United States Patent [19]

Hanson

[11] **3,754,370**

[45] **Aug. 28, 1973**

[54] **BAG DISPENSING APPARATUS AND METHOD**

[76] Inventor: **Neil L. Hanson,** 1355 Cambridge Rd., San Marino, Calif. 91108

[22] Filed: **Mar. 24, 1972**

[21] Appl. No.: **237,769**

[52] **U.S. Cl.** **53/29,** 53/67, 53/187, 53/385, 225/4, 225/100, 225/106

[51] **Int. Cl.** **B65b 43**

[58] **Field of Search** 53/29, 64, 67, 183, 53/187, 390, 384, 385, 386; 225/2, 4, 5, 100, 101, 106; 242/55.53, 56.8; 312/39

[56] **References Cited**

UNITED STATES PATENTS

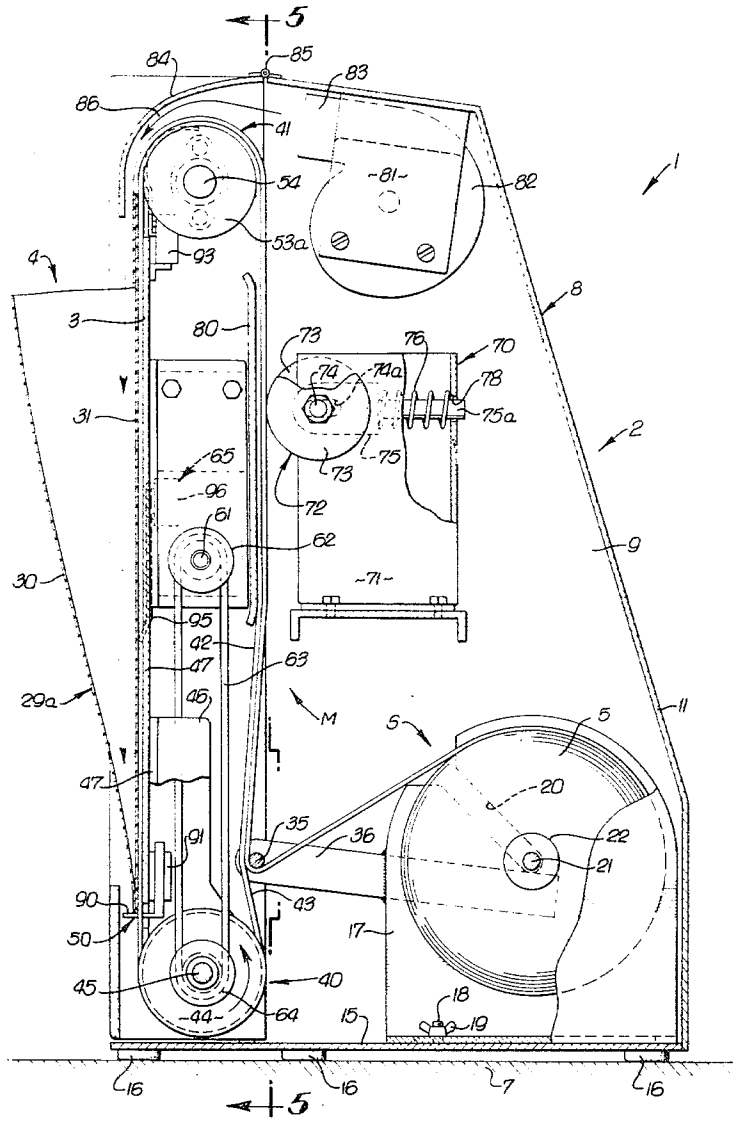
2,874,886	2/1959	Piazze	225/106
3,298,580	1/1967	Lerner	225/106
3,328,939	7/1967	Harris et al.	53/385
3,477,196	11/1969	Lerner	53/29 X
3,579,948	5/1971	Lerner	53/385 X

Primary Examiner—Robert L. Spruill
Attorney—Louis J. Bachand, Jr. et al.

[57] **ABSTRACT**

Preformed bags e.g. of thin-film plastic are singly dispensed in opened condition from a rolled supply in which the bags are closed and interconnected, by an apparatus and method which passes the bag from the supply roll to a dispensing station and in the course of such passage relatively moving the opposing bag sidewalls to selectively sever one sidewall to open the bag and at the dispensing station inflating the bag for convenience in loading, easy grasping and removal.

27 Claims, 8 Drawing Figures



Patented Aug. 28, 1973 3,754,370

FIG. 1.

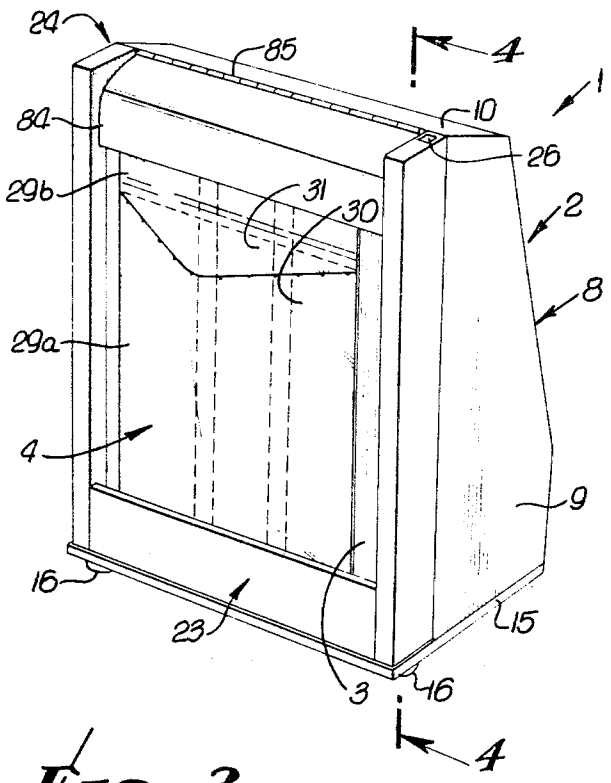


FIG. 2.

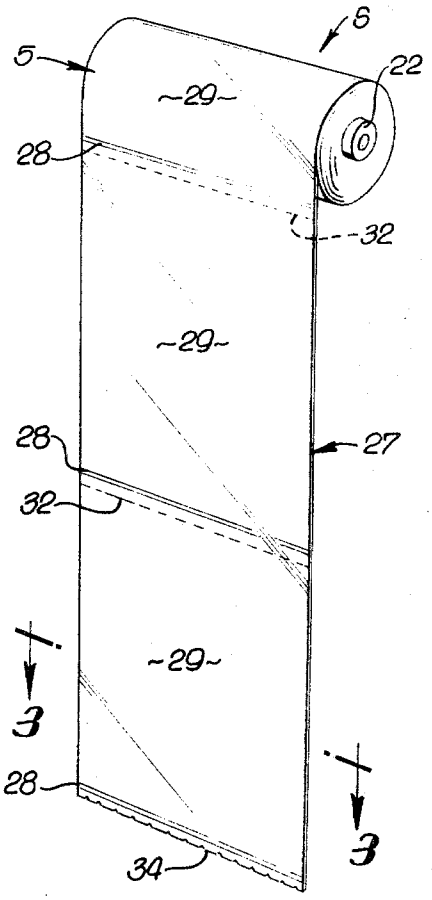


FIG. 3.

FIG. 8.

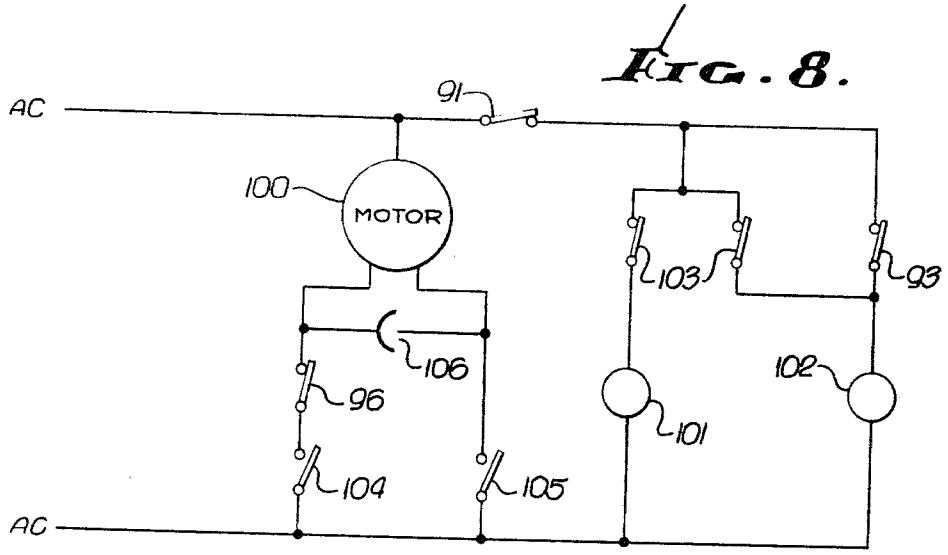


FIG. 4.

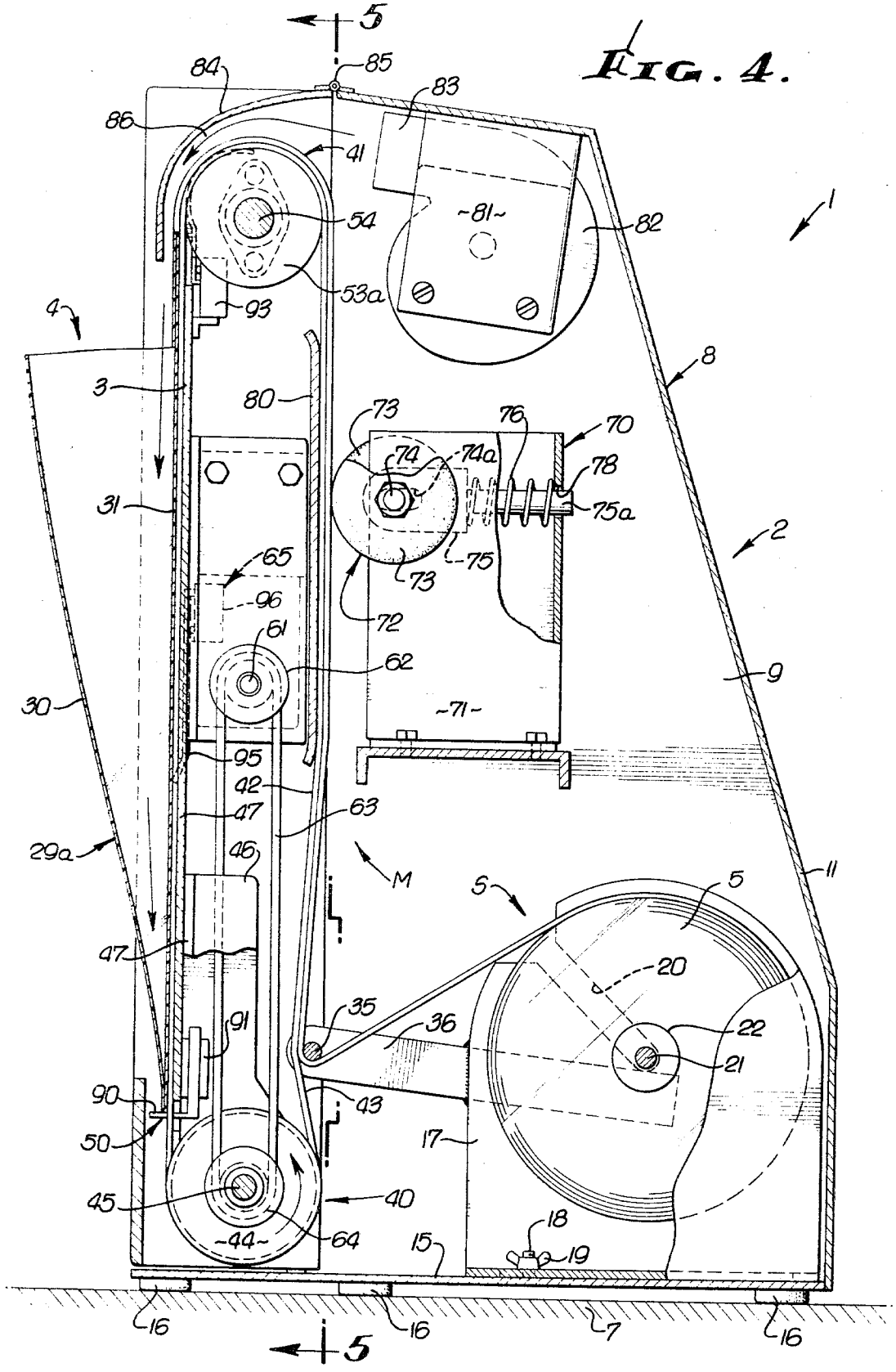

5
85
84
83
86
41
54
81
82
1
53a
93
4
8
3
80
73
76
70
74
74a
78
31
75a
2
65
75
73
96
72
61
62
9
30
71
95
42
63
47
29a
46
M
5
5
11
47
20
35
36
22
91
21
90
43
50
17
45
40
44
64
18
15
19
16
16
7
16
5

FIG. 5.

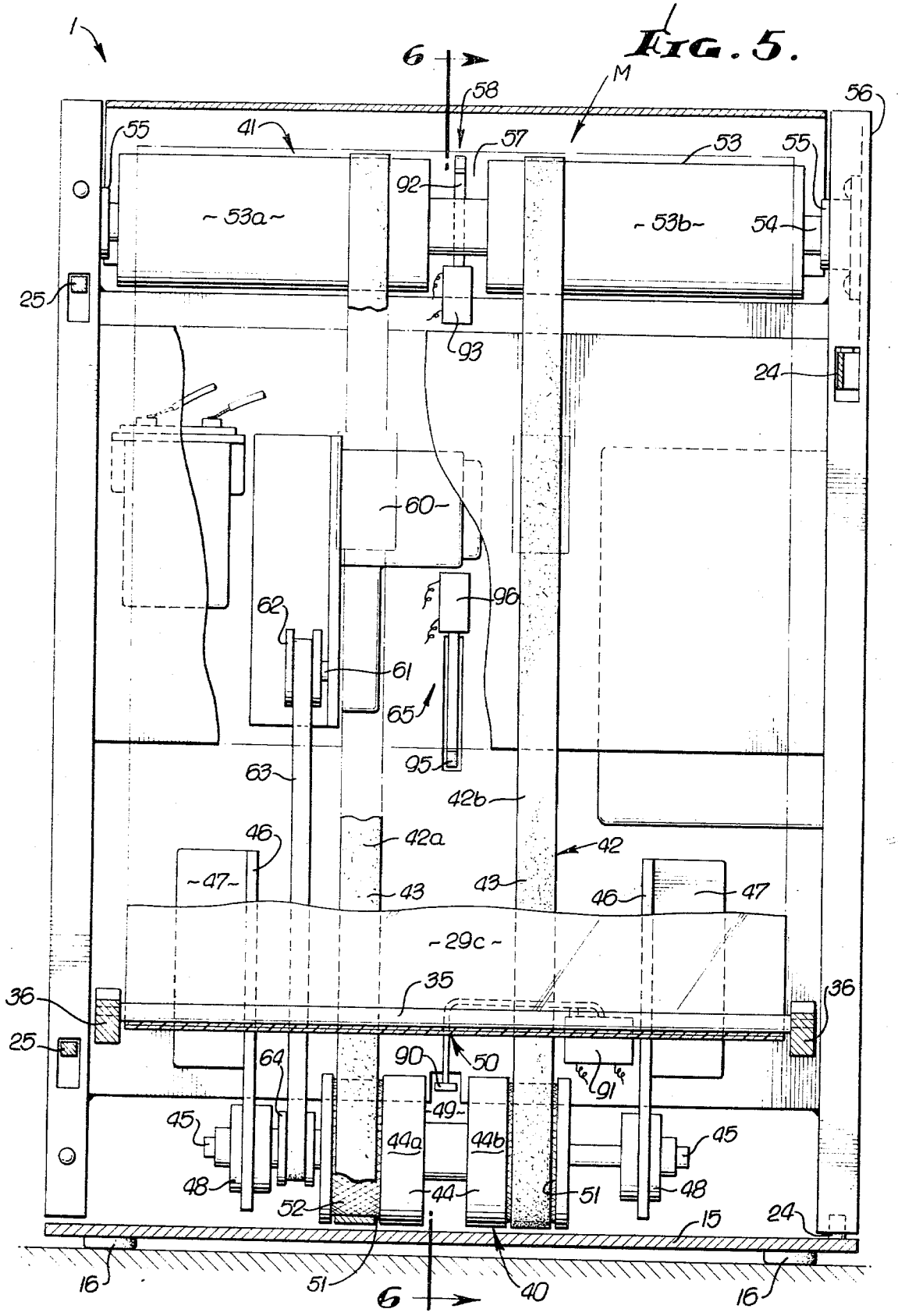

1
6
58
M
56
55
41
57
53
55
92
53a
53b
54
25
93
24
60
62
96
61
65
95
63
42b
46
42a
42
47
43
43
46
47
29c
35
36
36
25
64
90
50
91
49
45
44a
44b
45
48
52
44
51
48
15
24
16
51
6
40
16

FIG. 6.

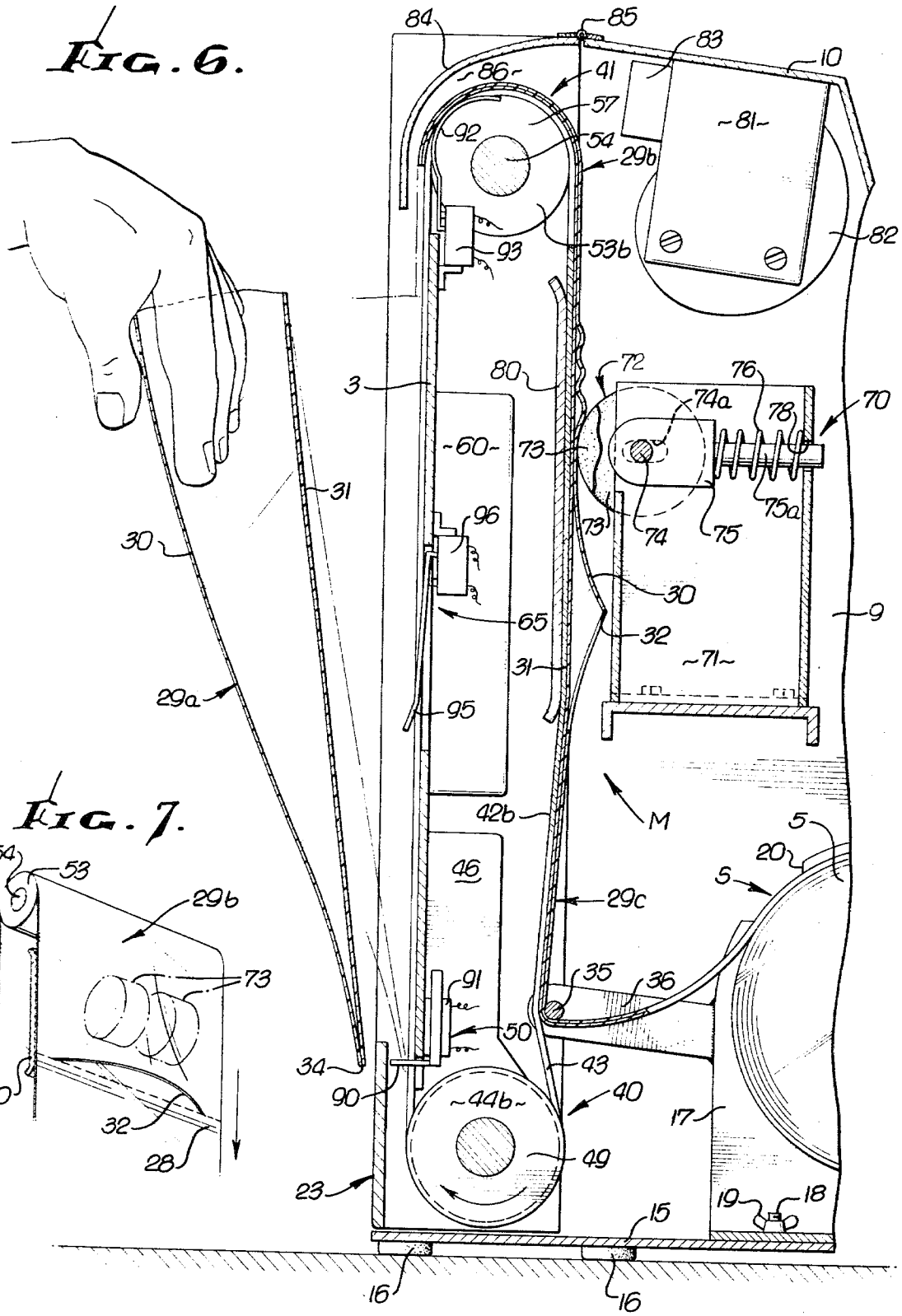

84
85
83
10
86
41
57
92
54
29b
81
93
53b
82
3
80
72
76
74a
78
70
60
73
31
96
73
74
75
75a
30
30
65
32
9
31
71
29a
95
M
42b
5
20
5
46
29c
54
53
29b
73
91
35
36
50
80
34
43
90
44b
40
17
32
28
49
23
19
18
15
16
16

FIG. 7.

54
53
29b
73
80
32
28

BAG DISPENSING APPARATUS AND METHOD

BACKGROUND OF THE INVENTION

This invention has to do with apparatus and method for dispensing preformed bags singly and on demand in opened condition, ready for use, from a lowest cost supply such as a preperforated roll of connected bags. More particularly, the invention is concerned with provision of means to enable use such lowest cost bag rolls to dispense, automatically facile and reliably, single bags extended for ready filling, easy grasping and removal by the user.

The invention is highly adapted to use in supermarkets but is likewise an important solution to packaging problems in many industrial agricultural and food handling applications.

The convenience of plastic bags for packaging arises from their insensitivity to moisture, their see-through qualities and their ease of manipulation. Recently, supermarkets have begun to provide their customers with plastic bags, in lieu of traditional small paper bags, particularly in produce areas, where the mentioned advantages of plastic bags are most significant. Typically, these bags are carried on a roll which is hung in the produce area. The shopper grasps the end bag and tugs. If she is skillful and not unduly freighted with groceries, a single bag will tear cleanly from the roll. Often, however, dexterity or attention fails and several bags are pulled from the roll before any bag tears away. The result is waste. Some shoppers may use this event to acquire extra bags at increased cost to the store; others are only irritated. Once the bag removal has been negotiated the problem of separating the film walls to open the bag vexes the would-be user.

Other forms of plastic bag supply than rolls, such as stacks of precut, preopened bags are, in the opinion of many stores, unduly expensive for a convenience item to shoppers.

Accordingly, there exists a need for a better means of providing plastic bags to shoppers in supermarkets. Ideally, such better means would meet these objectives:

1. Be adapted to use of lowest cost bags; these are end-to-end interconnected and closed bags on a roll;
2. Be capable of singly dispensing bags to eliminate waste;
3. Be foolproof, readily comprehended and reliable in operation to encourage proper bag use;
4. Be simple in design to minimize maintenance problems and down-time;
5. Below in capital cost;
6. Be positive in bag opening technique to minimize failures;
7. Be compact to fit into crowded supermarket areas;
8. Be quiet in operation;
9. Be easily replenished with bag supplp rolls by relatively unskilled labor; supply
10. Be designed to present bags open, ready for easy grasping, loading or removal and use;
11. Be self-actuating for additional bag deliveries.

It will be evident that devices meeting these criteria are not limited in utility to supermarkets. Indeed, modern industrial packaging is coming increasingly to rely on bags to carry various multi-component and even single component products. Plastic bags are particularly useful in this regard because of their see-through quality, their sanitary properties, their ability to be reliably and rapidly heat sealed and their relatively low cost. In practice, an operator or loading apparatus places the parts to be packaged, ranging from nuts and bolts to chicken parts, in each bag. Reduction in the time required to obtain, open and secure each bag for filling can mean significant savings on the packaging line. In this connection, the present method and apparatus are an important contribution, providing as they do the lowest cost bags, ready for filling, at speeds capable of exceeding a single operator's capacity to fill them, to be highly adapted to high speed automated loading machinery.

SUMMARY OF THE INVENTION

The foregoing objectives are met in the method and apparatus of the present invention which provides for the rapid and reliable opening and dispensing of bags from a roll of bags, at low cost, with great efficiency.

More particularly, the invention provides a method of dispensing preformed bags from a supply of end-to-end severably interconnected bags individually and in opened condition at a dispensing station, which includes advancing collapsed bags successively in connected relation along a path to the dispensing station in a manner to have a predetermined sidewall facing outward at the dispensing station, relatively moving the predetermined sidewall and the opposing bag sidewall in advance of the dispensing station to selectively sever the predetermined bag sidewall from the next succeeding bag for presentation in opened, single sidewall connected condition at the dispensing station. The opposing bag sidewalls may be relatively moved in the plane of the advancement path and parallel to the direction of the bag advance. The predetermined bag sidewall may be maintained stationary and the opposing bag sidewall moved in sliding relation therewith or vice versa. The bags may be advanced intermittently and responsive to separation of the forwardmost bag at the dispensing station. Typically the bags are positively opened at the dispensing station e.g., by blowing air into the bag open end, thus maintaining the bag open at the dispensing station.

In a highly preferred embodiment of the present method, thin-film plastic bags are dispensed individually and in opened condition at the dispensing station from a supply of collapsed, end-to-end severably interconnected bags by the method which includes engaging each bag in succession by a first sidewall thereof for travel to the dispensing station, engaging the second opposing bag sidewall for relatively different movement during bag travel to the dispensing station to selectively sever the second sidewall from the next succeeding bag to open each bag in advance of the dispensing station and inflating each open bag presented at the dispensing station. In this embodiment there is further typically included the steps of adhesively gripping the first sidewall, to engage the same, at laterally spaced locations adjacent the severable interconnection thereof with the next succeeding bag, and sequentially moving the bag sidewalls in a manner e.g., unequally, to sever the second sidewall from the next succeeding bag, such as first in reverse direction a distance then again forward a greater distance to present a single bag at the dispensing station.

Apparatus is provided for carrying out the foregoing method for singly dispensing preformed bags in opened condition from a supply of such bags closed in end-to-

end severably interconnected relation, the apparatus comprising means to transport connected bags from the bag supply to a dispensing station in a manner ultimately to have a predetermined bag sidewall facing outward at the dispensing station and means to relatively move the opposing sidewalls of each bag in timed relation with the movement of the bags to the dispensing station to selectively sever the predetermined sidewall of each bag from the next succeeding bag, thereby to open each bag in sequence for dispensing at the dispensing station. The apparatus typically further includes means to separate the opposing bag sidewalls to open the bag mouth at the dispensing station, a roll of bags carried on a spindle defining the bag supply, bag means which includes bag engaging structure traveling between the bag supply and the dispensing station, the transport structure being adapted to successively engage each bag opposite its predetermined sidewall for transport to the dispensing station. The transport structure may further include a drive for the bag engaging structure and a drive control responsive to separation at the dispensing station of the forwardmost bag, to actuate the drive. The drive control may be operated to drive the bag structure rearward, then forward, to the dispensing stations in time sequence, upon each actuation of the drive. The apparatus may further include drag structure limiting travel of the predetermined bag sidewall relative to its opposing sidewall to effect severence of the predetermined sidewall from the next succeeding bag.

In certain preferred embodiments, the present apparatus may be particularly adapted for singly dispensing at a dispensing station preformed thin-film plastic bags in opened condition from a supply of such bags in closed end-to-end severably interconnected relation; the apparatus in this embodiment comprising an endless belt mounted to travel a path extending between the bag supply and the dispensing station, first bag engaging means carried by the belt and adapted to draw the bags in succession from the bag supply and along said path in sidewall engaged relation, second bag engaging means arranged to selectively engage each bag at the opposite sidewall and means to intermittently vary the belt movement to cause said second means to engage said opposite sidewall for relative movement with its opposing sidewall and to sever the connection between one of said sidewalls and the next succeeding bag, to thereby open the bag. The first bag engaging means typically comprises adherent material adapted to releasably grip the bags, and the apparatus typically includes bag inflating means at the dispensing station.

The bag supply as indicated may comprise a roll of bags and the apparatus further includes a frame supporting the supply roll for unrolling delivery of bags, the frame defining the dispensing station in spaced relation to the roll, a pair of rollers carried by the frame including a roller at the dispensing station and a roller adjacent the bag roll. The rollers support the belt means. There may further be provided means to press bags against the belt adherent material between the rollers. The pressing means may comprise a wheel supported by the frame to resiliently engage the opposing sidewall and the apparatus may further include means to spring urge the wheel into bag contact. The mentioned pressing wheel may be arranged to roll with the opposing bag sidewall during bag advance and to resist movement of this sidewall on reverse travel of the bag. Plate means may be provided beneath the belt to cooperate with the wheel to press the bags into adherent engagement.

The mentioned advancing and reversing means will typically comprise an electric motor, and motor control switches responsive to bag movement to initiate and terminate motor operation to advance a succession of bags singly and in opened condition.

generally the Generally are unrolled horizontally from the roll and the apparatus may further include means to present the bags open end up at the dispensing station including successive belt portions carried for passing over and around the dispensing station roller with successive bags.

The bag inflating means may comprise plant compressed air or an air blower as a pressurized air source and the apparatus may further include deflector means arranged to direct pressurized air into successive bags as the bags are carried around the dispensing roller.

The apparatus may also include sensing means arranged to sense a bag at the dispensing station, and motor control means adapted to cycle the motor sequentially through alternating reverse and forward movements responsive to the sensed absence of a bag at the dispensing station to present the next bag at the station after removal of a bag.

Conveniently, the rollers, belt, and motor are supported by a section of the frame which is removable from the remainder of the frame.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be further descirbed as to an illustrative embodiment thereof in conjunction with the attached drawings in which:

FIG. 1 is a perspective view of bag dispensing apparatus according to the invention;

FIG. 2 is a perspective view of a bag supply roll, partly unrolled showing the transverse heat sealed and perforated tubing which comprises the bags in end-to-end severably interconnected relation;

FIG. 3 is a horizontal section of the tubing in FIG. 2, taken along line 3—3 in FIG. 2;

FIG. 4 is a side vertical section of the apparatus taken on line 4—4 in FIG. 1;

FIG. 5 is a vertical section from thereof taken on line 5—5 in FIG. 4;

FIG. 6 is a side vertical section taken on line 6—6 in FIG. 5 particularly depicting the forwardmost bag separation and the next bag opening;

FIG. 7 is a perspective view of the engaging wheel and back up plate arrangement used to open the bags; and

FIG. 8 is a schematic of the circuitry used to effect the sequence of transport mechanism operation resulting in opening and dispensing of bags automatically.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Turning now to the drawings in detail, and particularly with reference to FIGS. 1, 4, 5, and 6, the bag dispensing apparatus 1 comprises a housing 2 of sheet metal or the like having a front panel 3 defining a bag dispensing station 4, a bag supply roll 5 and a bag handling mechanism generally indicated by M, each enclosed by the housing. The apparatus 1 is sized to be placed on a shelf or counter 7 or it may be supported

on a pedestal at the use location e.g. in a supermarket or on a packaging line, for operation in any plane.

The housing 2 includes a rear cabinet portion 8 having sidewalls 9, a top wall 10, rear wall 11 and a bottom plate 15 projecting forwardly of the sidewalls and provided with rubber feet 16 to rest upon counter 7.

The housing 2 further includes a door 23 side hinged at 24 and releasably securable to the cabinet 8 by latch means 25 operable by button 26. The bag handling mechanism M is carried by and within the plane of door 23 for easy access to or removal of moving parts for maintenance or repair, by simply unlatching the door and swinging it open on hinge 24. And the door 23 arrangement enables facile replacement of supply rolls 5.

Before turning to the bag handling mechanism M in detail, the bag supply will be described. As noted above, there is provided herein means for dispensing singly and in opened condition bags from a supply in which the bags are closed and in end-to-end severably interconnected relation. Such a bag supply is depicted at S in FIGS. 2 and 3. Plastic tubing 27 is transversely heat sealed at longitudinally spaced locations 28 to define a succession of bags 29 having opposed sidewalls 30, 31 (FIG. 1) which are accordingly successive sections of the tubing. The tubing 27 is perforated through both tubing walls adjacent and forward of each heat seal 28 to form a dual severable interconnection 32. The tubing 27 thus sealed and perforated is rolled upon core 22 for unrolling delivery of bags, bottom 34 first. Because both tubing walls 30, 31 are perforated, one bag 29 may be separated from the next partially by severing one sidewall 30 or 31 or completely by severing both sidewall 30 and 31 from their respective continuations on the next bag, across the heat seal 28. Use is made of the resulting selective severability of bags 29 thus formed from tubing 27 in this manner, for dispensing the bags opened, singly and still partly connected, for reliability of delivery, as shown in FIG. 1.

The bag supply may be remote or adjacent to the dispensing station and the bag handling mechanism M sized accordingly. In the drawing, the supply roll 5 is supported in the cabinet 8 by vertical members 17 secured to bottom plate 15 by bolt 18 and wing nuts 19. These members are spaced to accommodate the roll 5 width and are radially slotted at 20 to receive the ends of spindle 21 on which core 22, upon which the bag supply is rolled, is carried. Stacked, flat bags connected end-to-end may also be used as the bag supply. The interconnected bags 29 are drawn from the supply roll 5 to the bag handling mechanism M where guide spindle 35 carried between arms 36 extending from members 17 presses the bags outward for handling mechanism engagement.

The bag handling mechanism M provides means to transport bag 29 formed in tubing 27 from supply roll 5 to the dispensing station 4 at front panel 3 therein, and means to relatively move the bag sidewalls 30, 31 during passage to the dispensing station, to selectively sever at least one sidewall of the bag from the next succeeding bag, to open the bag. Accordingly, the bag handling mechanism comprises the transport structure, the opening structure, and a drive and controls to operate these structures in timed relation.

The bag transport structure is essentially comprised of means extending between the supply roll 5 and the dispensing station 4 and means to grip the bags 29 in sequence for travel from the roll to the station.

With reference to FIGS. 4, 5, 6, one form of bag transport structure is shown, comprising a lower roller assembly 40, an upper roller assembly 41, and a bifurcated endless belt 42 extending between and around the rollers, the belt carrying bag adherent adhesive as a surface layer 43.

The lower roller assembly 40 comprises driven lower roller 44 fixed on horizontal shaft 45 which is journaled in vertically disposed mounting plates 46 secured at their flange portions 47 to the door 23 front panel 3 by fasteners, not shown. The roller shaft 45 rotates on its longitudinal axis in bearings 48, carried in the mounting plates 460 The lower roller 44 is divided into left and right sections 44*a*, 44*respectively* respecitvely which are spaced apart at 49 to accommodate therebetween trip means 50 located therebetween for purposes to be explained below.

The lower roller sections 44*a*, 44*b* are each grooved at 51 and knurled at the groove bottom 52 for nonslip engagement of the endless belt.

The endless belt is divided into right and left segments 42*a*, 42*b* each of which comprise relatively inelastic, tough webs of cloth, plastic, metal or like material having a gummy, tacky or sticky outer surface for temporary adhesion to the bags 29 e.g., a tacky adhesive coating forming layer 43. Suitably, the adhesive of layer 43 is high in shear strength and low in peel strength to enable positive advancement of the bags 29 and easy release at the dispensing station 4. Numerous known, high tack, rubber or resin based materials possess the requisite temporary adherent quality and can be used, including materials available in tape form, the belt then being, a tape backing e.g., Mylar film, or a solid block of gum rubber or sticky elastomer suitably shaped e.g., as a wheel can be used.

The upper roller assembly 41 lies in a common vertical plane with the lower roller assembly 40 and includes an upper roller 53, a shaft 54 parallel to lower roller shaft 45 journaled in bearings 55 carried by the panels 56 of door 23. The upper roller 53 is an idler roller comprising left and right sectios 53*sections* 53*b* spaced apart at 57 to accommodate trip means 58 for purposes hereinafter explained, and corresponding to section 44*a*, 44*b* of lower roller 44 is carried on the upper shaft 54 for rotation about the shaft.

It will be observed that lower roller 44 carries the belt segments 42*a*, 42*b* closely adjacent to the bag supply roll 5 and into bags 29 directed outwardly by guide spindle 35. The bags 29 in connected relation are thus engaged in sequence simultaneously by the belt segments 42*a*, 42*b*.

The belt segments 42*a*, 42*b* by means of their adhesive layer 43 adherently grip each bag 29 urged thereto by guide spindle 35. The relatively narrow width of the individual belt segments 42*a*, 42*b* and their relatively wide spacing is highly advantageous in obtaining true tracking of the bags 29 coming off the roll 5 and sure passage of the bags to the dispensing station 4 without misalignment, while nontheless maintaining easy removability of the bags from the belt at the dispensing station.

As best seen in FIGS. 4 and 6 the belt segments 42*a*, 42*b* carry the adhesively engaged bags 29 bottom 34 up (or heat seal end first) from the supply roll 5 upward to upper roller assembly 41 whereupon the bags are drawn over the upper roller 53 and thereby inverted as they come into the dispensing station, see FIG. 1. The

bag can be advanced open end first to the lower roller assembly **40** to achieve the same open end up relation of the bag at the dispensing station **4**. The bag **29** at the dispensing station **4** is separated by hand (FIG. **6**), before or after filling, utilizing the relatively low peel strength of the adhesive layer **43** to advantage, as well as the relatively small lateral extent of the belt **42** engaging the bag, provided by the spaced belt segments **42***a*, **42***b*.

An electric motor **60** of the reversing type is provided supported on the door **23** between the rollers **44, 53** for driving the rollers through motor output shaft **61**, drive pulley **62**, drive belt **63**, and lower shaft pulley **64**.

The lower and upper rollers **44, 53** are drivingly connected by belt segments **42***a*, **42***b* so that forward or reverse operation of the motor causes respectively counterclockwise or clockwise rotation of the upper and lower rollers together about their respective axes and concomitant belt segment travel. Control of motor and thus belt segment **42***a*, **42***b* travel direction is by switches **50, 58**, and **65** and circuitry shown in FIG. **8** and is explained below, it being necessary here only to note that the switches are sequentially actuated to alternate belt **42** travel direction, in unequal forward and reverse modes.

Having thusfar described the transport of the bags **29** from the supply roll **5** to the dispensing station **4**, the bag opening aspects of the device will be delineated.

The bags **29** are initially interconnected across perforations **32** in the opposing sidewalls **30, 31** adjacent the heat seals **28**. See FIGS. **2** and **6**. It is a signal feature of the method and apparatus herein that the bags **29** are opened for dispensing although drawn from a roll **5** wherein the bags are closed. In general, the bags are opened by moving the opposing bag sidewalls **30, 31** relative to one another in the course of the bag transport from the bag supply **5** to the dispensing station **4**. The relative movement may be with respect to the path of advance of the bags, generally defined by the path of belt segments **42***a*, **42***b* either parallel to the path, i.e., the opposing sidewalls are moved parallel to the path either in opposite direction e.g., one sidewall up and one sidewall down in the machine configuration shown in the drawings, or in the same direction at unequal speeds, or one sidewall is moved and the other held stationary e.g., by belt **42** or drag structure **70** described below. The sidewalls **30, 31** may be moved laterally apart to a degree inducing severing of a sidewall at the perforations or the sidewalls may be oppositely or differentially angularly displaced, e.g., relatively rotated. In each of these movements, the bag sidewalls **30, 31** are moved sufficiently to cause the tubing **27** film to tear at the perforations **32**.

In preferred practice, and as shown in the drawings, one sidewall only of the bags is severed, the other sidewall remains interconnected with the next succeeding, corresponding bag sidewall, so that there is no discontinuity in the advance of the bags from the supply roll to the dispensing station, and the bags are carried for alternately reversing movement.

Referring particularly to FIGS. **4, 6**, and **7**, the belt segments **42***a*, **42***b* are adapted to grip the bags **29** in succession and move them to and from the dispensing station **4** as determined by tne motor **60** operation. Means to relatively move the opposing bag sidewalls **30** and **31** in conjunction with the belt segments **42***a*, **42***b* is provided in the form of drag structure generally indicated at **70** which is carried adjacent the bag advancement path and intermediate the rollers to engage the bag sidewall **31** thereopposite, for unidirectional movement. In the embodiments of the Figures, the drag structure **70** includes a bracket **71** supported by the cabinet sidewall **9**, and a wheel assembly **72** carried thereby comprising wheels **73** (FIG. **7**) an axle **74** therefor supported by bracket **71**, a clevis **75** having opposed slots **74***a* to receive the axle **74** in laterally adjustable relation and a guide stem **75***a* connected to the clevis on which tension spring **76** is centered in engagement with wall **77** of the bracket and clevis **75**. The guide stem **75** passes through opening **78** in bracket wall **77** in guiding relation, to maintain wheel **73** engagement with sidewall **31** of the bags. The spring **76** urges the wheel assembly **72** forward into bag engagement. A back-up plate **80** is provided behind the belt segment sections opposite the wheel assembly **72** to cooperate with the wheels **73** in firmly engaging the bag outer sidewall **31** between the upper and lower rollers **44, 53**.

The wheels **73** and axle **74** are connected through a clutch means (not shown) permitting the wheels to rotate only clockwise or with the bag advance. The wheels **73** are provided with relatively non-slip surface and are desirably somewhat resilient to maximize the "footprint" of the wheel on the bag sidewall **31**. Suitably wheels **73** are fabricated of relatively hard rubber or plastic or provided with a surface layer of suitable friction material.

During advance of the bags **29** to the dispensing station **4**, the wheels **73** are urged against the outer bag sidewall **31** to ride in a rolling manner on the sidewall in directly opposed relation to belt segments **42***a*, **42***b*. Reversal of the bag travel direction causes the clutch mechanism to lock wheels **73** against counterclockwise rotation and the wheels drag on the bag sidewall **31**. Sufficient pressure is applied by the wheels **73** through action of spring **76** to preclude substantial retrogressive movement of the outer sidewall **31**, although the inner sidewall **30**, gripped by the adhesive layers **43** of the belt segments **42***a*, **42***b*, does move in the reverse direction. The result is relative movement of the bag sidewalls **30, 31** as they slide past each other. The engaged outer sidewall **31** crumples and backs up, as best seen in FIG. **6**. The nonengaged outer sidewall **31** of the next succeeding bag **29**, untrammeled by any drag structure does move, and the result is a tearing force at the perforation **32** in the outer sidewall **31**, but not at the inner sidewall **30**. The perforated tubing **27** yields locally, severing the bag interconnection on one side, and the bag is opened on the outer side. See FIG. **7**.

The opposed arrangement of drag structure and belt segments is significant in effecting the optimum tear at the outer sidewall junction. A Quidrilateral relation is highly suitalbe, e.g., two spaced belt segments forming two corners and drag structure wheels thereopposite. Departures from equilateral and opposed spacing of these elements may be used and will result in special tearing effects, e.g., one half of a sidewall perforation may be opened or a perforation may be opened at the sides and not at the center. Center tearing is preferred in the present invention where bag inflation is to be practiced at the dispensing station and is most effectively realized by mounting the wheels **73** directly across the bags from the belt segments **42***a*, **42***b*.

In addition to the spacing of the opposing bag engaging elements, the rate of relative movement and the distance of relative movement may be varied for particular tubing materials, types of perforations and like variable factors. In general, it may be observed that the length of relative sidewall movement should be sufficient to initiate perforation tearing, at a minimum, and less than that tearing an opening greater than the outer sidewall width. In this connection the width and spacing of the belt or other means to grip the moving sidewall is desirably such that the bag is gripped approximately equidistantly between the bag edges and the line of engagement of the drag wheel or like structure. As a bench mark, it has been observed that a 14 polyethylene inch long, one mil gage polyehtylene film bag, having a width of 12 inches is readily single sidewall severed from a roll for opening by belt segments three-fourth inch wide spaced 4 inches apart and equidistant from the bag center, where two one inch wide drag wheels are spaced 4 inches apart and equidistantly from the bag center, over the belts.

The mentioned engagement and wide track draw in the bags dispensed as described above has mainfold benefits in reliability of device operation. Countless bags may be reliably severed from a supply roll, despite vagaries of film gage, film blocking tendencies, imperfections in perforations and like quality control problems. The bags are reliably, time after time, perfectly dispensed because of the self-correcting balance in the bag tracking system.

Once opened desired the deisred degree, the bags **29** are advanced to the dispensing station **4** by again reversing the belt segments **42***a*, **42***b* travel direction. With reference particularly to FIGS. **1** and **6**, a further feature of the apparatus **1** can now be described. At the top of housing **2**, secured to the cabinet top wall **10** by bracket **81** is a self-contained blower **82** having an outlet **83** arranged to deliver pressurized air along the inside of the top wall. A transversely curved deflector **84** is provided hinged at **85** to the forward edge of the top-wall **10** to define a plenum at **86** between the deflector **84** and the bag wall **31** atop upper roller **53** which causes the pressurized air to be distributed across the width of panel **3**. The outer sidewall separated—but still inner sidewall interconnected—bag **29** being advanced to the dispensing station **4** is filled with blower air as it is fully invented, (see FIG. **1**) with the outer wall **30** bellying outward, for filling or only easy grasping and removal by simply overcoming the remaining perforated connections and the low peel strength of the belt segments **42***a*, **42***b*.

The control of the apparatus **1** may now be described commencing with the removal of the bag by the user. As noted above the apparatus is arranged to cycle the belt segments **42***a*, **42***b* through alternately reversed travel directions to alternately open and deliver bags **29** for dispensing.

The actuation of the motor **60** to effect the described belt **42** movements is by means of the already mentioned trip means **50**, **58** and **65**. Trip means **50** is located below the dispensing station and comprises an upwardly biased trip arm **90** and microswitch **91**, and is arranged to act as a lower limit switch, sensing the full length presence of a bag at the dispensing station **4** as the bag bottom edge **34** contacts the arm **90**. Depression of arm **90** by the leading bag edge opens the switch **91** and shuts off motor **60**. Conversely, separation of the bag **29** from the dispensing station **4** (FIG. **6**) permits the trip arm to raise, closing the switch **91** and starting motor **60** in a first (reverse) direction to drive rollers **44**, **53** clockwise (FIG. **6**).

Trip means **58** is located at the upper roller assembly **41** above the dispensing station **4** and comprises a curved, outwardly biased trip arm **92** and microswitch **93**. The trip means **58** is arranged to act as an upper limit switch, sensing the absence of a bag above the dispensing station **4** in sequence with the start up of the motor by switch **91** and acts to reverse the motor to the bag advance mode, the rollers **44**, **53** then rotating counterclockwise (FIG. **4**).

Accordingly when a bag **29***a* is separated at the dispensing station **4**, the lower limit switch **50** closes and starts the motor **60** to carry the next succeeding bag **29***b* backward whereupon the drag structure **70** automatically actuates to retard outer sidewall **31** movemnt as explained above, and thus open the bag **29***b* at perforation **32**, between bag **29***b* and **29***c*. When the front edge of bag **29***b* moves past switch **58**, arm **92** moves outwardly closing the switch **93** and reversing the motor **60**. The bag **29***b* is now advanced to the dispensing station **4** until the lower limit switch arm **90** is depressed again opening switch **91** and shutting off the motor. It will be noted that the open end of the bag **29***b* passes through plenum **86** and the bag is thus air inflated as it engers the dispensing station. The deflector **84** continues to direct blower **82** air into the open bag end to maintain inflation, see FIG. **1**. enters

A third trip means **65** is proved located centrally of the dispensing station and comprising an outwardly biased trip arm **95** and microswitch **96**. The trip means **65** is arranged as a "fail-safe" switch and signals the motor **60** through switch **96** to stop through a suitable delay circuit to permit full length presence of a bag at the dispensing station.

A suitable circuit arrangement for the motor and switches is shown in FIG. **8**. As shown, the circuit comprises a low output instant reversing motor **100**, a single pole double throw relay **101**, a double pole double throw relay **102**, switches **91**, **93** and **96** and capacitor **106** to provide additional power for instant stop and reverse action. Referring to FIGS. **4** and **8**, when the bag at dispensing station **4** is removed, lower limit switch **91** and center limit switch **96** close, energizing the relay **101** through contacts **103**, **104** to drive the motor **100** to reverse the belt **42** travel, toward the bag supply **5**. The bag about to be dispensed is carried backward until the sealed bottom **28** thereof clears the upper limit switch **93**, defining the distance and time of reverse movement. A time delay relay can also be used for this purpose. Upper limit switch **93** is closed and energizes relay **102** through contacts **103**, **105** to drive the motor **100** to advance the belt **42** while simultaneously de-energizing the relay **101**. The travel of the next bag **29** across the dispensing station is sensed by arm **90** and opens the lower limit switch **91**, shutting off the motor **100** until the bag is removed and another cycle commenced. The center limit switch **96** serves to prevent recycling operation of the device should a bag not fully engage the lower limit switch arm **90**.

I claim:

1. Apparatus for singly dispensing preformed bags in an opened condition from a supply of such bags closed in end-to-end severably interconnected relation, said apparatus comprising means to transport connected

bags from the bag supply to a dispensing station in a manner ultimately to have a predetermined bag sidewall facing outward at the dispensing station and means to relatively move the opposing sidewalls of each bag in timed relation with the movement of the bags to said dispensing station to selectively sever said predetermined sidewall of each bag from the next succeeding bag, thereby to open each bag in sequence for dispensing at the dispensing station.

2. Apparatus according to claim 1 including also means to separate the opposing bag sidewalls to open the bag mouth at the dispensing station.

3. Apparatus according to claim 1 including also a roll of bags carried on a spindle defining the bag supply.

4. Apparatus according to claim 1 in which said transport means includes bag engaging structure traveling between the bag supply and the dispensing station, said structure being adapted to successively engage each bag opposite its predetermined sidewall for transport to the dispsnsing station.

5. Apparatus according to claim 4 in which said transport means further includes a drive for the bag engaging structure and a drive control responsive to separation at the dispensing station of the forwardmost bag to actuate the drive.

6. Apparatus according to claim 5 in which the drive control operates to drive the structure rearward then forward to the dispensing station in time sequence upon each actuation of the drive and including also drag structure limiting travel of said predetermined bag sidewall relative to its opposing sidewall to effect severance of the predetermined sidewall from the next succeeding bag.

7. Apparatus for singly dispensing at a dispensing station preformed thin-film plastic bags in opened condition from a supply of such bags in closed, end-to-end severably interconnected relation, said apparatus comprising an endless belt mounted to travel a path extending between the bag supply and the dispensing station, first bag engaging means carried by the belt and adapted to draw bags in succession from the bag supply and along said path in sidewall engaged relation, second bag engaging means arranged to selectively engage each bag at the opposite sidewall and means to intermittently vary the belt movement to cause said second means to engage said opposite sidewall for relative movement with its opposing sidewall and to sever the connection between one of said sidewalls and the next succeeding bag, to thereby open the bag.

8. Apparatus according to claim 7 in which said first bag engaging means comprises adhesive adapted to releasably grip said bags.

9. Apparatus according to claim 8 including also bag inflating means at the dispensing station.

10. Apparatus according to claim 9 in which said bag supply is a roll of bags and including also a frame supporting said roll for unrolling delivery of bags, said frame defining said dispensing station in spaced relation to said roll, a pair of rollers carried by the frame including a roller at the dispensing station and a roller adjacent said bag roll, said rollers supporting the belt means, and means to press bags against the belt adhesive between the rollers.

11. Apparatus according to claim 10 in which said pressing means comprises a wheel supported by the frame to resiliently engage said opposing sidewall and including also means to spring urge said wheel into bag contact.

12. Apparatus according to claim 10 in which said belt is carried for alternating forward and reverse movement, and said wheel is arranged to roll with the opposing bag sidewall during bag advance and to resist movement of said sidewall on reverse travel of the bag to effect the sidewall severance.

13. Apparatus according to claim 12 including also plate means beneath said belt adapted to cooperate with said wheel to press said bags into belt adhesive engagement.

14. Apparatus according to claim 10 in which said advancing and reversing means comprises an electric motor, and motor control switches responsive to bag movement to initiate and terminate motor operation to advance a succession of bags singly and in opened conditoion. condition.

15. Apparatus according to claim 14 in which said bags are unrolled horizontally from the roll and including also means to present the bags open end up at the dispensing station including successive belt portions carried for passing over and around the dispensing station roller with successive bags.

16. Apparatus according to claim 15 in which said bag inflating means comprises a pressurized air source and including also deflector means arranged to direct pressurized air into successive bags as the bags are carried around the dispensing station roller.

17. Apparatus according to claim 16 including also sensing means arranged to sense a bag at the dispensing sequentially and motor control means adapted to cycle the motor sequentialy through alternating reverse and forward movements responsive to the sensed absence of a bag at the dispensing station to present the next bag at the station after removal of a bag.

18. Apparatus according to claim 17 in which said rollers belt and motor are supported by a section of said frame removable from the remainder of said frame.

19. Method of dispensing preformed bags from a supply of end-to-end severably interconnected bags individually and in opened condition at a dispensing station, which includes advancing collapsed bags successively in connected relation along a path to the dispensing station in a manner to have a predetermined bag sidewall facing outward at the dispensing station, relatively moving said predetermined bag sidewall and the opposing bag sidewall in advance of the dispensing station to selectively sever the predetermined bag sidewall from the next succeeding bag for presentation in opened, single sidewall connected condition at the dispensing station.

20. The method according to claim 19 including also relatively moving said opposing bag sidewalls generally in the plane of said advancement path and parallel to the direction of bag advance.

21. The method according to claim 20 including also maintaining said predetermined bag sidewall stationary and moving said opposing bag sidewall in sliding relation therewith.

22. The method according to claim 19 including also advancing said bags intermittently and responsive to separation of the forwardmost bag at the dispensing station.

23. Method according to claim 19 including also opening the bag at the dispensing station.

24. The method according to claim 23 including also blowing air into the bag open end to maintain the bag open at the dispensing station.

25. Method of dispensing thin-film plastic bags individually and in opened condition at a dispensing station from a supply of collapsed, end-to-end severably interconnected bags which includes engaging each bag in succession by a first sidewall thereof for travel to the dispensing station, engaging the second opposing bag sidewall for relative movement during bag travel to the dispensing station to selectively sever said second sidewall from the next succeeding bag to open each bag in advance of the dispensing station and inflating each open bag presented at the dispensing staion.

26. The method according to claim 25 including also adhesively gripping said first sidewall at laterally spaced locations adjacent the severable interconnection thereof with the next succeeding bag.

27. The method according to claim 26 including also sequentially moving each bag in unequal reverse and forward directions, sufficient to sever one sidewall from the next succeeding bag across the major portion of the bag width and to present a single bag at the dispensing station.

* * * * *