

[54] **PRODUCT PACKAGING APPARATUS**

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Related U.S. Application Data

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[51] Int. Cl. **B65b 43/36**

[58] Field of Search 53/59 W, 63, 78, 189, 385;
177/120

[56] **References Cited**

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997,145	7/1911	Lines	53/190 X
3,581,459	6/1971	Elliot et al.	53/59 W
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Primary Examiner—Travis S. McGehee

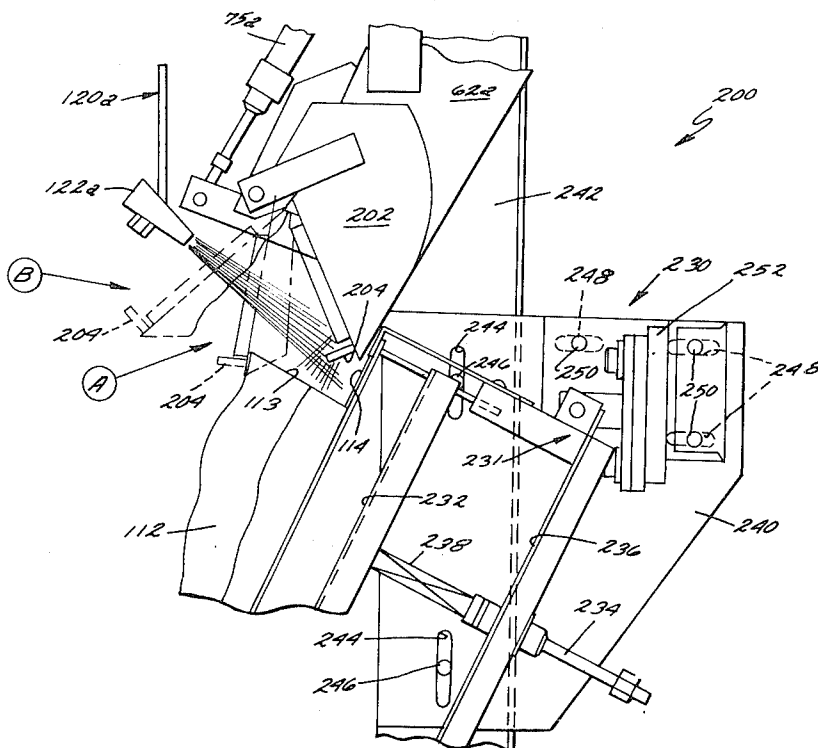
Attorney, Agent, or Firm—Price, Heneveld, Huizenga & Cooper

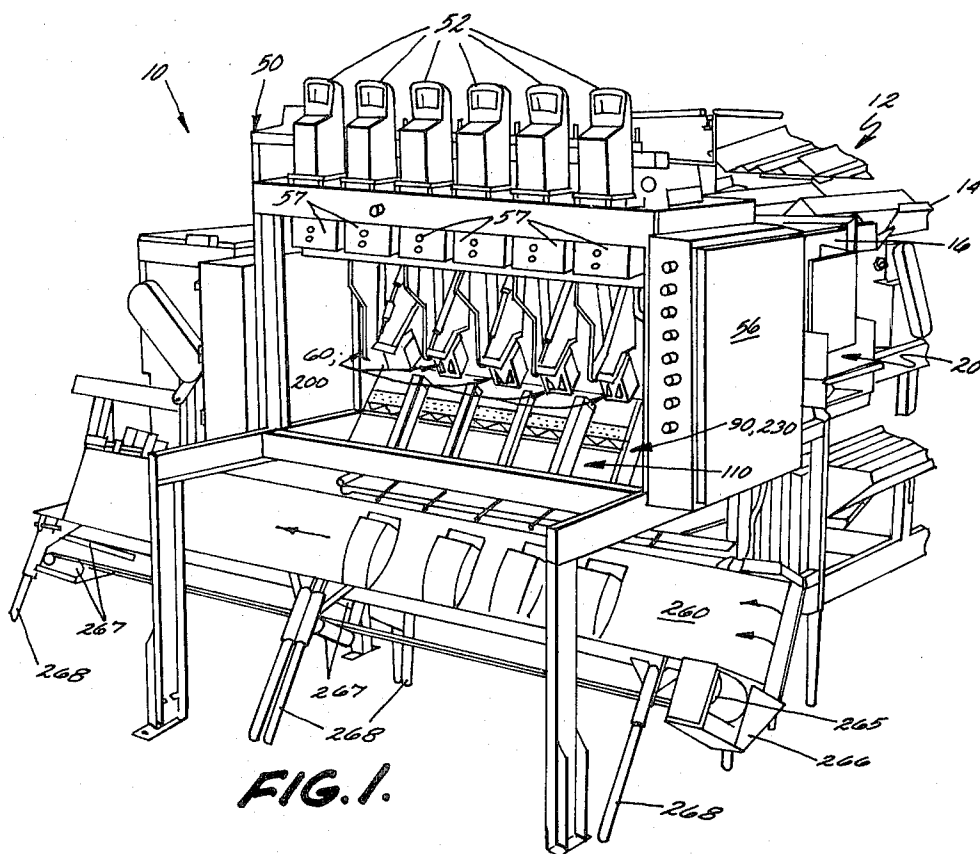
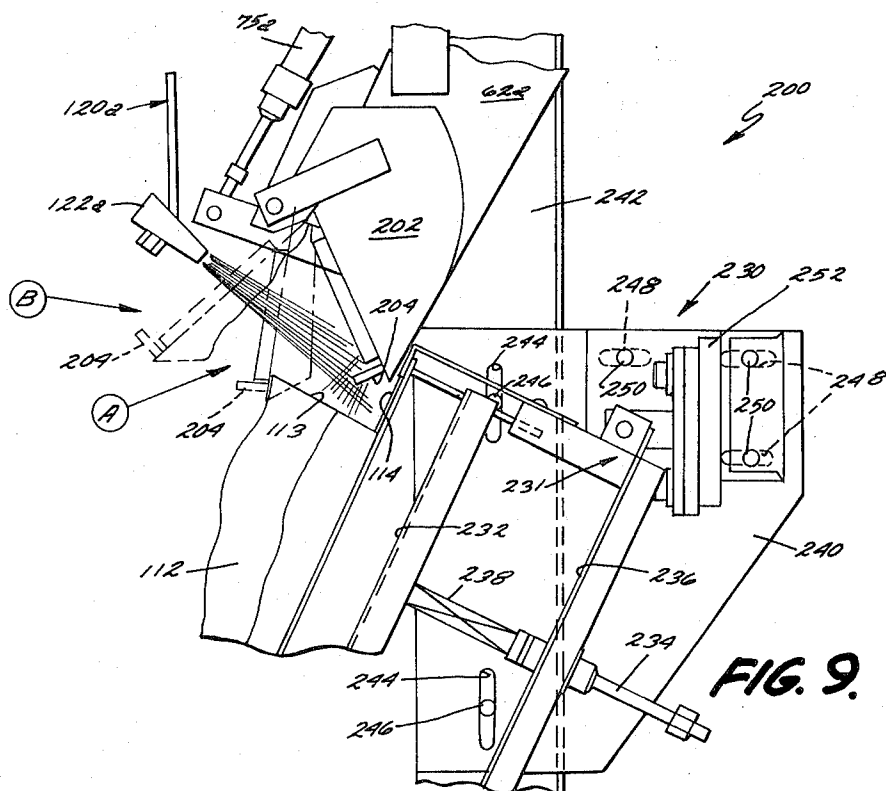
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ABSTRACT

A product packaging apparatus for the automated conveyance and packaging of predetermined quantities of products or materials in individual, flexible bags. The apparatus comprises an infeed conveyor for feeding a flow of material to be packaged to a packaging means and means for shutting off the flow of material from the infeed conveyor to the packaging means. The packaging means includes a receptacle, weighing means, support means for holding a plurality of flexible bags beneath the receptacle, closure means for opening, filling, and removing the bags, and a control means associated therewith for controlling the operation of the above means for shutting off the flow of material from the infeed conveyor to the packaging means. Means are included on the closure means for grasping each bag to be filled to keep the bag open and for directing a stream of air into the bag to initially open the same.

13 Claims, 9 Drawing Figures





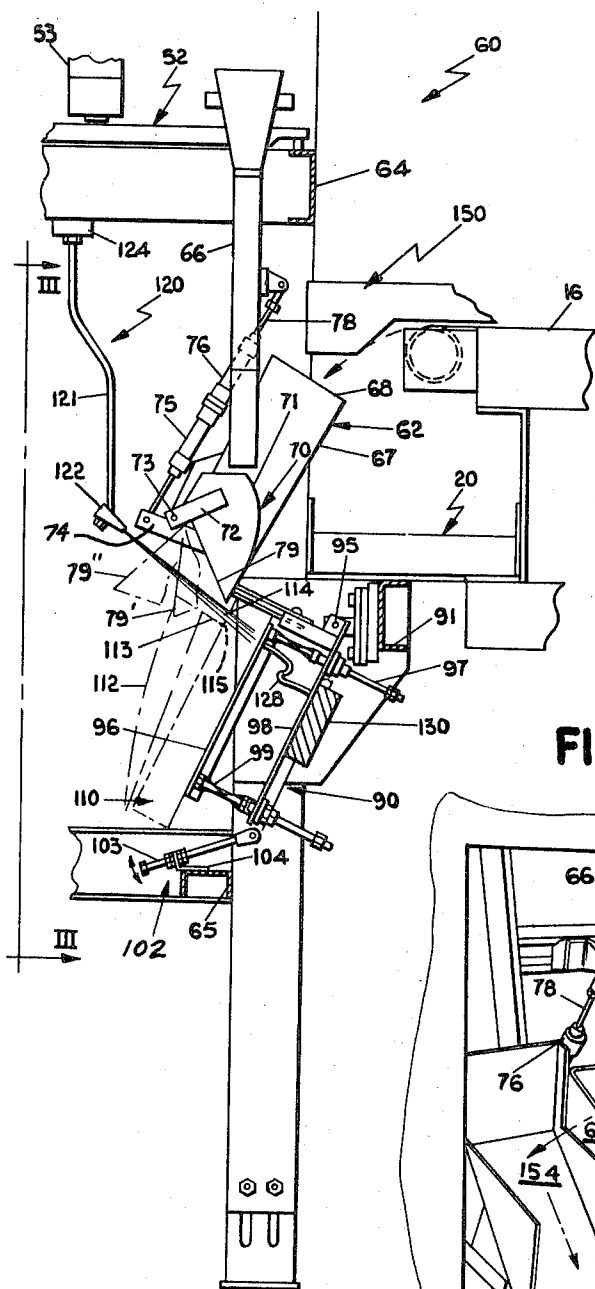


FIG. 2.

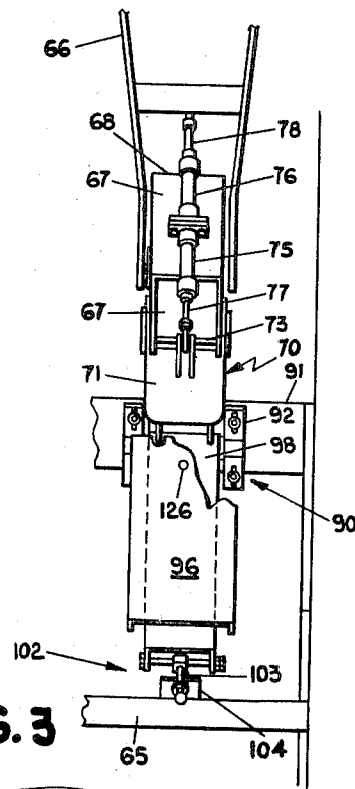


FIG. 3

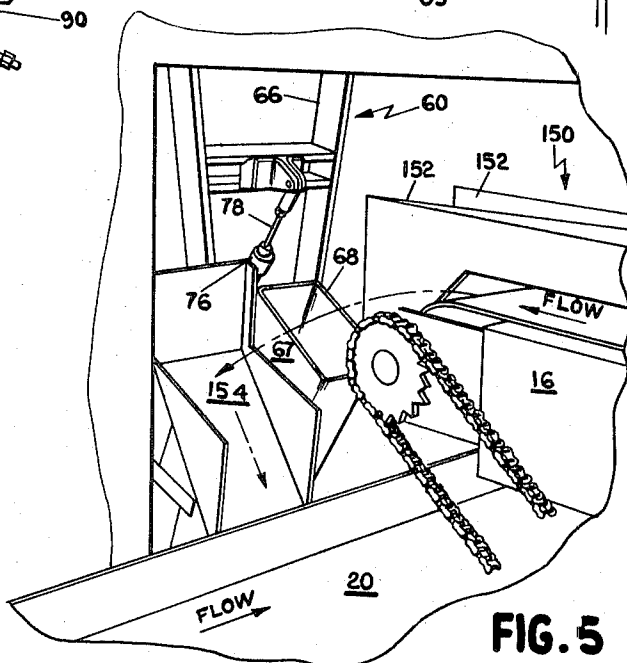


FIG. 5

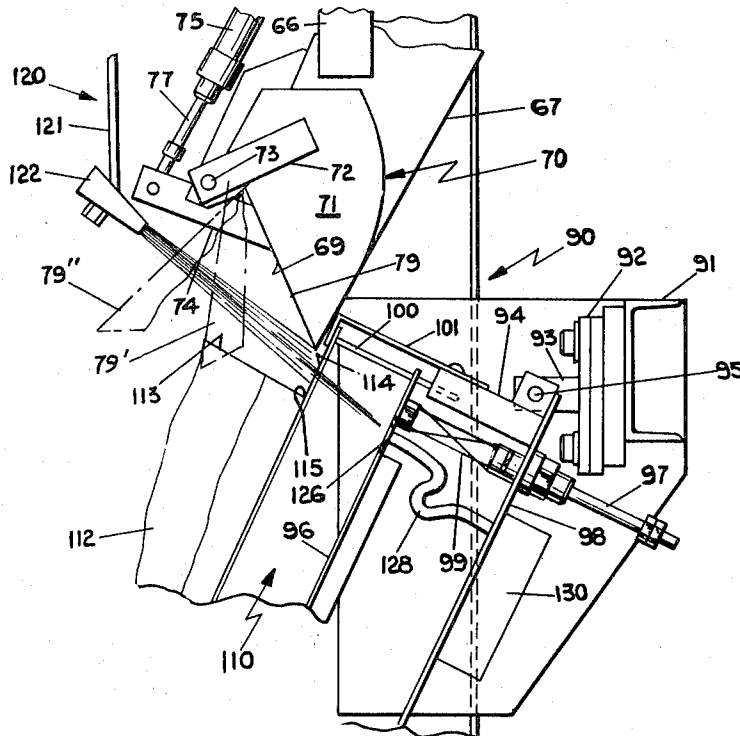


FIG. 4

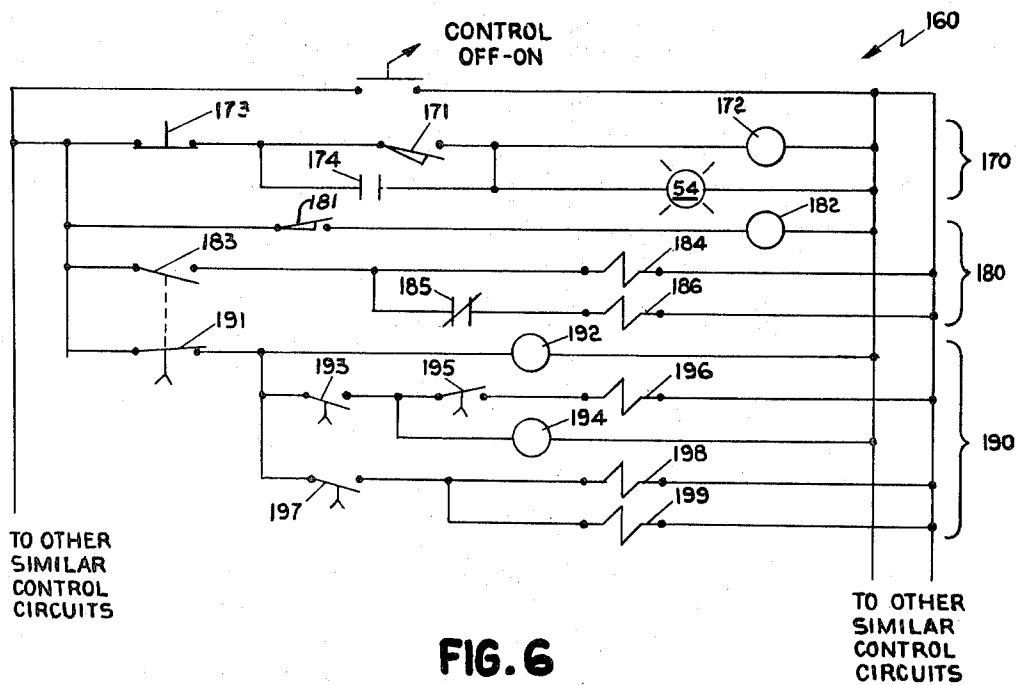


FIG. 6

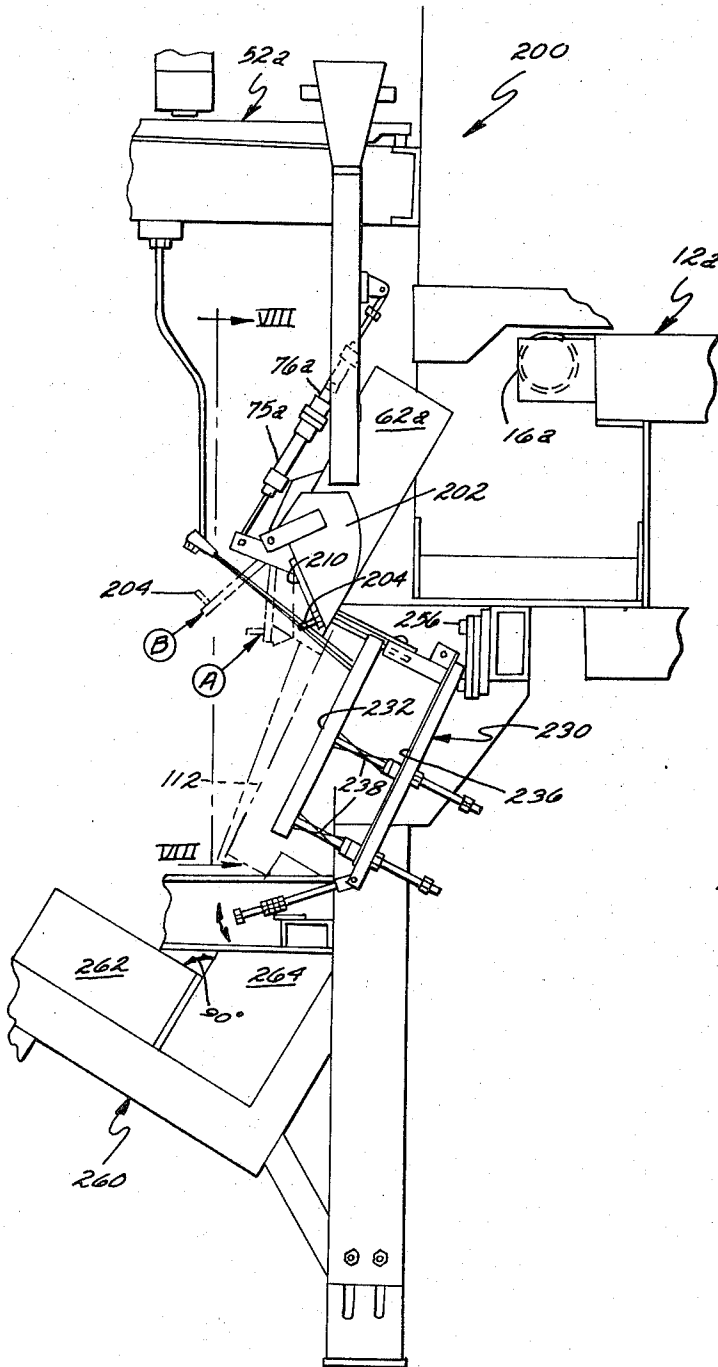


FIG. 7.

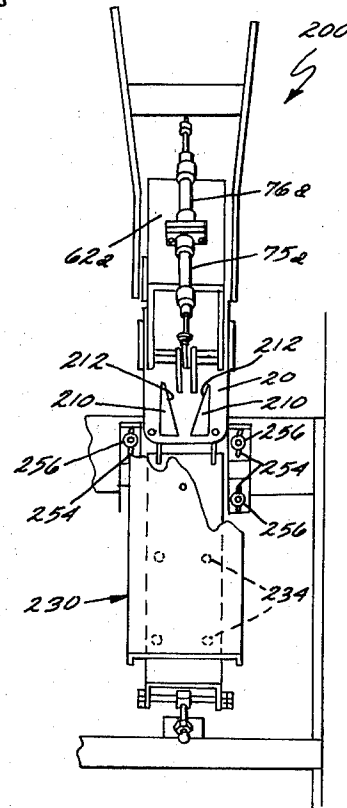


FIG. 8.

PRODUCT PACKAGING APPARATUS

This application is a continuation-in-part of my previous application, Ser. No. 254,074, entitled PRODUCT PACKAGING APPARATUS, invented by Lee S. Kihnke, filed May 17, 1972, now U.S. Pat. No. 3,807,123.

This invention relates to a product packaging apparatus and, more particularly, to an apparatus for the automated conveyance and packaging of predetermined quantities of products or materials in individual, flexible bags.

BACKGROUND OF THE INVENTION

In the past, machines and apparatus for the packaging of products and materials, and especially carrots and other elongated materials, have been characterized by their complexity and intricate design. More recently, such machines have been made highly automated with the result that the machine designs have become increasingly more complex. Although being automated, the intricate designs have detracted from the value of such machines due to the resulting inefficiencies. Thus, such prior machines with their intricate machinery have been prone to frequent breakdowns, and have required constant attention to keep the apparatus operational. Additionally, such machines have been either incapable or relatively inefficient in handling varying types of products and materials. Therefore, the prior packaging apparatus was, from many standpoints, inadequate to provide a packaging machine which was automatic and packaged a product or material without the intervention of any manual labor, which was flexible and could therefore handle a variety of products or materials to be packaged, and which was simple and efficient in its operation.

SUMMARY OF THE INVENTION

Accordingly, it is an object and feature of the present invention to provide a packaging apparatus which weighs and dispenses predetermined amounts of material received from an infeed conveyor into individual flexible bags which are automatically opened, filled and removed. Fluid means are included to initially open each of the bags after which a multi-purpose door closure releases the material from the weighing receptacle, positively engages and completely opens the mouth of the initially opened bag, and finally pulls the filled bag from a bag support and drops it on a waiting conveyor.

It is another object and feature of the present invention to provide fluid guide means to direct fluid, such as a stream of air, to maintain the individual bags open prior to and during positive engagement of the bags by the door closure.

It is yet another object and feature of the present invention to provide positive bag engaging means, such as bag puncturing prongs, to facilitate the multi-purpose operation of the door closure.

It is another object and feature of the present invention to provide a packaging apparatus which is capable of packaging a variety of products and materials, but especially thin, elongated articles or produce such as carrots.

It is a further object and feature of the present invention to provide a simple and efficient packaging apparatus utilizing few moving parts which can accurately

and quickly dispense predetermined amounts of a continuous flow of material to be packaged into individual bags after which the bags are removed and dropped onto a waiting receptacle or conveyor, all without the intervention of any human operators, or the waste or spillage of any material to be packaged.

These and other objects and features of the present invention may be accomplished by providing a product packaging apparatus which packages a continuous flow of products or material received from one of several types of infeed conveyors. The packaging apparatus includes a packaging means comprising at least one receptacle or bucket for receiving the material from the infeed conveyor which bucket is suspended from a scale in order to measure the quantity of material received in the bucket. The bucket is disposed adjacent a support means for holding at least one flexible bag, which bag receives the material to be packaged from the bucket. A fluid means is provided for opening the bag prior to the reception of the material from the bucket and, in one embodiment, for indicating the absence of any bags on the support means.

Following the measurement of the material in the bucket by the scale, a door closure means is activated to release the material from the bucket into the bag, after which release the filled bag is removed from the support means. The door closure includes projecting prongs to positively retain the bag until it is filled and removed from the support as well as guide vanes for directing a stream of air from the fluid means to facilitate opening of the bag. After the bucket is filled and during the release of the material to be packaged into the bag, a flow diverting means mounted on the discharge end of the infeed conveyor diverts the flow of material into a recirculating means which carries the diverted material to a position where it may be returned to a portion of the infeed conveyor. A separate, transverse, discharge conveyor, positioned below the support means, is included to receive the filled bags after their removal from the support means. Signaling means, timing means, and power means are provided for operating the various elements of the apparatus and for accomplishing these operations in the proper sequence.

These and other objects, advantages and features of the invention will become apparent from a study of the following description taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmentary perspective view of the packaging apparatus comprising the present novel invention;

FIG. 2 is a fragmentary side elevation of the packaging means shown positioned adjacent the discharge end of the infeed conveyor;

FIG. 3 is a fragmentary front elevation taken along lines III—III of FIG. 2;

FIG. 4 is an enlarged side elevation of a portion of the packaging means shown in FIG. 2;

FIG. 5 is a perspective view of the discharge end of the infeed conveyor, the packaging means, and the recirculating means;

FIG. 6 is a schematic diagram of the electrical circuit controlling one of the units of the packaging means;

FIG. 7 is a fragmentary side elevation of a modified embodiment of the packaging means shown positioned adjacent the discharge end of the infeed conveyor and

including a separate, transverse discharge conveyor positioned below the support means;

FIG. 8 is a fragmentary front elevation similar to FIG. 2 but taken along plane VIII—VIII of FIG. 7; and

FIG. 9 is an enlarged side elevation of a portion of the modified packaging means shown in FIGS. 7 and 8.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in greater detail, FIG. 1 shows the packaging apparatus 10 as assembled and installed for operation. As depicted therein, packaging apparatus 10 comprises an infeed conveyor means 12, a recirculating means 20, and a packaging means 50. Generally, the infeed conveyor means 12 receives the products or material to be packaged at its infeed end 14 and transports or conveys the material to the packaging means 50. The packaging means 50 includes six separate packaging units 60 spaced along the discharge end 16 of the infeed conveyor 12. The packaging means 50 also includes six scales or weighing means 52, each of which is operably associated with one of the individual packaging units 60. A control box 56 and pneumatic logic circuit boxes 57 are provided for housing the electrical circuit and pneumatic timing controls needed for the operation of the packaging apparatus 10.

Infeed conveyor means 12 and recirculating means 20 may be of the type described in either of my copending applications entitled PACKAGING APPARATUS, invented by Lee S. Kihnke, Ser. No. 254,076, filed on May 17, 1972, now U.S. Pat. No. 3,807,124, or Ser. No. 348,974, entitled PRODUCT ORIENTING APPARATUS FOR PACKAGING, invented by Lee S. Kihnke and filed Apr. 9, 1973, both of which are incorporated by reference herein. Thus, the infeed conveyor 12 generally receives and conveys or transports a quantity of products or material to be packaged from its infeed end 14 to and into the packaging means 50 as will be more fully described below. As described in the former application referred to above, Ser. No. 254,076, the infeed conveyor 12 includes guide means 18 for segregating the flow of material to be packaged into a plurality of columns of flow, each of which columns is directed to one of the packaging units 60. As described hereinafter, if the individual packaging units 60 are filled or unable to accept any more of the material to be packaged, flow diverting means 150 provided at the discharge end 16 of infeed conveyor 12 are activated to divert the flow of material onto recirculating means or recirculating conveyor 20, which recirculating conveyor then removes the flow of material such that it may be returned to the infeed end 14 of infeed conveyor 12. Thus the continuous and efficient operation of the packaging apparatus 10 is insured since the conveyor 12 may operate continuously without clogging or jamming resulting when the individual packaging units 60 are for any reason unable to accept more of the material to be packaged.

As described in the latter application referred to above, Ser. No. 348,974, the infeed apparatus may include means for orienting elongated articles such as carrots for packaging in the packaging means 50. The orienting means includes multiple sections adapted to successively linearly space and longitudinally align in columns a plurality of such articles after they are received randomly in a first of the multiple sections. The

sections are aligned rectilinearly and comprise a surge tank and elevating conveyor, a reciprocating, vibratory conveyor which segregates the articles into columns, a conveyor having endless belts with generally V-shaped cross-sections, and a final conveyor having endless flat belts. The last three conveyors are located successively lower levels such that the carrots or elongated articles cascade downwardly from section to section. The sections may also be driven at successively faster speed to facilitate the linear spacing of the articles.

Individual packaging units 60 generally include a receptacle means 62 for receiving the flow of material to be packaged from the discharge end 16 of the infeed conveyor 12, as shown in FIG. 1. A support means 90 for a bag means or plurality of bags 110 is disposed adjacent to and immediately below the lower end of receptacle means 62 such that the material to be packaged, which has been weighed and measured by means of a scale 52 while held in receptacle means 62, may be released into the outermost bag of bag means 110 as supported by support means 90. The individual bags 112, which are opened by a fluid means 120 (FIG. 2) prior to the release of the measured amount of material to be packaged by the receptacle means 62, are then removed mechanically by closure means 70 from support means 90, after which the filled bags drop into a receptacle, container, or separate, transverse discharge conveyor 260 positioned therebeneath. The details and construction of the various elements enabling this continuous bag filling and recirculating operation will be more fully described below.

Referring now FIGS. 2 through 5, the details of the construction and operation of the various elements utilized to accomplish the above described packaging operation will be more fully revealed. As shown in FIG. 2, each individual packaging unit 60 includes a scale or weighing means 52, a receptacle means 62, a closure means 70, a support means or bag holder 90 for holding a bag means 110 including a plurality of individual flexible bags 112, and a fluid means 120. Also associated with the packaging units 60, are the flow diverting means 150 and recirculating means 20 mounted adjacent to the packaging units 60 on the discharge end 16 of infeed conveyor 12. Scale 52 is mounted on frame members 64 and supports receptacle means 62 by means of downwardly extending frame 66. Scale 52 includes a counter-balancing means 53 on which weights may be placed to predetermine the amount of material received in receptacle means 62 prior to its release into bags 112. Scale 52 is of the conventional and well-known type which is readily commercially available and which indicates exactly when a weight suspended from it exactly matches the weight of counterweight 53 preset thereon. Scale 52 also includes a control signaling means (not shown) which may be set to activate both the closure means 70 and the flow diverting means 150 when a predetermined weight has been measured by the scale, as will be more fully described below.

Receptacle means 62 comprises a bucket 67 having a first opening 68 at the upper end thereof and a second opening 69 at the lower end. Bucket 67 is fixedly mounted on the lower portion of frame 66 at an angle with the vertical such that the first opening 68 is positioned immediately adjacent and in line with the trajectory of the flow of material to be packaged leaving the discharge end 16 of infeed conveyor 12 (See FIG. 2). Second opening 69 of bucket 67 is disposed adjacent

to support means 90 and is selectively opened and closed by closure means 70 in order to release the material to be packaged held by bucket 67.

Closure means 70 comprises a pivotal door 71 including a hinge arm 72, which hinge arm 72 allows door 71 to pivot about rod 73 which is mounted on bucket 67. Door 71 also includes a power arm 74 which is in turn operably connected to air cylinders 75 and 76 mounted end to end such that a double air cylinder is formed. Cylinders 75 and 76 include extensible shafts 77 and 78, respectively, which shafts 77 and 78 are respectively pivotally connected to power arm 74 and frame member 66. Thus, when one of the air cylinders 75 and 76 is activated, an extensible shaft is withdrawn thereby moving the door 71 from a closed position 79, shown by the solid lines in FIGS. 2 and 4, to the first open position 79' shown in phantom. The movement of the door 71 to the first open position 79', also inserts the extremity of door 71 into the opening of the outermost bag 112 supported on support means 90. Bag 112 is opened prior to the pivotal insertion of door 71 therein by fluid means 120 which directs a stream of compressed air from nozzle 122 in a direction of the lower edge of door 71 thereby causing the air to reflect off door 71 and into the opening 113 of bag 112. The stream of air thus opens and maintains bag 112 in an opened position, after which the rotation of door 71, by means of the activation of one of the cylinders 75 or 76, causes the extremity of door 71 to be inserted in opening 113 thereby mechanically stretching open, i.e., further opening, opening 113 to its fullest extent in preparation for the release of the material from bucket 67. The activation of the remaining cylinder 75 or 76 will withdraw the remaining extensible shaft causing door 71 to rotate or pivot about rod 73 to the second open position shown at 79'', also shown in phantom in FIGS. 2 and 4. This rotation to the second open position 79'' of door 71, causes bag 112 to be removed from holder 90 since the pivotal movement of door 71 separates bag 112 from flap 114 along perforated line 115. Other types of bags without perforations may also be used since the opening of door 71 to position 79'' is also sufficient to pull the bag from the hanger on support 90 as will be more fully described below.

Thus, in cooperation with fluid means 120, closure means 70 is extended to fully open and fill the outermost bag 112 held by support means 90, after which filling the closure means 70 is further extended to completely remove bag 112 from support means 90 and packaging means 60. These various operations are timed to occur sequentially in response to successive signals from control or signaling means included with the scale 52 and timing means mounted within control box 56, as will be more fully described below.

As illustrated in FIGS. 7 through 9, a modified embodiment 200 of the individual packaging unit includes additional means which facilitate the opening of the bag 112. As shown in those figures, the packaging unit 200 is very similar to the unit 60 shown and described in FIGS. 2 through 4 except for modifications made to the door 71, bag support 90, and the addition of the transverse, discharge conveyor 260 mentioned above. Carrots or other elongated articles are fed from the discharge end 16a of infeed conveyor 12a into receptacle 62a where they are weighed by scale 52a. Instead of a closure means 70 comprising door 71, unit 200 includes a door 202 which is pivotally secured and pow-

ered by back-to-back air cylinders 75a and 76a in the same manner as that of unit 60. Thus, the door 202 moves from a closed position (shown in solid in FIGS. 7 and 9) to a first open position A wherein the piston rod of one of the air cylinders 75a or 76a is retracted and to a second open position B wherein the piston rods of both of the air cylinders 75a and 76a are retracted. Although the fluid means 120a including adjustable nozzle 122a directs a stream of air partially against door 202 to initially open bags 112 which are held in the proper filling position on the modified bag support 230, grasping prongs 204 are provided adjacent the lower edge of door 202 to puncture and retain the lip of bag 112 to assure that it is first stretched open by the door at its first open position A and then removed from the bag holder 230 at its second position B. Prongs 204 in the preferred embodiment comprise round, cylindrical rods which extend normally from the flat external bottom surface of door 202 approximately three-eighths to one-half inch. As the door 202 moves to its first and second open positions, as shown in FIGS. 7 and 9, prongs 204 will be seen to engage and puncture the lip of previously open bag 112 as the door reaches the first open position A. The puncturing of the lip securely grasps and holds the lip of the bag against the bottom of door 202 thereby stretching the mouth 113 completely open and allowing the carrots or other elongated articles to easily fall into the bag from receptacle 62a. Following the dumping or filling of the bag, the door 202 is moved to its second open position B wherein the flap 114 of bag 112 is pulled from the hanger on support 230 and the weight of the carrots pulls or tears the filled bag 112 off prongs 204 and allows them to drop vertically downwardly onto the transverse discharge conveyor 260 as shown in FIG. 1. Accordingly, prongs 204 grasp, engage and retain the edge of bag 204 to assure its proper opening and removal from the packaging apparatus 200.

Referring again to FIGS. 2, 3 and 4, the construction and operation of the support means 90 in relation to the position and construction of the weighing means 52, receptacle means 62 and fluid means 120 will become more fully apparent. Support means 90 is of the type described in the copending application entitled BAG HOLDING APPARATUS & METHOD FOR PACKAGING invented by Lee S. Kihnke and Dewey L. Thompson, Ser. No. 254,075, filed May 17, 1972 and incorporated by reference herein. Support means or bag holder 90 is mounted on frame member 91 by means of support members 92 and arm 93. Bag holder 90 further includes a bag frame 94 pivotally mounted on pin 95 mounted on arm 93. Bag frame 94 comprises a back plate 96 slidably mounted on rods 97 which rods 97 are in turn mounted in apertures provided in rear support plate 98 of bag frame 94. Back plate 96 is biased away from rear support plate 98 by means of springs 99. Bag means 110 comprising a plurality of bags 112 are mounted by means of a U-shaped wire wicket 100 as shown in FIGS. 2 and 4. Preferably, the bags 112 contemplated for use with support means 90 are flexible, plastic bags made from polyethylene or other similar materials. The bags 112 are preferably formed in a rectangular shape with an opening 113 at the top. A supporting flap 114 extends beyond the opening from one side of the bag and includes apertures for receiving the legs of the U-shaped wire wicket 100. The bag 112 may be removed from flap 114 and

wicket 100 along a perforated line 115 between the flap 114 and the edge of opening 113. As mentioned above, different types of bags may also be used especially with the modified embodiment 200 of the packaging unit including door 202 with prongs 204. The different bags include no perforated line 115 between flap 114 and the edge of opening 113. Rather, that area is solid. Thus, when prongs 204 engage and puncture the lip of bag 112, and door 202 moves to second open position B, flap 114 is torn from wicket 100 with the bag material ripping through from the wicket aperture in that flap. Thus, no special bag preparations are necessary.

The U-shaped wire wicket has two parallel legs interconnected by a cross member, which legs extend through apertures provided in flaps 114 of each individual bag 112 such that the bags may be stacked on the wicket and prevented from sliding off the ends of the legs by means of the cross member. The parallel legs of the wicket are slidably and removably inserted in bag frame 94 such that the plurality of bags 112 is supported by the back plate 96 with the outermost bag, i.e., the bag farthest away from back plate 96, being supported immediately adjacent and beneath the second opening 69 of bucket 67 and closure means 70 as described above. A securing plate 101 is removably attached over the tops of the bag means 110 such that it contacts the cross member of wire wicket 100 thereby securely holding the wicket and the attached plurality of bags 112 in place.

Therefore, when assembled, bag holder 90 supports a removable and replacable plurality of bags 110 at an angle immediately adjacent and beneath the second opening 69 of bucket 67 with the back plate 96 continuously biasing the outermost bag 112 into the proper position such that the bag may be opened by fluid means 120 and filled and removed by closure means 70 in combination with bucket 67. Support means or bag holder 90 also includes pivotal securing means 102 comprising a pivotal securing arm 103 pivotally mounted on the lower portion or rear support plate 98 such that arm 103 may be selectively pivoted into and out of a slot member 104 fixedly secured to a portion of the frame 65 beneath the bag holder. Consequently, the pivotal movement of arm 103 out of contact with slot member 104 releases the bag holder 90 enabling it to swing about pivot point 95 such that securing plate 101 and wire wicket 100 may be easily removed and replaced with a full complement of bags.

As described above, fluid means 120 comprises a means for directing a stream of compressed air at the lowermost extremity of closure means 70 such that the air is deflected off the closure means 70 thereby opening and filling the outermost bag 112 supported on support means 90. In addition, fluid means 120 comprises a portion of the bag supply indicating means for indicating when the bag means or supply of bags 110 has been entirely removed from the bag holder 90. Fluid means 120, as referred to above, comprises a conduit 121 for compressed air, which conduit is connected to a compressed air supply 124 as shown in FIG. 2. The compressed air supplied to a fluid means 120 originates at the same source as the compressed air used to power cylinders 75 and 76, however, the air for cylinders 75 and 76 is first passed through a lubricant such that a sufficient amount of oil is carried into the cylinders for lubrication purposes. The air provided to fluid means

120, on the other hand, does not pass through an oil bath and is thus perfectly dry and oil free thereby preventing any contamination of dirtying of the individual bags 112 or the packaging means 60. A nozzle 122 is mounted at the end of conduit 121 and is directed such that a stream of air just contacts the lowest extremity of door 71 of closure means 70. The main portion of the stream of air continues on and, when all the bags held by support means 90 have been used by the packaging apparatus, the stream of air enters port 126 formed in biased back plate 96.

Port or aperture 126 is connected to a fluid pressure responsive signaling means 130 by means of a communicating means or flexible conduit or tube 128. The fluid pressure responsive signaling means 130 comprises a fluidic servo unit including an expandable bellows and a switch (not shown), which bellows when filled by the stream of air directed at port 126 and communicated to the bellows by means of tube 128, expands and closes the switch thereby producing a signal which is transmitted to flow diverting means 150 as will be hereinafter described. Consequently, when at least one bag remains supported on support means 90, port 126 will be blocked by the material forming the bag, thus preventing the stream of compressed air from entering port 126 and activating the fluid pressure responsive signaling means. When the last bag 112 is used, however, the stream of air will enter port 126, activate fluid pressure responsive signaling means 130 producing a signal which, when transmitted, activates the flow diverting means 150 and turns on light 54 indicating the bag holder or support means 90 is empty. Thus, the flow of material to be packaged on infeed conveyor 12 will be diverted by flow diverting means 150 when no bags are left on bag holder 90 to receive the material as described below. Consequently, no waste or spillage of the material to be packaged is encountered.

As illustrated in FIGS. 7 through 9, the modified embodiment 200 of the packaging unit includes additional apparatus cooperating with the fluid means 120a which is similar in all respects to the fluid means 120 described above in connection with packaging unit 60. This cooperating apparatus includes guide vanes 210 which are secured laterally adjacent one another adjacent the lower edge of door closure 202 and prongs 204. Guide vanes 210 are substantially flat, generally triangularly shaped elements including inside edges 212 which are laterally adjacent and inclined with respect to one another, each of which inside edges lies in a plane which is perpendicular to the general plane including the bottom of door closure 202. As will be seen in FIG. 8, the spaced vanes 210 with edges 212 form a generally V-shaped, flat bottomed trough which funnels the air from nozzle 122a, which is directed against door closure 202, downwardly into the opening 113 of bag 112. Vanes 210 prevent the stream of air from scattering when it strikes the generally flat surface of door closure 202. Further, as door 202 opens, the guide vanes 210 maintain the direction of the air into the opening 213 until the prongs 204 securely engage the edge of the bag by puncturing the same as the door opens to station A and tightly stretches open the opening 113. Accordingly, guide vanes 210 assure both that the bag 112 will be properly opened by the stream of air and properly engaged by the door 202 including prongs 204.

The modified packaging unit 200 also includes the modified bag support or holder 230. As is best seen in FIGS. 7 and 9, bag support 230 omits the use of the fluid pressure responsive signaling means 130, port 126 and connecting means 120a. Further, the back plate 232 which supports the plurality of bags 112 such that the outermost bag is always in the correct position adjacent the bottom of receptacle 62a and door closure 202 is supported on rods 234 secured on rear support plate 236. The upper slide support rods 234 have been moved downwardly such that they are approximately centered behind the back plate 232 as seen in FIGS. 7 and 8. The back plate 232 is biased away from support plate 236 via springs 238 which are received concentrically around rods 234 thereby forcing the bags into the correct position. The modified location of the upper support rods 234 allows the rods to support the center of gravity of the plurality of bags such that the back plate 232 will freely slide toward the correct position.

Additional modifications to the embodiment 230 of the bag support include the adjustable mounting of the entire bag support assembly on a support plate 240 as is best seen in FIG. 9. Plate 240 is vertically adjustably mounted on support frame 242 via slots 244 and bolts 246 received therethrough. Similarly, the bag support frame 231 is horizontally adjustable with respect to the bottom of receptacle 62a in door closures 202 via horizontally disposed slots 248 and bolts 250 in the support member 252 and is vertically adjustable via vertical slots 254 and bolts 256. Accordingly, the modified bag support 230 will be seen to be horizontally and vertically adjustable with respect to the bottom of receptacle 62a such that proper spacing and adjustment can be made for the reception of various materials from the that receptacle.

As seen in FIGS. 1 and 7, the modified packaging unit or apparatus 200 further includes a transverse, discharge conveyor 260 disposed beneath the bag support units 230. Conveyor 260 includes two endless belt conveyors 262 and 264 which are disposed such that their material support surfaces are substantially at right angles to one another as shown in FIG. 7. The endless belts are mounted on rollers 265 at either end of the conveyor, at least one of the rollers being powered by an electric motor and associated drive apparatus 266. The motor is adjustable for varying the speeds if desired. Supporting rollers 267 are provided intermediate the ends of the endless belts to properly support the belts when transporting the filled bags. Adjustable legs 268 support the conveyor with the corner between the supporting surfaces of the two endless belts directly below the door 202 when that door is in its open position B. Accordingly, it will be understood that the weight of the carrots pulls the preferred thin polyethylene bags 112 from the prongs 204 allowing them to drop directly onto the supporting surfaces of conveyors 262 and 264 to transport them away from the packaging apparatus to a location where the filled bags may be boxed or packed in bulk.

Referring now to FIGS. 2 and 5, the construction and cooperation of the flow diverting means 150, packaging means 50 including either packaging unit 60 or 200, and recirculating means 20 will become apparent. As described in the copending application referred to above, Ser. Nos. 254,076 and 348,974, flow diverting means 150 comprise a plurality of pivotal extensions of the guide means 18 or gates 152. Gates 152 are pow-

ered by fluid pressure means or air cylinders (not shown) which, in response to signals produced by either the scale 52 or the fluid pressure responsive signaling means 130, pivot gates 152 across the flow of material on infeed conveyor 12 at the discharge end of the conveyor. The pivoting of the gates 152 thus causes the flow to be diverted from entering the opening 68 of bucket 67 onto and against the deflecting chute 154, as shown by the dotted lines in FIG. 5. The deflected material or products then slide down chute 154 and onto recirculating conveyor 20 which carries the diverted material away from the end of infeed conveyor 12 to a position at which it may be transferred back to the infeed end 14 of conveyor 12. As shown in FIGS. 1, 2 and 5, the recirculating means or conveyor 20 is mounted such that it carries the flow thereon transverse to the flow on infeed conveyor 12. However, conveyor 20 may be mounted in any convenient position such that it receives and carries the diverted material to a position where that material may be transported to the infeed end 14 of conveyor 12.

Referring now to FIG. 6, the control circuit 160 for controlling each of the individual packaging units 60 is shown. Circuit 160 is repeated several times such that each unit 60 has its own control circuit. The control circuit basically operates as follows. The main control switch is pushed on and power is fed to the three circuits 170, 180 and 190 contained within circuit 160, each of which included circuits operates to control an operation of the packaging apparatus 10 upon the occurrence of a certain event.

Circuit 170 comprises the bag-empty signaling circuit indicating when support means 90 contains no more flexible bags. As described above, when fluid pressure responsive signaling means 130 is activated due to the lack of any bags preventing the stream of air from entering port 126, switch 171 is closed, thereby activating relay 172 and indicating light 54. Relay 172 immediately closes switch 174 in order to activate the flow diverting means 150 to divert gates 152 thereby stopping the flow of material to be packaged to bucket 67 since no bags 110 remain to receive any material from bucket 67. Reset switch 173 must be manually pushed after the support means 90 have been refilled with bags 110 in order to open circuit 170 thereby allowing the continued operation of the packaging unit 60.

When sufficient bags are held by bag holder 90, the normal operation of the packaging apparatus 60 will take place as controlled by circuits 180 and 190. When a sufficient amount of material has entered bucket 67, the scale 52 will close switch 181 activating first timing means or time delay relay 182 thereby closing switch 183 and simultaneously opening switch 191. When switch 183 is closed, solenoid 184 is activated thereby pivoting gates 152 and again diverting flow away from bucket 67 to diverting chute 154. The activation of solenoid 184 also closes switch 185 thereby activating solenoid 186 which activates one of the cylinders 75 or 76 thereby causing closure means 70 to open to the first open position shown at 79' in FIG. 4.

After the activation of solenoids 184 and 186, the time delay relay 182 causes switch 183 to open thereby closing interconnected switch 191 and immediately activating circuit 190 including a second timing means or time delay relay 192. Following a predetermined amount of time set on time delay relay 192 to allow bucket 67 to release all material held therein, relay 192

closes switch 193 thereby activating a third timing means or time delay relay 194 which immediately closes switch 195 thereby activating solenoid 196. Solenoid 196 activates the remaining cylinder 75 or 76 to further open closure means 70 to position shown in FIG. 4 at 79''. This further opening of closure 70 removes the outermost bag 112 from support means 90. After a preset amount of time on time delay relay 194, relay 194 closes switch 197 thereby activating solenoids 198 and 199 which cause the closure means 70 to close the opening 69 of bucket 67 and pivot gates 152 back to their normal position, respectively. After gate 152 has returned to its normal position, the operation will repeat itself since the flow of material will enter bucket 67 and again cause scale 52 to activate switch 181.

Therefore, the various operations and elements of packaging means 60 are controlled by a circuit 160 including circuits 170, 180 and 190 as described above. The basic operation thereby utilizes three time delay relays to sequentially fill bucket 67, divert the flow of material with gates 152, open closure means 70 to a first open position 79' to fill outermost bag 112, further open closure means 70 to position 79'' to remove the filled bag 112 from the packaging means 60, pivot closure means 70 back to its original position, and return gate 152 to its original position.

Packaging unit 200 may be controlled by a control circuit similar to circuit 160 but omitting the bag-empty signaling circuit 170 since, as mentioned above, modified bag holder 230 does not include the fluid pressure responsive signaling means 130. The operation of such a circuit (not shown in the drawings) is exactly similar to that of circuit 160 when a sufficient supply of bags is held by bag holder 90. Additionally, pneumatic control and timing means may also be used to control either packaging unit 60 or 200. With such controls, the operational sequence is exactly similar to that with the combined electric and pneumatic controls described above but the system includes alternative elements such as pilot valves for electrical solenoids, pneumatic timers for electrical timers, and the like.

The method or operation of packaging material or products by means of the novel packaging apparatus 10 described above will now be apparent. The operation begins by feeding a flow of material to be packaged onto the infeed end 14 of infeed conveyor 12, which conveyor both orients and accelerates the material over the length of the conveyor as it progresses toward discharge end 16. The flow of material is also segregated by guide means 18 into a number of columns, one column for each of the packaging means 60 or 200 included within packaging apparatus 10. In the case of packaging units 60, if the support means or bag holder 90 has a sufficient supply of bags 112 supported thereon, fluid means 120 will not be able to direct the stream of compressed air into aperture 126. This prevents the activation of circuit 170 and allows the flow of material to progress into the individual packaging units 60, since gates 152 will not be diverted or moved across the flow of material.

With either units 60 or 200, when the material reaches the discharge end 16 of infeed conveyor 12, its linear momentum imparted by the motion of conveyor 12 will carry it in a smooth trajectory into the opening 68 of bucket 67 disposed adjacent thereto. When a sufficient amount of material is in bucket 67, the weight

of that material will overcome the predetermined counterweight 53 placed on scale 52 causing scale 52 to activate circuit 180. During the filling of bucket 67, fluid means 120 through nozzle 122 is directing a stream of compressed air against the lower extremity of door 71 of closure means 70 which stream is thereby deflected into the opening of the outermost bag 112 supported by support means 90. Guide vanes 210 funnel and direct this stream into the bags in units 200. The deflection of air into opening 113 of bag 112 opens and fills bag 112 thereby readying the bag for filling in the next operation.

The activation of circuit 180 by means of scale 52 immediately causes gates 152 to pivot across the flow of material on discharge end 16 thereby diverting the material against discharge chute 154 causing the material to fall onto recirculating conveyor 20 which carries the material out of the area of packaging apparatus 10. At the same time the gates 152 are pivoted, time delay 182 activates one of the cylinders 75 or 76 thereby retracting or withdrawing one of the shafts 77 or 78 which in turn moves the closure means 70 including door 71 to the first open position shown at 79'. In units 200 movement of door 202 to position A (corresponding to position 79' in units 60) causes prongs 204 to puncture bag 112 and securely retain the bag on the open door. The pivoting of either door 71 or 202 into the first open position releases the material to be packaged from bucket 67 into the already opened bag 112 thereby filling the bag with the predetermined quantity of material. After a time delay, preset on time delay relay 192 in circuit 190, which circuit has been activated previously by time delay relay 182 and a movement of interconnected switches 183 and 191, the doors 71 (or 202) are pivoted to their second open position shown at 79'' (position B for door 202) by the activation of the remaining cylinder 75 or 76 and the withdrawing of the remaining shafts 77 or 78. This movement of the door 71 to the second open position causes the bag 112 to be separated from the flap 114 along perforated line 115 thereby removing the bag from the packaging unit 60 and allowing the filled bag to drop into a waiting receptacle placed under unit 60. Alternatively, with non-perforated bags, movement of the doors to the second open position causes the bags to be pulled from the bag holding wicket 100 and dropped. Following a time delay preset on a third timing means or time delay relay 194, the closure means 70 including door 71 is pivoted back to its closed position by means of the extension of shafts 77 and 78 by the reverse activation of air cylinders 75 and 76 as controlled by circuit 190.

Should the packaging unit 60 fill and remove all of the bags 112 included in bag means 110, circuit 170 will be activated by means of the compressed air stream entering aperture 126. The compressed air entering aperture 126 causes an increase in fluid pressure within communicating tube 128 thereby activating fluid pressure responsive signaling means 130. The activation of signaling means 130 is indicated by the light 54 and also causes the pivoting of the gates 152 across the flow of material such that the material is diverted into recirculating conveyor 20 thereby preventing the filling of bucket 67 when no bags are present on the support means 90. A new supply of bags 110 may be inserted on support means 90 by pivoting arm 102 out of slotted member 104 and pivoting the entire bag frame 94 downwardly and away from bucket 67. The pivotal

movement of bag frame 94 allows sufficient room to remove securing plate 101 thereby allowing the removal of the empty wicket 100 and the insertion of a new supply of bags 110 on another wicket 100. Following the insertion of the new supply of bags 110, the reset switch 173 may be pushed, thereby deactivating the operation of circuit 170 and allowing the continued normal operation of the packaging apparatus 10. With packaging units 200, the use of the supply of bags is monitored manually.

Therefore, it is apparent that a highly efficient automatic packaging apparatus and method is provided with the novel construction described above. The apparatus is seen to have a simple construction utilizing few moving parts yet is able to accurately, quickly and continuously package a flow of products and materials carried to the packaging apparatus. Additionally, the novel construction will be seen to have the necessary flexibility enabling it to accommodate many varied types of products and materials which may need to be packaged.

While on preferred form of the invention has been shown and described, other forms will now be apparent to those skilled in the art. Therefore, it will be understood that the embodiment shown in the drawings and described above is merely for illustrative purposes, and is not intended to limit the scope of the invention which is defined by the claims which follow.

I claim:

1. Packaging apparatus for the packaging of material comprising in combination: receptacle means for receiving material to be packaged; support means for supporting at least one bag for receiving said material from said receptacle means; said receptacle means having closure means adapted to open said bag, release said material into said bag, and remove said bag from said support means; and fluid means arranged to cooperate with said support means and said closure means for initially opening said bag; said closure means including means for positively grasping said bag as said bag is opened, said grasping means facilitating the retention of said bag in an open position while said material is released and facilitating the removal of said bag from said support means.

2. The packaging apparatus as described in claim 1 wherein said closure means comprises a door hingedly mounted on said receptacle means adjacent said support means, said door adapted to pivot between a closed position, a first open position, and a second open position; said pivotal movement between said closed and first open positions causing said door to engage and further open said initially opened bag and to release said material from said receptacle into said bag; said pivotal movement between said first and second open positions causing said door to forcibly remove said bag filled with said released material from said support, said grasping means comprising at least one prong extending from an exterior surface of said door; said prong adapted to puncture a portion of said bag as said door is moved to said first open position.

3. Packaging apparatus for the packaging of material comprising in combination: receptacle means for receiving material to be packaged; support means for supporting at least one bag for receiving said material from said receptacle means; said receptacle means having closure means adapted to open said bag, release said material into said bag, and remove said bag from

said support means; and fluid means arranged to cooperate with said support means and said closure means for initially opening said bag; said fluid means including means for directing a stream of air to open said bag prior to the release of said material; said closure means including means for guiding said stream into the mouth of said bag adjacent thereto.

4. The packaging apparatus as described in claim 3 wherein said closure means comprises a door hingedly mounted on said receptacle means adjacent said support means, said door adapted to pivot between a closed position, a first open position, and a second open position; said pivotal movement between said closed and first open positions causing said door to engage and further open said initially opened bag and to release said material from said receptacle into said bag; said pivotal movement between said first and second open positions causing said door to forcibly remove said bag filled with said released material from said support, said guide means comprising guide vanes secured to the external surface of said door; said vanes forming a funneling trough having an opening adjacent the bottom of said door; said trough directing said stream into said bag as said door is moved to said first open position.

5. Packaging apparatus for the packaging of material comprising in combination: receptacle means for receiving material to be packaged; support means for supporting at least one bag for receiving said material from said receptacle means; said receptacle means including closure means for opening said bag, releasing said material into said bag, and removing said bag from said support means; said closure means including means for positively grasping said bag as said bag is opened, said grasping means facilitating the retention of said bag in an open position while said material is released facilitating the removal of said bag from said support means.

6. Packaging apparatus for the packaging of material comprising receptacle means for receiving material to be packaged; support means for supporting at least one bag for receiving said material from said receptacle means; closure means on said receptacle means adapted to open said bag, release said material into said bag, and remove said bag from said support means; fluid means arranged to cooperate with said support means and said closure means for initially opening said bag; said closure means including means for facilitating the opening of said bag; said last mentioned means including means for positively grasping said bag as said bag is opened and means cooperating with said fluid means for assuring that said bag is opened prior to engagement by said grasping means.

7. The packaging apparatus of claim 6 wherein said closure means comprises a door pivotally secured to said receptacle means and pivotable between closed and open positions; said grasping means comprising at least one prong projecting from the surface of said closure means, said prong adapted to puncture a portion of said bag as said closure means is moved from said closed to said open positions.

8. The packaging apparatus of claim 7 wherein said door includes an end edge which enters the mouth of said bag as said door is opened; said prong comprising a cylindrical rod extending normally to the exterior surface of said door adjacent the end edge thereof.

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9. The packaging apparatus of claim 6 wherein said fluid means include means directing a stream of air toward said closure means and support means such that said stream of air is directed into the mouth of said bag; said means cooperating with said fluid means comprising means mounted on said closure means for guiding said stream of air into said bag.

10. The packaging apparatus of claim 9 wherein said closure means comprises a door pivotally secured to said receptacle means and pivotable between closed and open positions; said door including an end edge which enters the mouth of said bag as said door is opened; said guide means comprising two guide vanes, each guide vane having one edge extending in a plane perpendicular to the exterior surface of said door; said vanes secured laterally adjacent one another and spaced apart such that said perpendicular edges are inclined with one another; said edges forming a generally V-shaped trough which funnels said stream of air through an opening between said edges adjacent the end edge of said door and into said mouth of said bag.

11. Packaging apparatus for the packaging of material comprising receptacle means for receiving material to be packaged; support means for supporting at least one bag for receiving said material from said receptacle means; closure means on said receptacle means adapted to open said bag, release said material into said bag, and remove said bag from said support means; fluid means arranged to cooperate with said support means and said closure means for initially opening said bag; said closure means including means for facilitating the opening of said bag; said closure means including a door hingedly mounted on said receptacle means adjacent said support means, said door adapted to pivot between a closed position, a first open position, and a second open position; said pivotal movement between said closed and first open positions causing said door to engage and further open said initially opened bag and to release said material from said receptacle into said bag; said pivotal movement between said first and second open positions causing said door to forcibly remove said bag filled with said released material from said support, said means for facilitating the opening of

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said bag including prongs extending from said door for puncturing a portion of said bag and holding said bag thereon until the weight of said material released in said bag pulls said bag from said prongs; said facilitating means further including guide vanes mounted on said door for directing a stream of air from said fluid means into said bag to initially open the same; said apparatus further including conveyor means positioned beneath said support means to catch said bags after the weight of said released material therein pulls said bags from said prongs.

12. The packaging apparatus of claim 11 wherein said conveyor means comprises two endless belt conveyors arranged such that their material supporting and conveying belt surfaces are disposed in planes substantially at right angles to one another beneath said support means.

13. Packaging apparatus for the packaging of material comprising receptacle means for receiving material to be packaged; support means for supporting at least one bag for receiving said material from said receptacle means; closure means on said receptacle means adapted to open said bag, release said material into said bag, and remove said bag from said support means; fluid means arranged to cooperate with said support means and said closure means for initially opening said bag; said closure means including means for facilitating the opening of said bag; said receptacle means including a bucket having first and second open ends; said support means comprising a frame and a hanger means for supporting said bag adjacent said opening at said second end of said bucket, said bag adapted to be mounted on said hanger means, said bag having an opening into the interior of the bag along the side of said bag nearest said bucket, said support means also including a biased back plate for constantly urging said bag toward said bucket such that said bag is always positioned to receive said material from said bucket through said opening; and means for adjusting the horizontal and vertical position of said supporting means with respect to said bucket.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,859,775
DATED : January 14, 1975
INVENTOR(S) : Lee S. Kihnke

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 6;
After "located", insert --at--;
Column 4, line 27;
After "separate", delete ",";
Column 4, line 32;
After "now" insert --to--;
Column 6, line 59;
"shwon" should be --shown--;
Column 7, line 63;
After "to", delete "a";
Column 9, line 64;
"application" should be --applications--;
Column 12, line 32;
"be" should be --by--;
Column 13, line 22;
"on" should be --one--;
Column 14, line 16;
"relelase" should be --release--;
Column 14, line 38;
After "released", insert --and--;
Column 16, line 41;
"supporting" should be --support--.

Signed and Sealed this

twenty-second Day of July 1975

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks