Nov. 15, 1966 A. JOHNSON ETAL 3,285,606

BAG FEEDING APPARATUS

Filed July 29, 1964 3 Sheets-Sheet 1

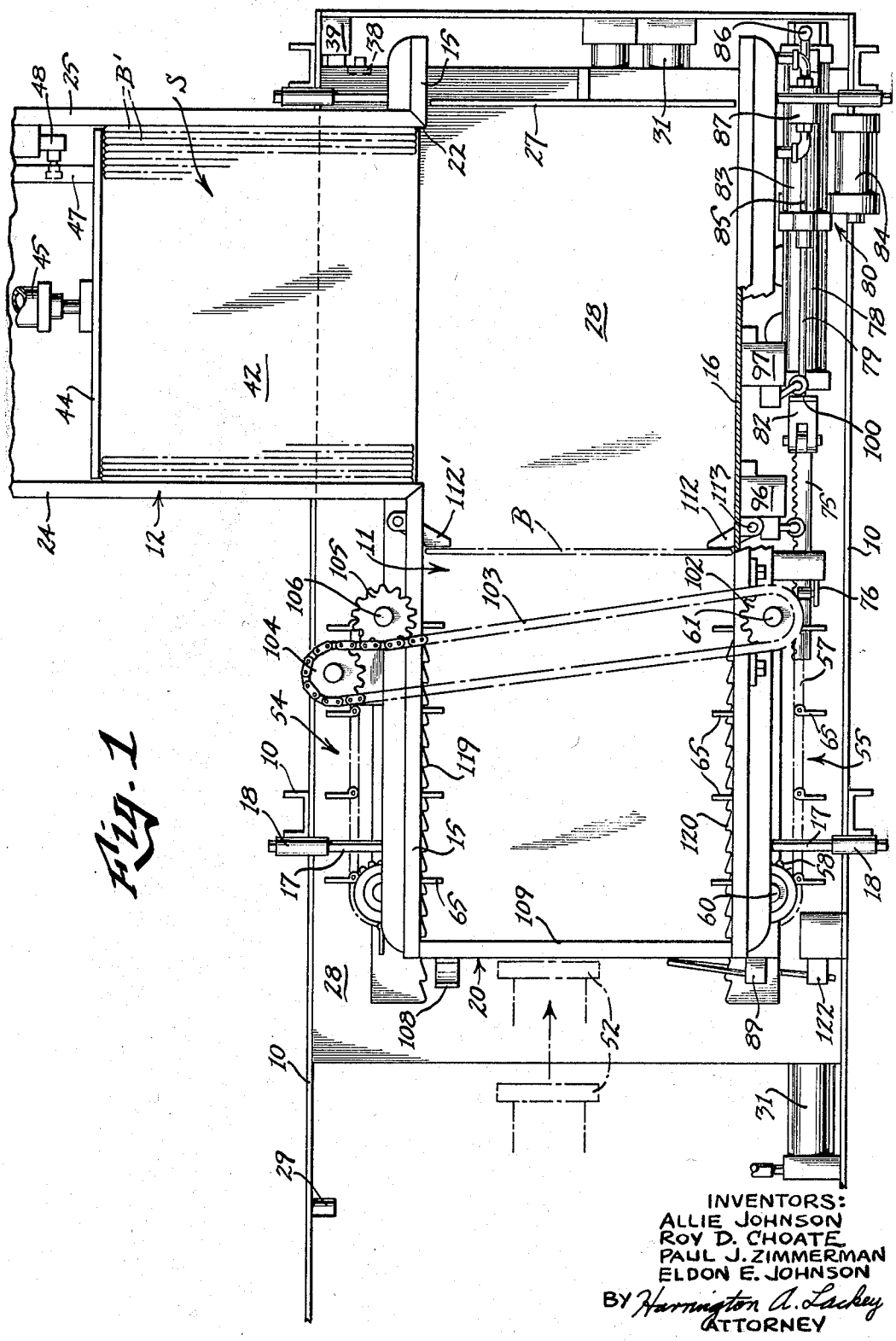


Fig. 1

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BAG FEEDING APPARATUS

Filed July 29, 1964 3 Sheets-Sheet 2

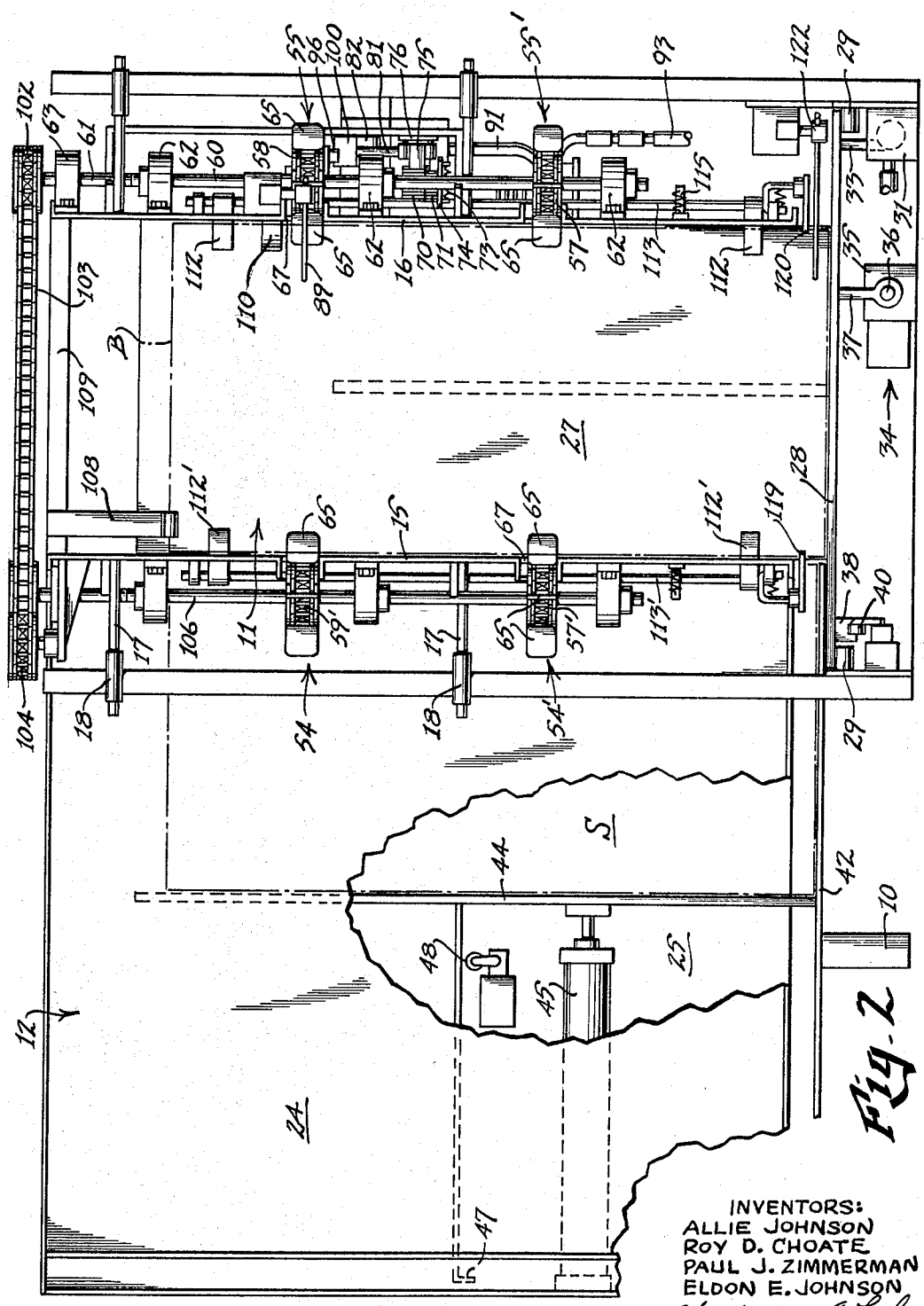


Fig. 2

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BAG FEEDING APPARATUS

Filed July 29, 1964 3 Sheets-Sheet 3

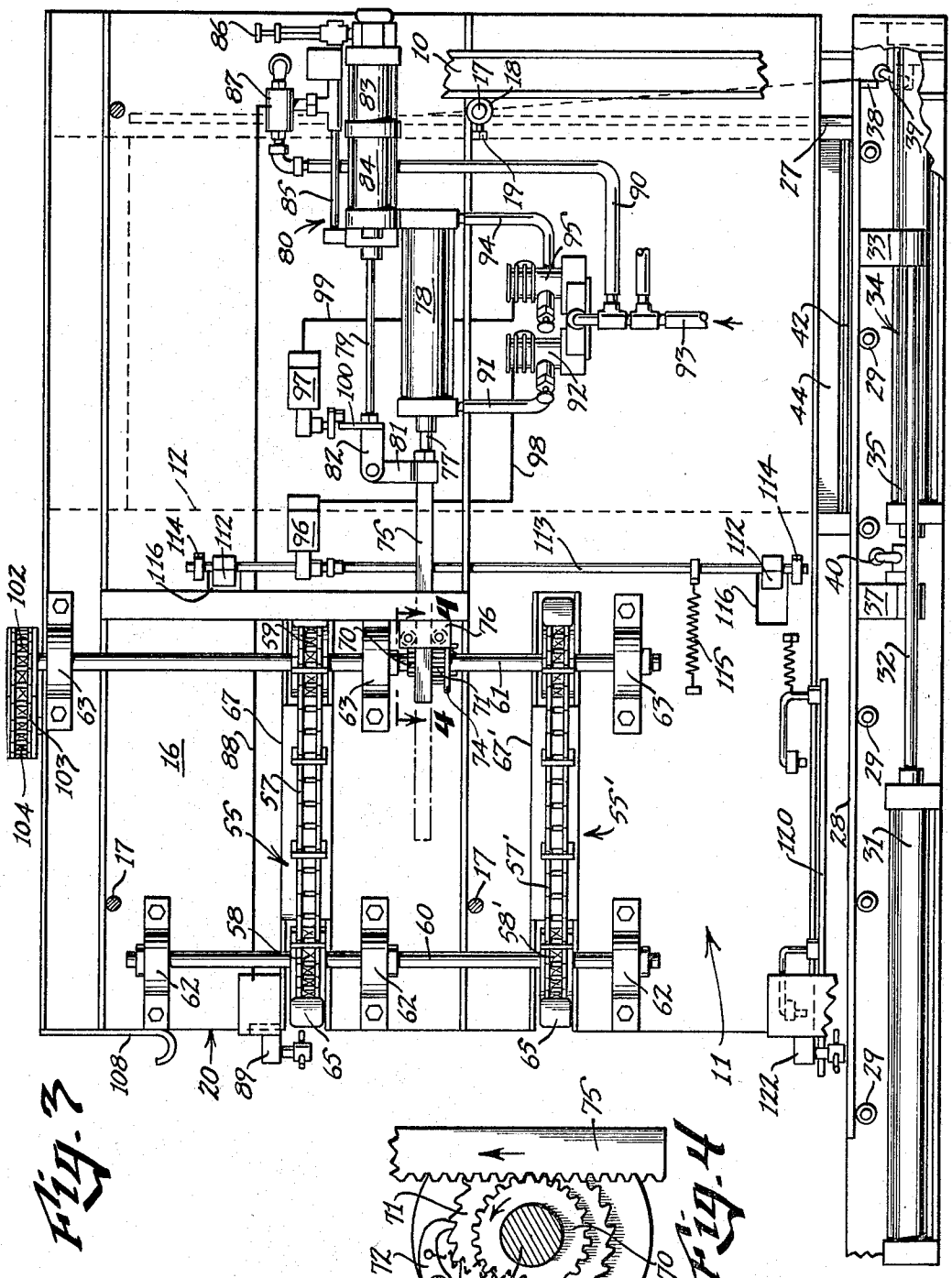


Fig. 3

Fig. 4

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BAG FEEDING APPARATUS

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6 Claims. (Cl. 271—62)

This invention relates to a feeding apparatus or magazine for collapsed bags, such as paper bags, or other stacked articles of uniform size.

One object of this invention is to provide an apparatus for feeding collapsed paper bags in an upright position to a discharge point, with means for loading the apparatus during the feeding operation.

Another object of this inveniton is to provide a novel bag feeding apparatus for loading, feeding and discharging collapsed paper bags in an upright position.

A further object of this invention is to provide a magazine for collapsed bags having a feeding compartment and a loading compartment, and means for moving the bags in the feeding compartment to a discharge position and another means for moving the bags in the loading compartment into the feeding compartment.

A further object of this invention is to provide a novel magazine for feeding collapsed paper bags in an upright position to a discharge point with auxiliary means for maintaining the bags in a substantially vertical position at the discharge point.

Another object of this invention is to provide a collapsed paper bag magazine, means for feeding a stack of bags in upright position through the magazine, and auxiliary means for feeding the top portions of the bags faster than the bottom portion so that the bags will arrive in a substantially vertical position at the discharge station.

Further objects and advantages of the invention will be apparent from the following description taken in conjunction with the drawings, wherein:

FIG. 1 is a top plan view of the invention, with parts broken away;

FIG. 2 is a front elevation of the invention, with parts broken away;

FIG. 3 is a side elevation of the invention, as viewed from the right side of FIG. 2, with parts broken away; and

FIG. 4 is an enlarged section taken along the line 4—4 of FIG. 3.

Referring now to the drawings in more detail, the bag feeding device, or magazine, includes a stationary frame 10 supporting a first receptacle or feeding compartment 11 and a second receptacle or loading compartment 12.

The feeding compartment 11 comprises a pair of elongated guide members, or vertically disposed side walls 15 and 16. These walls 15 and 16 are spaced apart a distance substantially equal to the width of a paper bag B to be fed longitudinally through the compartment 11. The walls 15 and 16 are mounted on the frame 10 by means, such as rods 17 fixed to and extending laterally outwardly from walls 15 and 16 and adapted to be telescopingly received in the collars 18 mounted on the frame 10. Each rod may be fixed in its collar 18 by means, such as set screw 19 (FIG. 3). In this manner, the walls 15 and 16 may be laterally or transversely adjusted to accommodate the width of various types of collapsed bags B. One end of the feeding compartment 11 comprises the discharge end or station 20.

An opening 22 is formed in the wall 15 spaced remotely from the discharge end 20 and toward the rear end of the feeding compartment 11. This opening 22 also forms the discharge or loading opening for the loading compartment 12. The loading compartment 12 also comprises a pair of elongated guide members or side walls 24 and 25, each of which join the edges of the opening 22 substantially perpendicular to side wall 15. The side walls 24 and 25 are parallel and spaced apart a predetermined distance for receiving a stack S of collapsed bags B' which are stacked in a direction extending transversely of loading compartment 12 so that the width of the bags B' are substantially parallel to the side walls 24 and 25.

Adapted to thrust the collapsed bags B in an upright position through the feeding compartment 11 is a reciprocable pusher member including an upright pusher plate 27 fixed on a bottom plate 28. The bottom plate 28 is supported on rollers 29 to roll or reciprocate in a longitudinal direction beneath the bottom edges of side walls 15 and 16. The plate 28 is adapted to be reciprocated by means of the double-acting pneumatic cylinder 31 connected through its piston rod 32 to the plate 28 by link 33. A hydra-check unit 34, including a hydraulic cylinder 35 and piston rod 36, is connected to the bottom plate 28 by link 37, to retard the forward movement of the plate 28, but permit free rapid movement of the plate 28 toward the rear.

A stop 38 depends from the bottom of plate 28 in order to engage rear limit switch 39 when the pusher member is in its extreme rear or retracted position, as disclosed in FIGS. 1 and 3, and also to engage the forward limit switch 40 when the pusher member is in its extreme forward position.

The loading receptacle or compartment 12 is provided with a fixed floor or bottom plate 42 mounted on frame 10 and above the reciprocating plate 28. A pusher member or plate 44 is mounted to reciprocate longitudinally over the floor 42 in the loading compartment 12 by means of a double-acting pneumatic cylinder 45. A stop 47 is fixed to and extends rearwardly of the pusher plate 44 a sufficient distance so that when it engages, the limit switch 48, the pusher plate 44 will be in its extreme discharge position, occupying discharge opening 22, and in substantial alignment with the sections of the side wall 15 of the feeding receptacle 11.

Because of the conventional manner in which paper bags are collapsed or folded, the bottom portions of the bags are more bulky than the top portions. Thus, when a stack of paper bags B are thrust in an upright position by the pusher plate 27 towards the discharge end 20, there is a tendency for the progressively remote bags from the pusher plate 27 to lean more and more toward the pusher plate 27, so that the first bag B to arrive at the discharge station 20 will be leaning backward at a substantial angle, or in other words, the bottom portion of the bag will reach the discharge station 20 before the top portion. This problem is particularly troublesome when the magazine is employed in conjunction with a bagging, or bag filling machine incorporating a longitudinally reciprocating suction head 52, shown in phantom in FIG. 1. In order for the suction head 52 to be effective in withdrawing one bag B at a time for the discharge station 20, the bags B must be in a substantially vertical position.

In order to overcome this problem, a pair of paddle units 54 and 55 are mounted opposite each other in the forward portions of the side walls 15 and 16, respectively, adjacent discharge end 20. The paddle unit 55 comprises an endless chain 57 extending around sprockets 58 and 59, which are supported for horizontal rotational movement about vertical shafts 60 and 61, respectively, journaled in appropriate bearings 62 and 63 fixed to the side wall 16. The endless chain 57 carries a plurality of laterally or radially extending, uniformly spaced paddles 65. The inner leg of the chain 57 is adapted to move in a slot 67 in side wall 16 so that the paddles 65

will extend inwardly between the top portions of some of the bags B as the inner chain leg and the paddles 65 move forward.

The drive shaft 61 is rotated only in one direction, that is, in the direction which will carry the paddle 65 forward toward discharge station 20. To establish this uni-directional drive, the shaft 61 carries a freely rotatable gear 70 and ratchet 71 rigidly fixed to the gear 70. The free wheeling ratchet 71 is adapted to engage a pawl 72 when rotated in the direction of the arrow disclosed in FIG. 4. The pawl 72 is biased into engagement with the ratchet 71 by means of the spring 73, and is pivotally supported on the disc 74 fixed to the shaft 61. The gear 70 engages a rack 75, which is retained in a roller guide 76 for reciprocatory movement longitudinally of the side wall 16, between the extreme positions disclosed in FIG. 3.

The rack 75 forms an extension of rod 77 controlled by the double-acting pneumatic cylinder 78. The rack 75 is also connected to piston rod 79 of the hydra-check unit 80 by links 81 and 82. The hydra-check unit is conventional and includes a double-acting hydraulic cylinder 83 for reciprocating the piston rod 79, an oil reservoir 84 communicating with the forward portion of the cylinder 83 in advance of the piston, not shown, and a feed-back line or pipe 85 connecting the rear portion of the cylinder 83 with the forward portion to establish fluid communication between the cylinder portions on opposite sides of the piston. The feed-back line 85 includes a metering valve 86 to control the rate of flow through line 85, and a pilot valve 87 to open and close line 85. The pilot valve 87 is a conventional type of needle valve which is actuated by a solenoid connected through lead 88 to upper limit switch 89 at discharge station 20, and by air pressure from pipe 90.

Compressed air is introduced into the front end of cylinder 78 through conduit 91 and solenoid valve 92 from supply pipe 93, and alternately into the rear end of cylinder 78 through conduit 94 and solenoid valve 95 from supply pipe 93. The solenoid valves 92 and 95 are respectively connected to limit switches 96 and 97 through electrical leads 98 and 99. Each limit switch 96 and 97 is actuated when engaged by trigger flange 100 to energize the corresponding solenoid valve 92 or 95 and de-energize the other solenoid valve to introduce compressed air into the cylinder 78 through the corresponding conduit 91 or 94.

Assuming that no bags B have arrived at the discharge station 20, the limit switch 89 remains de-actuated to de-energize the pilot valve 87 to open the feed-back line 84 in the hydra-check unit 80. With the solenoid valve 92 energized and solenoid valve 95 de-energized, cylinder 78 is actuated to move the piston rod 77 and rack 75 toward the rear and drive the paddle units 54 and 55 to move the top portions of the bags B forward. The hydra-check unit 80 limits the rate of rearward movement of the rack 75 and consequently the forward rate of movement of the bags B. This rate is determined by the setting of the metering valve 86 which regulates oil flow through the feedback line 85.

If the trigger flange reaches the limit switch 97 before a bag B reaches the discharge station 20, energization of the solenoid valves 95 and 92 is reversed to open conduit 94 and actuate the cylinder 78 to thrust piston rod 77 and rack 75 forward. This forward movement is quite rapid because the fluid resistance in the hydra-check unit 80 is substantially reduced by short-circuiting the oil flow from cylinder 83 into the oil reservoir 83 and by-passing the feed-back line 85 and metering valve 86. Moreover, the forward moving rack 75 is merely ratcheted over the disc 74 without driving the shaft 61 and the paddle units 54 and 55. This forward or return stroke of the rack 75 is so rapid as to be almost imperceptible. When the trigger flange 100 engages the forward limit switch 96, the energization of the solenoid valves 92 and 95 are again reversed to continue the forward movement of the upper portions of the bags B. This operation continues until a bag B reaches the discharge station 20 and its upper portion, in vertical position, actuates limit switch 89 to energize pilot valve 87 and close feed-back line 85, which immediately halts the reciprocable movement of the rack 75 and the forward movement of paddle units 54 and 55, until the bag B is removed from discharge station 20.

The paddle unit 54 is identical in construction to the paddle unit 55, except that it is the mirror image of the unit 55. The unit 54 is driven by means of a sprocket 102 fixed to the top of the shaft 61 and carrying an endless chain 103, which passes around an idler sprocket 104 supported on the opposite side wall 15, and also drives a sprocket 105 fixed to shaft 106, which drives the sprocket 59′ to drive the paddle unit 54 in the opposite direction from and in unison with the paddle unit 55. The paddle units 54 and 55 ar e mounted in a substantially horizontal plane in order to carry the opposite edges of the top portions of the bags *b*. If desired, additional lower paddle units 55′ and 54′ may also be mounted on the shafts 60, 61 and 106 in order to improve the efficiency of the paddle units.

A keeper 108 depends from a cross bar 109 to extend slightly below the top of the bags B in order to prevent them from falling out of the discharge station 20 until the bags B are positively removed. A similar keeper 110 is also supported on the side wall 16 for the same purpose.

Fingers 112 are mounted on a vertical shaft 113 for pivotal movement in bearings 114 on the outside of wall 16, and are biased by spring 15 to swing through corresponding slots 116 in wall 16 to extend inwardly in the path of the bags B and the feeding compartment 28. Similar fingers 112′ are similarly mounted and extend through the wall 15 in transverse alignment with the fingers 112. When bags B are thrust forward by the pusher plate 27, the bags depress the fingers 112′ and 112 into their respective side walls 15 and 16. However, when the pusher plate 27 and bottom plate 28 are moved toward the rear, any bag B which might frictionally engage the bottom plate 28 will not be permitted to move rearwardly beyond the fingers 112′ and 112, since in their biased position, the fingers abut against the rear edges of their corresponding slots 116.

The saw-teeth plates 119 and 120 are pivotally mounted to extend below the bottom edges of the walls 15 and 16, respectively, to assist in supporting the bottom portions of the bags B without retrograde movement. The plates 119 and 120 are biased into the solid line positions disclosed in FIGS. 1 and 2, and may be manually swung outwardly of the walls 15 and 16, when and if desired.

Another limit switch 122 is supported near the bottom and adjacent the discharge station 20 so that the switch is normally de-actuated when the discharge station 20 is unoccupied by a bag B. However, when a bag B enters the discharge station 20, the switch 122 is actuated to energize a pilot valve, not shown, but similar to pilot valve 87, in hydra-check unit 34 to immediately stop the movement of bottom plate 28 and the bags B. When a bag B is removed from discharge station 20, switch 122 is de-actuated to permit resumption of the feeding of bags B toward discharge station 20. The hydra-check unit 34 functions identically to the hydra-check unit 80.

The operation of the invention is as follows:

Assuming that the pusher plates 27 and 44 are in their retracted positions as disclosed in FIG. 1, a stack S of bags B′ are manually placed into the loading compartment 12, as disclosed in FIG. 1. The controls are then manually started to cause the pneumatic cylinder 45 to thrust the pusher plate 44 toward the opening 22 and push the stack S into the feeding compartment 11. As soon as the pusher plate 44 is flush with the opening 22, the stop 47 energizes the limit switch 48 to reverse the air circulation in cylinder 45 and the movement of the pusher plate 44,

and to actuate the cylinder **31** to start the forward movement of the pusher plate **27**. When the pusher plate **44** returns to its retracted position, it automatically stops, and another stack of bags B' may then be introduced into the loading compartment **12** and stored for the next feeding cycle.

If the forward portion of the feeding compartment **11** is empty, the pusher plate **27** and bottom plate **28** will continue to move forward slowly against the retarding action of hydra-check **34**, with the stack S until the bottom portion of the foremost bag B' engages the limit switch **122**, which will actuate the hydra-check unit **34** to immediately stop the forward movement of the bags B. However, until the front bag B' is in a substantially vertical position in the discharge station **20**, the paddle units **54**, **54'**, **55** and **55'** will continue to drive their respective paddles forward. When the upper portion of the front bag B engages the limit switch **89**, the paddle units **54**, **54'**, **55** and **55'** will stop.

When the bottom plate **28** reaches its extreme forward position, stop **38** engages limit switch **40** to reverse the movement of the plates **27** and **28**. The reverse or return movement is rapid because of the absence of the retarding action of the hydra-check unit **34** in this direction, and the movement continues until the stop **28** engages the limit switch **39** to stop the plate **27** in its retracted position disclosed in FIG. 1, and to automatically actuate the cylinder **45** to re-start the pusher plate **44** and repeat the cycle.

All of the controls and circuitry for the limit switches and double-acting pneumatic cylinders have not been disclosed since they are conventional and not material parts of the invention. The limit switches energize conventional solenoid valves which control and reverse the flow of compressed air from suitable supply sources to the cylinders, and could be arranged in different ways to perform the same function.

Although it will be understood that there are various ways of connecting the different limit switches in order to obtain the desired feeding and loading controls, it will be understood that in all cases, the pusher plate **27** must be in its retracted position before the pusher plate **44** can move forward to load the feeding compartment **11**.

It will be apparent to those skilled in the art that various changes may be made in the invention without departing from the spirit and scope thereof, and therefore, this invention is not limited by that which is shown in the drawings and described in the specification, but only as indicated in the appended claims.

What is claimed is:

1. An apparatus for feeding stacked articles of uniform size comprising:

(a) a first receptacle for receiving said articles in upright position having first and second elongated guide members spaced apart substantially the width of said articles and forming a discharge end,

(b) a second receptacle having third and fourth elongated guide members spaced apart to receive a stack of said articles in upright position, stacked substantially parallel between said third and fourth guide members,

(c) said third and fourth guide members extending normal to said first guide member outside said first receptacle to form an opening in said first guide member spaced from said discharge end,

(d) a first pusher member in said first receptacle,

(e) means for reciprocably moving said first pusher member longitudinally of said first receptacle from a retracted position on the opposite side of said opening from said discharge end to a position between said opening and said discharge end,

(f) a second pusher member in said second receptacle,

(g) means for reciprocably moving said second pusher member longitudinally within said second receptacle between a position occupying said opening and a retracted position spaced from said opening at least the width of said stack, and

(h) means mounted in said first and second guide members adjacent said discharge end for moving the top portions of said articles toward said discharge end independently of said first pusher means to position each article at said discharge end substantially vertically.

2. The invention according to claim **1** in which said top portion moving means include fingers extending transversely into said first receptacle at sufficient elevation to engage said top portions, and means for moving said fingers toward said discharge end.

3. The invention according to claim **2** in which said finger moving means comprises an endless chain, said fingers being uniformly spaced on said chain, means for rotating said endless chain so that said one leg of said chain moves along said first receptacle toward said discharge end, and limit switch means at said discharge end for stopping said finger means when said switch means senses an article in vertical position at said discharge end.

4. An apparatus for feeding stacked articles of uniform size comprising:

(a) a first receptacle for receiving said articles in upright position having first and second elongated guide members spaced apart substantially the width of said articles and forming a discharge end,

(b) a second receptacle having third and fourth elongated guide members spaced apart to receive a stack of said articles in upright position, stacked substantially parallel between said third and fourth guide members,

(c) said third and fourth guide members extending normal to said first guide member outside said first receptacle to form an opening in said first guide member spaced from said discharge end,

(d) a first pusher member in said first receptacle,

(e) means for reciprocably moving said first pusher member longitudinally of said first receptacle from a retracted position on the opposite side of said opening from said discharge end to a position between said opening and said discharge end,

(f) a second pusher member in said second receptacle,

(g) means for reciprocably moving said second pusher member longitudinally within said second receptacle between a position occupying said opening and a retracted position spaced from said opening at least the width of said stack,

(h) first and second detents pivotally mounted on said first and second guide members, respectively,

(i) means biasing said detents to extend into said first receptacle between said opening and said discharge end to prevent any article between said detents and said discharge end from moving toward said first pusher member,

(j) said detents being adapted to be pivotally depressed into said first and second guide members by the engagement of articles moving toward said discharge end.

5. An apparatus for feeding stacked articles of uniform size comprising:

(a) a first receptacle for receiving said articles in upright position having first and second elongated guide members spaced apart substantially the width of said articles and forming a discharge end,

(b) a second receptacle having third and fourth elongated guide members spaced apart to receive a stack of said articles in upright position, stacked substantially parallel between said third and fourth guide members,

(c) said third and fourth guide members extending normal to said first guide member outside said first receptacle to form an opening in said first guide member spaced from said discharge end,

(d) a first pusher member comprising a bottom plate

forming the bottom of said first receptacle and a pusher plate extending upright on said bottom plate in said first receptacle,

(e) roller means in said first receptacle supporting said bottom plate for reciprocable movement,

(f) means for reciprocably moving said first pusher member longitudinally of said first receptacle from a retracted position on the opposite side of said opening from said discharge end to a position between said opening and said discharge end,

(g) a second pusher member in said second receptacle,

(h) means for reciprocably moving said second pusher member longitudinally within said second receptacle between a position occupying said opening and a retracted position spaced from said opening at least the width of said stack.

6. An apparatus for feeding stacked articles of uniform size comprising:

(a) a first receptacle for receiving said articles in upright position having first and second elongated guide members spaced apart substantially the width of said articles and forming a discharge end,

(b) a second receptacle having third and fourth elongated guide members spaced apart to receive a stack of said articles in upright position, stacked substantially parallel between said third and fourth guide members,

(c) said third and fourth guide members extending normal to said first guide member outside said first receptacle to form an opening in said first guide member spaced from said discharge end,

(d) a first pusher member in said first receptacle,

(e) first means for reciprocably moving said first pusher member longitudinally in said first receptacle between a retracted position on the opposite side of said opening from said discharge end and a projected position toward said discharge end,

(f) a second pusher member in said second receptacle,

(g) second means for reciprocably moving said second

pusher member within said second receptacle between a retracted position spaced from said opening at least the width of said stack and a projected position flush with said opening,

(h) finger means in said first receptacle between said opening and said discharge end for engaging the top portions of said articles,

(i) means for moving said finger means toward said discharge end,

(j) first limit switch means energized by said first pusher member in its retracted position to actuate said second moving means to move said second pusher member toward its projected position,

(k) second limit switch means at said discharge end adapted to be energized by an article in said discharge end to stop said first moving means, and

(l) third limit switch means at said discharge end adapted to be energized by an article at said discharge end in vertical position for stopping said finger moving means, and to be de-energized by the absence of an article at said discharge end in vertical position to actuate said finger moving means.

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