equivalent to that of the roller 21 in the slot 28. In the subsequent sequences of the opening movement the bottom of the bag moves away from the lower extremity of the blade 15 and hinges about the hinge point 50. The blade 15 continues the application of the downward and outward force with respect to the side wall 47 and also maintains its thrust against the bottom, until the blades 15 and 16 are spaced apart in parallelism as appears in the last sequence. This is the position illustrated by FIGURE 2.

FIGURE 9 is a schematic illustration of the controlling element utilized in the invention. FIGURE 9 shows the single pole double throw switch 13 for energizing the solenoid 8 and the control valve 45. The solenoid 8 actuates the bag gripper 3. The control valve 45 when energized delivers fluid under pressure to the motor 38 and forces the piston and the blades carried thereby to the upper position illustrated in FIGURE 1. In the circuit to solenoid 8 is the switch 41 which when opened de-energizes solenoid 8, thereby releasing bag gripper 3. In operation the bag to be opened is placed with the blades partially within the bag and with one wall of the bag in a position to be gripped by the bag gripper 3. A bag, in this position, will actuate switch 13. When the bag is held by the gripper, contact will be maintained to solenoid 8 through switch 13 and the normally closed contacts energizing valve 45 will be opened, retracting motor 38, thereby lowering the blades into the bag. The blades remain in this position until switch 41 is opened, de-energizing solenoid 8 and releasing the bag from gripper 3. The bag moving by gravity and spring action of switch 13 actuates the contacts of switch 13 to energize valve 45.

Whereas I have shown and described an operative form of the invention, it should be understood that this showing and description thereof is to be taken in an illustrative or diagrammatic sense only. There are many modifications to the invention which will fall within the scope and spirit thereof and be apparent to those skilled in the art. The scope of the invention should be limited only by the scope of the hereinafter appended claims.

The use and operation of the invention are as follows:

The invention utilizes a bag-opening mechanism which may be positioned beneath an automatic weighing machine or other mechanism designed to deliver a preselected charge of material to a bag to be filled. The mechanism is so designed that it may be positioned quite close to a discharge chute from such a mechanism without interference with the bag-opening mechanism. As will be noted in FIGURE 1, the over-all vertical height

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required for the bag-opening mechanism and the chute 2 is just slightly greater than would be required in the event no mechanism were employed at all and the bag was positioned by hand beneath the discharge chute 2.

The bag-opening mechanism herein described may be utilized conveniently with existing weighing mechanisms.

In a typical sequence of use of the invention the one foldable side wall of a folded bag is slipped into position between the two fingers 5 and 6 of the gripping mechanism, thus energizing the switch 13 and the solenoid 8, which, in turn, closes the fingers 5 and 6 and suspends the bag from the fingers 5 and 6. At this point the lower extremity of the blade 16 is positioned in the cut-away portion of the upper and opposite side wall of the bag. Energization of the solenoid 8 is accompanied by opening of the valve for the fluid motor 38 which exhausts air behind the piston 37. When air is exhausted behind the piston 37, the piston blades 15 and 16 and interconnecting and guiding linkage move downwardly by gravity. During the initial stages of the movement the upper portion of the blade 16 moves inwardly while the lower portion of the blade is moving downwardly into the bag. In effect, the blade 16 rocks about the axis of roller 24 as a pivot during the course of this initial downward movement toward the position illustrated in FIGURE 2. During this same initial period the blade 15 is also moving downwardly. The lower portion of the blade 15 moves inwardly toward the side wall of the bag held by the gripping mechanism 3 while the upper portion of the blade 15 is moving inwardly toward the other blade and downwardly.

As the blade 16 moves downwardly within the bag it applies a rapidly expanding force to the upper portions of the side walls of the bag. When the blade 16 has reached its lower extremity of movement wherein the roller 24 is positioned at or near the bottom of the guide slot 26 the blade 16 firmly holds the side wall opposed to the side wall held by the gripping mechanism in the position illustrated in the first sequence in FIGURE 8. When the blade 16 is at or near this position the blade 15 goes through the sequential motion illustrated in FIGURE 8 so as to apply the downwardly and outwardly moving force to the folded side wall of the bag. This applied force thrusts the bottom of the bag to the open position and it is then ready to be filled with material from the chute 2.

The divergent guide portions 15a and 16a hold the upper side walls of the bag square and in the fully expanded position.

After a charge of material has been delivered from the chute 2, and the bag is filled, the bag is ready for removal from the machine. It should be understood that any suitable mechanism, not herein shown, may be employed to initiate the filling operation from the chute 2 when the blades 15 and 16 have fully opened the bag.

When the bag is full, the operator may nudge the plate 39 so as to actuate the switch 41 and thereby deenergize the solenoid 8. When this happens, the bag-gripping mechanism is released and switch 13 is actuated, thereby actuating the pneumatic motor 38. Then the blades 15 and 16, by operation of said pneumatic motor, are moved to the upper position illustrated in FIGURE 1.

Whereas the invention is shown and described as usable with manual feeding of bags to the bag-gripping mechanism, it should be understood that automatically operated bag-feeding mechanism may be employed for use with the invention. For example, a vertically oscillating bag-holding mechanism may be used to lift a bag into a position wherein the foldable side wall of the bag is inserted between the movable gripping fingers of the bag-gripping mechanism.

It should also be understood that whereas the bag-opening mechanism shown and described herein is advantageously utilized in connection with an automatic bottom bag, the apparatus may also be used with an envelope bag. In using the mechanism with an envelope type of

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bag care should be taken that the bag is such a size that the lower ends of the bag-opening blades are spaced above the bottom of the bag when the blades are in open position, so as to avoid tearing the bags.

I claim:

1. A method of opening a bag having one side wall folded at a point spaced from the bottom wall to enable the bottom and side walls of the bag to collapse, said method including the steps of holding the folded wall of the collapsible bag near the upper portion thereof, applying a progressively expanding divergently outwardly directed opening pressure to the upper portions of the side walls of the bag, thereafter, while maintaining a generally laterally directed force against a substantial portion of the other side wall, applying a force directed generally downwardly momentarily against the bottom and outwardly against the folded side wall near the fold in said folded side wall to thereby unfold said folded side wall away from the other side wall and at the same time open the lower portion of said bag, and continuing the application of said outward force against the folded side wall until the bag is opened.

2. A bag opening and feeding mechanism for opening foldable bags having opposite, separable side panels, said mechanism including a member for discharging material in a downward direction, means for holding a bag in a position to receive such discharged material, a pair of separate bag opening members, one opposable to each side panel, means for moving them in unison but along different paths into the upper portion of said bag and laterally outwardly against the upper portion of said panels, said bag opening members being substantially inclined to the perpendicular and to each other when in their initial bag entering position, and means for constraining said members for movement along their separate paths and for guiding said members, in the course of an outward thrust against the opposite side panels of the bag, into a position of parallelism with each other, whereby to open the bag and to position the side panels of the bag in spaced, generally parallel upright planes.

3. The structure of claim 2 wherein said bag-holding means includes a pair of gripping elements adapted to grip the upper portion of a bag, and switch controlled means adapted to move said elements together and to initiate actuation of said bag opening members in response to entry of a bag between said elements.

4. The structure of claim 3 characterized by and including additional switch controlled means for disabling said first named switch means to thereby enable release of said bag when said bag has been filled with material.

5. The structure of claim 2 wherein said bag opening members are upwardly divergent so as to apply a progressively expanding pressure to the top of the bag as said members move downwardly into a bag held by said gripping means.

6. A bag-opening blade comprising an elongated relatively narrow member adapted to enter a foldable bag, and a guiding plate positioned on an end portion of said member, the portion of said plate adjacent an end of the elongated member having a width generally equal to the width of the side wall of an automatic bottom bag, said plate having side edges converging toward an intermediate part of the elongated member.

7. The structure of claim 2 further characterized in that said constraining means are constructed and arranged to move one of said bag opening members initially downwardly into a bag held by said gripping means and thereafter downwardly and outwardly with respect to the other bag opening member.

8. In a bag opening mechanism, a base and means on said base for gripping and suspending one side wall of an automatic bottom bag, a pair of bag opening blades mounted for movement along individual and different paths with respect to said means, camming means for constraining said blades for movement between an upper

position wherein said blades are upwardly divergent and a downward position wherein said blades are spaced and parallel to one another, means for moving said blades between said two positions, with the blades, at the end of their downward movement, being in engagement with opposite side walls of the bag and in contact with said side walls substantially from top to bottom of the bag, said last named means including an upstanding cam plate on said base, links for supporting said blades and having camming rollers cooperating with grooves in said camming plate so as to guide said blades into said lower position of parallelism, said links being pivotally interconnected for movement together.

9. In a bag-opening mechanism, a base and means on said base for gripping and suspending one side wall of an automatic bottom bag, a pair of bag-opening blades mounted for movement along individual and different paths with respect to said means, camming means for constraining said blades for movement between an upper position wherein said blades are upwardly divergent and a downward position wherein said blades are spaced and are parallel to one another, and means for moving said blades between said two positions, with the blades, at the end of their downward movement, being in engagement with opposite side walls of the bag and in contact with said side walls substantially from top to bottom of the bag, power means on said base for raising said blades to said upper position and means releasing said power means so as to allow said blades to move by gravity toward said lower position.

10. In a bag opening mechanism, a base and means on said base for gripping and suspending one side wall of an automatic bottom bag, a pair of bag opening blades mounted for movement along individual and different paths with respect to said means, camming means for constraining said blades for movement between an upper position wherein said blades are upwardly divergent and a downward position wherein said blades are spaced and parallel to one another, said camming means being constructed and arranged to constrain movement of the lower end of one blade toward the other blade during a portion of said one blade's downward path of movement and then to constrain said lower end for movement in a downward and outward direction with respect to said other blade, and means for moving said blades between said two positions, with the blades, at the end of their downward movement, being in engagement with opposite side walls of the bag and in contact with said side walls substantially from top to bottom of the bag.

11. In a machine for opening bags of the type in which a bottom portion is folded upwardly against the exterior of one side portion, a base, means on said base for securing and supporting the upper edge of such side portion of the bag, and means for separating the normally abutting side portions of the walls of the bag and for unfolding the bag bottom which includes a plurality of spreader elements mounted on the base for independent differential movement in relation to the base and to each other, means for generally simultaneously moving said spreader elements in independent and differing paths downwardly into the bag after the upper edge of said side member has been gripped and while downward movement of the bag is thereby prevented, and for guiding one said spreader member to engage it initially with the lowest part of the folded bag at the junction of the bottom portion and a side portion opposite to the gripped side portion, and for guiding the other spreader member laterally against the lower end of the gripped side portion and simultaneously downwardly as well as outwardly away from the first spreader member, whereby, at the end of the movement of the two spreader members in relation to each other and to the base, the bag is completely open, with the said side portions separated and with the bottom member fully extended between them, and means for raising the spreader members to the initial upward position after the

opening of the bag, said last named means, when released, being movable by gravity downwardly into the next bag, and means for releasing them for such movement.

12. In a machine for opening bags of the type in which a bottom portion is folded upwardly against the exterior of one side portion, a base, means on said base for securing and supporting the upper edge of such side portion of the bag, means for separating the normally abutting side portions of the walls of the bag and for unfolding the bag bottom which includes a plurality of spreader elements mounted on the base for independent differential movement in relation to the base and to each other, means for generally simultaneously moving said spreader elements in independent and differing paths downwardly into the bag after the upper edge of said side member has been gripped and while downward movement of the bag is thereby prevented, and for guiding one said spreader member to engage it initially with the lowest part of the folded bag at the junction of the bottom portion and a side portion opposite to the gripped side portion, and for guiding the other spreader member laterally against the lower end of the gripped side portion and simultaneously downwardly as well as outwardly away from the first spreader member, whereby, at the end of the movement of the two spreader members in relation to each other and to the base, the bag is completely open, with the said side portions separated and with the bottom member fully extended between them, said means for moving and guiding the spreader member including an upright flange plate having guide slots therein, and guide elements associated with the spreader members, said elements entering and being guided by said slots, there being a plurality of guide slots for each spreader member, each spreader member having guide elements entering each of its guide slots.

13. In a bag opening device a base, a pair of spreader elements, means for bodily moving them on the base along different paths, means for supporting on the base a bag of the type which includes opposite side panels one of which is folded at a point spaced from the bottom wall to enable the bottom and the side panels of the bag to collapse, and means for guiding the spreader elements for penetration, from opposite sides of the bag, into the space between the panels, and into inner contact with said panels, said guiding means including means for positioning the spreader elements, at the end of their movement into the bag in generally upright, generally parallel laterally spaced position, in inner contact with said panels substantially from top to bottom thereof, with the side panels of the bag separated in position to receive a load, said bodily moving and guiding means being constructed and arranged to maintain the spreader elements, at the beginning of their movement into the bag at a substantial angle to each other, with their lower ends located above the edge of the bag to be opened, and with the lower end of one of said spreader elements at a somewhat lower elevation than the lower end of the opposite spreader element.

14. The method of opening a collapsible bag having a non-folding side wall, a bottom wall hinged thereto, and an opposite side wall folded at a point spaced upwardly from the connecting bottom wall, which includes the steps of holding the collapsed bag in a predetermined position, opening the top of the bag by positively applying a progressively expanding opening pressure outwardly along divergent directions against upper portions of said opposite side walls, then progressively extending downwardly the area of the bag side walls against which such pressure is directed until a lateral outward thrust is directed against the entire length of the non-folding side wall of the bag and initially against the part of the foldable side wall above its fold, thereby to unfold the foldable wall and to move it away from the non-folding side wall, directing unfolding pressure against the bottom wall,

whereby to move it about its hinged connection to the non-folding side wall prior to the major lateral movement of the lower end of the foldable side wall, and terminating the outward thrust against the two walls, when the foldable side wall, above its fold, is substantially unfolded and lies in a plane generally parallel to the plane of the unfolded wall, with the bottom wall generally perpendicular to the two side walls, and with the direction of thrust outwardly against the two walls being generally parallel.

15. The method of opening a collapsible bag having a non-folding side wall, a bottom wall hinged thereto, and an opposite side wall folded at a point spaced upwardly from the connecting bottom wall, which includes the steps of holding the collapsed bag in a predetermined position, opening the top of the bag by positively applying a progressively expanding opening pressure outwardly along divergent directions against upper portions of said opposite side walls, then progressively extending downwardly the area of the bag side walls against which such pressure is directed until a lateral outward thrust is directed against the entire length of the non-folding side wall of the bag and initially against the part of the foldable side wall above and in approximately the area of its fold, thereby to unfold the foldable wall and to move it away from the non-folding side wall, and continuing the application of the laterally outward thrusts against the walls until the bag is opened.

16. A bag opening and feeding mechanism for opening foldable bags having opposite, separable side panels, said

mechanism including a member for discharging material in a downward direction, gripping means for holding a bag in a position to receive such discharged material, a pair of separate bag opening members, one opposable to each side panels, means for moving them in unison but along different paths into the upper portion of said bag and laterally outwardly against the upper portion of said panels, said bag opening members being substantially inclined to the perpendicular and to each other when in their initial bag entering position, and means for constraining said members for movement along their separate paths and for guiding said members, in the course of an outward thrust against the opposite side panels of the bag, into a position of parallelism with each other, whereby to open the bag and to position the side panels of the bag in spaced, generally parallel upright planes, a fixed bag gripping finger and a movable bag gripping finger, and a solenoid adapted upon actuation thereof to move the movable finger toward said fixed finger to thereby grip a bag between said two fingers, and a switch-actuating member adapted for engagement by a bag when said bag moves between said two fingers, said switch member being effective to energize said solenoid.

References Cited in the file of this patent

UNITED STATES PATENTS

997,145	Lines	July 4, 1911
2,272,258	Allen	Feb. 10, 1942
2,601,480	Williams	June 24, 1952
2,689,073	Twigg	Sept. 14, 1954