BAG FEEDING, OPENING AND FILLING APPARATUS


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22 Claims

ABSTRACT OF THE DISCLOSURE

This invention is directed to apparatus for sequentially packing items in a chain of imbricated bags mounted on two strands of tape including a stationary support table, a tape puller, a forced air bag opener, a tray for inserting articles in the bag, indexing means operated by the bags for positioning the bags for loading; a method for sequentially loading such a chain of bags, supporting the bags in the loading position, opening the bags by directing air stream over and then into the bag, loading article via tray into bags; a special power tape supply apparatus for driving the tape puller including air motor, drive clutch and lock clutch; and a cartridge equipped chain of imbricated bags; all as further described hereafter.

The present invention relates to a new and improved method and apparatus for sequentially packaging items in bags and to a new and improved tape feeding apparatus, a new package of imbricated bags and to a new power supplying apparatus.

It is an object of this invention to provide an improved method and an improved apparatus for sequentially loading bags at a high output rate.

It is another object of this invention to provide such an apparatus having low cost and simplified design for minimum maintenance and operating expense.

It is another object of this invention to provide an improved method and apparatus for sequentially bagging items that lend themselves to use with a wide variety of different items, in particular, bulky items.

It is a further object of this invention to provide a method and apparatus suitable for packaging that is sufficiently simple in operation that it lends itself to highly efficient use by operators or baggers without the requirement for extensive training.

It is another object of this invention to provide a new and improved method and apparatus for pulling or conveying tape.

It is another object of this invention to provide a new and improved package of imbricated bags.

It is still another object of this invention to provide a power supplying apparatus that can be used in powering the apparatus for sequentially loading bags with particular advantage under particularly rigorous ambient demands.

In my invention, in order to effect thereof, a bag feeding, opening and filling apparatus is provided for feeding a continuous chain of imbricated bags sequentially into a loading position, sequentially opening the bags and filling the bags. The apparatus has a frame. A series of horizontal, spaced apart, parallel, and aligned guide rollers are mounted on the frame and they direct, orient, and guide the chain of imbricated bags toward the loading position.

A support table and tape pulling unit is mounted on the frame. The support unit includes a smooth support surface for a bag support, opening and loading position. The support table has the shape of an isosceles triangle with the base side of the triangle oriented forward into the loading position and tapering rearwardly for receipt of the imbricated bags. The forward edge of the support table curves downwardly. The support table and tape pulling unit includes a powered pulling gear and a two position meshing idler gear. The idler gear has a positive toggle lock for securing it in driven engagement with the driving gear. The meshing gears provide a means for conveying the imbricated bags by pulling the imbricated bags onto the support table. The gears grip two strands of tape between them and feed the tape therebetween, adhering the tacky surfaces of the tape together by squeezing the tape between the intermeshing gear surfaces. The intermeshing gears are cylindrical and they are positioned below the curved edge of the support table and have parallel axes that project forward and lie in a plane parallel to the general plane of the support table.

Two parallel laterally adjustable idler guide and orientation wheels are positioned below the curved edge of the support table and above the intermeshing gears with their axes parallel to the axis of the intermeshing gears, the outer cylindrical surfaces of the wheels are knurled to prevent the tacky surface of the tape from adhering to them. The wheels serve to provide a twist in the tape as it is pulled down over the forward edge of said support table and to orient the tape for passage into the meshing driven and idler gears. The driven gear is powered by a sequential drive means to pull the tape through the apparatus in small sequential steps. The sequential drive means is a short cycle power means connected to a powered rotating shaft. The shaft is connected to the driven gear.

A signal means in the path of the bag is provided by a resilient blade indexing trigger that projects through and extends above the forward edge of the support table. The actuating means or switch is engaged by the trigger and sequentially switches the drive means into driving actuation in response to the actuation of the trigger when the trigger is engaged and released by the trigger in the chain of imbricated bags.

An air blower driven by an electric motor is mounted on the frame and positioned below the tray. An air chute in air stream engagement with the blower's outlet is oriented to direct air from the blower against the forward edge of the bag engaged by the trigger in the loading position at the forward edge of the support table to inflate the bag. This is the means for opening the lead bag. The air is a fluid gas and provides the actively propelled force for opening the bag. A tray is mounted on the frame and has a resilient forward end of reduced cross section that engages in the open end of the bag to facilitate inserting items into the bag.

By other aspects of our invention a reciprocating tray is mounted on the apparatus' frame. The tray has expanding side arms that are resilient and form a resilient forward end of reduced cross section. An air cylinder is connected to a moveable gate and opens and closes a gate to the air blower in response to the actuation of an air switch mounted on the frame in the path of the reciprocating tray. By a still further aspect the tray may be stationarily mounted on the frame. The forward end of the tray has a reduced cross section and includes at least two resilient side arms at opposite sides of the tray. The lower edges of side arms have upwardly curving surfaces that guide a bag's upper lip outwardly and upwardly when the upper lip is lifted against the surface to cam the bag outwardly and guide it upwardly where it can open over the arms. In this manner the bag can encompass the arms enabling the tray to be stationarily positioned in the loading position a sufficient distance to facilitate the expeditious loading of the bags.

By another aspect of our invention, in a preferred form thereof, a package is provided comprising a cartridge having an internal spool rotatably secured medially there-
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in. A passage opens into the cartridge to the spool and two long strands of tape have respective ends attached to the spool and extending from the cartridge through the passageway. A plurality of identical bags are secured by one of these tapes. Each bag is oriented in the same direction relative to the tapes as all of the other bags and each bag faces along the tapes toward the cartridge. Each bag, after the bottom bag relative to the tape, is offset along the tapes and over- lies the opening of the underlying bag. The tapes are spaced apart over an even distance where they engage each of the bags. Each of the bags is flattened and has two sides arranged in overlying disposition.

By a further aspect of the invention, in a preferred form thereof, the tape pulling mechanism of the ap- paratus is modified to provide a coupling member at the end of the rotating shaft. The cartridge containing pack- age of imbricated bags has a coupling in the spool exposed for external coupling to the powered rotating shaft so that the tape pulling apparatus and the package of imbricated bags may be combined in an operating combination.

By another aspect of our invention, in one preferred form thereof, a drooping mechanism is provided for pivoting the support table and tape pulling unit rearwardly so that the apparatus can be conveniently reloaded with a new chain of imbricated bags. The drooping mechanism is controlled by a lever for actuating the support table and tape pulling unit in closed position. The lever releases the air from the cylinder to open the table and admits air to the cylinder to close the table.

In summary, in carrying out our invention in one form thereof, a process is provided for sequentially loading a chain of imbricated bags supported by two parallel spaced apart tapes each of which has one tacky surface engaging one side of each bag. In practice, the two spaced apart tapes are pulled from a medial position between their normal spaced apart paths and at the same time their respective tacky surfaces are squeezed together by gripping the tapes between the teeth of a pair of gears and sequentially activating the gears to pull the tape in stepwise fashion. The bags are sequentially moved into a loading position with their unattached sides oriented upwardly by pulling the tapes. The side of the bag engaged by the tapes in the loading position is firmly supported. The bags are sequentially inflated as they are positioned in the loading position by initially reducing the air pressure above the unattached side of the bag to partially open bag to increase the pressure inside the bag and fully open the bag. A tray is engaged in the opening bag and an article is loaded onto the tray. The article is loaded into the bag and the bag is simultaneously peeled from the tapes starting at the bag's forward edge and proceeding toward the bottom of the bag until the bag is free from the tape, and the loaded bag is disengaged from the tray.

While several species of the principles of the present invention are illustrated in the accompanying drawings and described in detail in the following specification, it is to be understood that such embodiments are by way of example only and that various mechanical and procedural modifications may be made without departing from the spirit of the invention, the scope of which is limited only as defined in the appended claims.

FIG. 1 is a diagrammatic top plane view of one species of the apparatus of our invention.

FIG. 2 is a diagrammatic perspective view of the support table and tape pulling unit 15 of FIG. 3 with parts broken away to show the trigger mechanism and driving means.

FIG. 3 is a diagrammatic side plane view of the appara- tus of FIG. 1 with the frame broken away.

FIG. 4 is a front view of a bag suitable for use on the apparatus.

FIG. 5 is a diagrammatic front plane view of a chain of imbricated bags mounted on tape suitable for use with the apparatus.

FIG. 6 is a diagrammatic side plane view of the chain of imbricated bags of FIG. 5.

FIG. 7 is a detail of each end view of the support table and inflated bag of FIG. 3.

FIG. 8 is a diagrammatic perspective view similar to FIG. 2 of another species of the support table and tape pulling unit.

FIG. 9 is a diagrammatic side plane view similar to FIG. 3 of another species of our apparatus to illustrate the distinctions between the two species. FIG. 9 is in less detail than FIG. 3.

FIG. 10 is a diagrammatic top plane view similar to FIG. 1 of the species of our apparatus shown in FIG. 9.

FIG. 11 is a diagrammatic side view of a still further species of the support table and tape pulling unit of our invention somewhat similar to FIG. 2 but displaying our improved windup package.

FIG. 12 is a diagrammatic front view similar to FIG. 5 of another species of a chain of imbricated bags mounted on tape and suitable for use with the apparatus of FIG. 1.

FIG. 13 is a diagrammatic side plane view of the chain of imbricated bags of FIG. 12.

Referring now to the drawings and in particular to FIG. 1, a packaging apparatus 10 is shown therein embodying the invention in one preferred form thereof. The apparatus 10 has the function of retaining the support table and tape pulling unit, 15 reciprocally mounted thereon for reciprocation from the out position shown in solid lines in FIG. 3 to the in- vested position 17 shown in dotted lines. A support table and tape pulling unit 15 is pivotally mounted on the frame. A forced air system 16 is mounted below the tray (as shown in FIG. 3) on the frame and directs air across the forward edge of the top of the support table and tape pulling unit as indicated by the arrows depicting the air flow path. A bag feed in arrangement 17 is pro- vided at one end of the apparatus 10. A table drooping mechanism 20 is provided for pivoting the support table and tape pulling unit between operating and reloading positions.

The support table and tape pulling unit 15 is shown in particular detail in FIGS. 2 and 3. The unit 15 includes a support table 21 which has the shape of an isosceles triangle with the base side of the triangle oriented for- ward. The triangle tapes rearwardly and has a curved point 18 at its outer end so that it will not tear the bags. The forward edge 22 of the support table curves down- wardly and has an opening 23 (FIG. 1) in the center of the curved forward edge cut. The unit 15 has a rectangular front plate 24 and a substantially rectangular bottom plate 25. The side plates 26 and 27 are substantially rectangular with their back edges curving and conforming to curved point 18 of the triangular support table 21.

The side plates 26 and 27 are cut out along their rear- most bottom edges to expose the power means 28. A housing for the unit power means 28 is formed by the members or walls 21, 24, 25, 26 and 27.

The power means 28 includes a power train which begins at the output end with a driven gear 30. A bevelled shaft 31 having an end 31a secured to the gear 30 and extending from the gear 30 through a supporting bushing assembly 32 and through the gear housing 33 of clutch 34. The shaft 31 is connected to the gear housing 33 for joint rotation therewith. The clutch disc 35 of clutch 34 is secured to the bottom plate 25 by bracket 19 against rotation. The shaft 31 passes beyond clutch 34, through a second supporting bushing 36, and through a second clutch 37. The gear housing 38 of the second clutch 37 is connected to shaft 31 for rotation therewith. The clutch disc 39 of clutch 37 is connected by shaft 40 to a arm 41 which is connected by shaft 42 to a reciprocating rotary actuator or reversing air motor 43. Clutch- es 34 and 37 are over-ride clutches of the type that have one direction drive and one direction slip. Both clutches
drive when clockwise motion is supplied (as seen in FIG. 3) and are out of driving engagement when counter clockwise motion is supplied. The reciprocating rotary actuator 43 is driven in a clockwise direction (as seen in FIG. 3) when the pressure is on line 44 which drives the driven wheel 30. Clutch 37 is engaged with driving shaft 31 and clutch 32 is disengaged from shaft 31 to rotate freely. When pressure is applied to the reciprocating rotary actuator by line 45 the rotary actuator has a counter clockwise motion and clutch 37 disengages allowing the driven disk 39 to slip and clutch 34 engages preventing the shaft 31 from reversing its motion. Drive gear 30 thus remains in locked position and will not turn counter-clockwise.

Rotary actuator 43 is controlled by a valve 46 which is a two-way valve that switches the air from line 44 to line 45 and back to line 44 in response to its actuation by a pilot valve 47. Pilot valve 47 is an on-off valve operated through a spring loaded actuator 50 by a leaf spring trigger 51 which closes the pilot valve cutting off the air to the actuator in valve 46 which also has an internal spring loaded actuator. The pilot valve 47 is connected to valve 46 by line 52. A constant supply of air is supplied to valve 46 and to valve 47 via line 53, branch 54 extending to valve 46 and branch 55 extending to valve 47. The leaf spring trigger 51 extends through the support table 21 via slot 23 (FIG. 1).

A meshing idler gear 56 can be intermeshed or released from meshing engagement with the driven gear 30 by manipulating toggle lock 57. Gear 56 is journaled in bracket 58 which is connected by rod 60 to the pivotal linkage 61 which moves the wheel in and out in response to the pivoting of handle 62. When the handle is in the position shown in FIG. 2 the toggle 57 is in the locked position and the meshing gears are not engaged. When the handle 62 is lowered the two-position idler gear 56 is moved to its outward position.

Two freely rotating guide and orientation wheels 63 and 64 project from are journaled in plate 24. Wheels 63 and 64 guide the tape that supports the bags down over the curved edge 22 of the support table and provides a twist in the tape so that it may be received between the meshing gears 30 and 56. The surfaces of the wheels 63 and 64 are knurled. The wheels are parallel to one another and laterally adjustable in slots 65 and 66 respectively, which secure the inner flanges of the wheels in fixed position in the slots in any selected position along the slots.

Looking now at FIGS. 1, 3, and the guide mechanism 17 may be seen to include a series of horizontal, spaced apart parallel and aligned guide rollers 73, 74, 75 and 76 which are rotatably mounted between the frame members 80 and 81; the topmost surface of each roller is substantially aligned with the upper plane of the supporting table 21. The rollers preferably have plastic or rubber surfaces so that they will not develop sharp ridges or bumps when scarred or damaged. Such sharp projections could damage the bags, particularly when the apparatus is used with plastic bags such as Saran or polypropylene bags.

Several spaced apart rollers are provided so that the apparatus will be readily adaptable for use with bags of varying sizes. The rollers are spaced outward from the back of the support table 21 a distance sufficient to provide for a substantially complete straightening out of the bag by the time the bag reaches the forward edge of the support table in its loading position. This is important in providing for the easy inflation of the bag, for if the bag is folded down at its rear portion for a substantial distance when it is being inflated the air must usually be supplied with greater force to inflate the bag, and lift it upwardly from the folded down region. This could result in the outer extremity of the bag remaining uninflated in some instances which would normally be undesirable. While the rollers can be lined up beyond the distance required to straighten out the bags this only makes the machine unnecessarily long. The chain of bags can also be fed over a roller more distant from the loading position than that necessary to straighten out the lead bags but then it is more trouble to unload a chain of bags from the machine to switch bag sizes because the bags must be folded back into the supply box to prevent tangling. If the entire chain of bags is not to be used up without directly attaching a subsequent chain onto its end it is desirable to have the bags pulled up and over the roller closest to the support table, commensurate with obtaining the needed bag straightening, to obtain the additional drag on the chain provided by the weight of the bags hanging down from the roller as long as possible for power tensioning and straightening of the bags and tape.

The rollers 73, 74, 75 and 76 are spaced sufficiently close together so that the chain of imbricated bags will not sag appreciatively down between the rollers when being fed across several of them. A very satisfactory spacing between the rollers has been found to be from about 21/2 inches to 3 inches using bags that are from 10 inches wide and 24 inches long and weigh .08 pound to 18 inches wide and 32 inches long and weigh .13 pound each when the bags are spaced 3/4 inch apart with a tolerance of 1/4 inch.

It is important to provide the triangular support table shape over which the chain of imbricated bags can be drawn as they pass from the rollers because when the tapes are spaced inwardly 3/4 the width of the bag from each side, the forward corners of the bags fall down as shown at one side in FIG. 5 for purposes of illustration. This occurs as the bags are drawn up onto the table because the edges of the bags that extend out beyond the bags are not supported by the tapes and if the bags are supple, such as 1.5 mil Saran film bags, the corners fall down as the bags are pulled from the box up onto the apparatus. The tips of the triangle over which the bags first proceed are narrower than the spacing of the top so that the bags pass on to the support table where they are supported and held straight by the tape. The edges of the bags fall over the edges of the support table. As the bags are pulled farther up on the widening triangle the edges of the bags are continuously straightened or cammed outwardly by the wedge shape of the triangle. At its forward edge the triangle is wider than the bags and they are held straightened out.

The table positioning mechanism 20 pivots the support table and tape pulling unit 15 about the pair of trunnions which are connected to the frame 11. Only one of the trunnions 82 is shown in FIG. 3. The trunnions are secured in brackets 83 as seen in FIG. 3. The brackets are secured to the frame 11.

The unit 15 is raised and lowered by a single air cylinder 84 which is operated by a valve 85. The valve 85 is opened and closed by lever 86. A constant supply of air is supplied by line 87 to the valve 85 and when the lever is in the position shown in solid lines air is supplied to the cylinder 84 through line 86 and the piston (not shown) is driven forward pulling the table into its closed operative position. By moving the lever 86 to the position shown in broken lines the air to the cylinder 84 which has been holding the table closed is shut off and line 89 is opened allowing the air in the cylinder to escape slowly through a restricted orifice (not shown) allowing the unit 15 to open slowly. The air pressure to the cylinder is 30 p.s.i. and this provides a safety feature because an operator can manually overcome the closing pressure by pushing against the unit. The air pressure is also insufficient to crush a hand. The cylinder 84 may be seen to be connected to the frame by bracket 90 and to the unit 15 by bracket 91 through a bag and fitting upwardly from the folded down region. The reciprocating tray 92 may be seen in FIGS. 1 and 3 to include sleeves 100 and 101 which are slidable mounted on the supporting guide rods 102 and 103. The reciprocating tray has sides 104 and 105. Spring arms 106
and 107 extend from the sides 104 and 105 respectively and converge inwardly.

The air blower unit 16 has a centrifugal air blower or fan 110 operated by an electric motor (not shown) positioned inside of the air blower's casing on the far side in FIG. 3. The air blower takes air in through the inlet 111 and propels it out through the outlet 112 into a chute 113 which has a sloping bottom wall 114 and side walls 115 and 116 (see FIG. 2). The chute 113 directs the air upwardly across the front or forward edge 22 of the support table 21 as indicated by the arrows in FIG. 3. A gate 117 closes the inlet 111 to the fan and thus prevent the movement of air through the fan and thence out exit 112 and chute 113. The gate is a flat disc that engages around the rim of opening 111. The cylinder 120 opens and closes the gate 117. Piston rod 21 connects the cylinder to the gate 117. The cylinder 120 is connected to the frame 11 by mounting bracket 120a. The piston in the cylinder 120 is spring loaded.

The piston is driven by air supplied by line 122 to close the gate 117 and when the air pressure is released the spring (not shown) opens the gate 117. Valve 123 controls the supply of air to cylinder 120 through the actuator and release of spring loaded lever 124. The gate valve 117, is normally held open by the spring in cylinder 120 so that air is supplied from the blower's outlet 112 through the chute 113 across the front or forward edge of the support table 21. However, when the tray 12 is moved inwardly the beveled camming surface 125 of sleeve 101 cams the lever 124 down admitting air to line 122 which drives the piston in the cylinder 120 outwardly moving the gate 117 shutting off the air entering the fan. When the tray 12 is retracted the lever 124 is released by the camming surface 125 shutting off the air to line 122 and opening the line so that the air in the cylinder may escape allowing the spring to drive the piston back in the cylinder opening gate 117 and admitting air pressure against the fan so that it may be propelled from the fan's outlet 112.

A plurality of imbricated bags that are arranged along the two strips of adhesive tape 128 and 129 may also be seen in FIGS. 3, 4, 5, 6 and 7. In FIG. 3, one bag 131 is shown inflated on the support table 21. The chain of imbricated bags 130 may be seen to be made up of the numerous individual bags 131, 132, 133 and 134, in FIG. 6, for example. These bags are adhered to the two parallel and spaced apart tacky tapes. The two may be seen in FIGS. 1 and 7 in operating engagement on the machine, providing the forward edge 22 of the support table 21 and passed around the knurled wheels 63 and 64 (as may also be seen from FIGS. 2 and 3) and between the meshing gears 50 and 56. The imbricated bags extend back across rollers 73 and 74 that support them. The bags extend over roller 74 and down into a stock box 143. Rollers 75 and 76 are provided for use in supporting longer bags. The bags should usually be at least substantially horizontal before they are inflated. The chain of bags or package 130 is hooked to a separate chain of bags or package 145 which is in another stock container 146. The two chains of bags are joined by securing the end portions of the tapes 128 and 129 and the beginning portions of tapes 147 and 148 in the fresh box 149 of imbricated bags.

The tapes 128 and 129 are spaced apart on the imbricated bags about 3/4 the width of the bag in from each side allowing a strip of width of the bag so that the bags may open into a wide oval opening. The opening approaches a circular configuration of the somewhat square configuration of FIG. 7. The tapes are spaced inwardly from their respective sides about an equal distance. The tolerance for the equal inward spacing is about 1/8 inch in order there to be equal support and loading position with the open end evenly aligned. Thus in the example shown in FIGS. 4, 5, and 6, the bag is 12 inches wide, the tapes are 51/2 inches from inside edge to inside edge, the tapes are 3/4 inch wide, the distance from the outside edge of each tape to the nearest side edge of the bag is 3 inches. The bags are oriented along the tape 3/4 inch. The tape contact surface is 1/4 square inches on each bag, 36 square inch contact surface per tape. Depending on the size bag used the tape contact surface per tape may desirably vary from 1/4 to 1 square inch per tape. The tack strength should be such that from 2 to 4 pounds, most preferably about 2 pounds, will separate the bag from the tapes and 1% pounds, more preferably 1 pound, will not separate the bag from the tapes when the pull is provided on an angle of 30° in the direction toward which the bags are normally stripped from the tapes. If a high tack tape is used the stick of tape and the area of contact can be substantially reduced by several fold. The tensile strength of the tape should, however, be maintained above about 25 to 55 pounds per tape; more preferably 55 pounds per tape. In order that the tapes not cause the lead bag to trough or curve side edge to side edge when being positioned in the loading position the tape extends 18 inches beyond the lead bag in the chain.

If the surfaces of the bags tend to adhere together a dusting of talc to cover the surfaces of the bags inside and out may be used to overcome the sticking together of the surfaces.

Other preferred embodiments of our invention are shown in FIGS. 8, 9 and 10. The support table and tape pulling unit 215 of FIG. 8 is similar to the support table and tape pulling unit 15 except rather than the multiple component power means 28 a power unit 228 is provided. The power unit 228 has a low geared start-stop motor 243 which is geared (gears not shown) in such a ratio that it will not reverse when a reverse pressure of 15 pounds is applied to shaft 231. The motor used was a Saso-Syn trademark, "Driving Motor" having a torque capacity of 400 amps inches at 16.5 r.p.m. obtained from the Superior Electric Company, Bristol, Conn. 231 is connected to and drives a driven gear 230. A spring loaded on-off electrical switch 247 is connected by wires 244 and 245 to the motor 243. The switch is biased to the off position. The switch is cut on by the leaf spring trigger 251 when it engages against the spring loaded actuator 250 and overcomes the bias of the actuator. In this respect the support table and tape pulling unit 215 is almost identical to the support table and tape pulling unit 15 with the exception of shield 219 (FIGS. 9 and 10). The support table 215 has a triangular support table 221 with a curved forward edge 222 (see dotted lines in FIG. 10 through its forward edge. Shield 219 is fastened to the front plate 224 of the support table and tape pulling unit 215 and extends over the leaf spring trigger 251 so that the trigger is shielded from the forward or article inserting end of apparatus directly above and in front of the trigger 25.

The support table and tape pulling unit 215 (FIG. 8) is shown equipped for non-pivotal mounting in the manner of the unit shown in FIGS. 9 and 10. However, the unit 215 could just as well be pivoting mounted in the manner of unit 15 and vice versa. Unit 15 could also be substituted for unit 215 in FIGS. 9 and 10 by the same token the unit 215 could be pivotally mounted and substituted for unit 15 in device 10 of FIGS. 1 and 3.

Unit 215 may be seen in FIG. 8 to have a front plate 224, a bottom plate 225 and side plates 226 and 227. The unit 215 has a non-laterally sliding table but freely rotating guide and orientation wheels 263 and 264 and a meshing idler gear 256. The idler gear 256 has a meshing position and an out of mesh or open position between which it is moved by the toggle 257. The tray 212 is rigidly mounted in assembly 315 with the fan 210 and chute 213. The assembly 315 is hinged to the frame 211 with hinges 382 and 383 (FIGS. 9 and 10). An over center self locking folding support arm 390 is connected to the frame 211 and the assembly 315 and supports the assembly in the raised
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position. When it is desired to unlock the arm 390 it is bent at 391 and folds as the assembly is lowered. The assembly is raised and lowered manually. Brackets 300 and 301 engage the assembly frame 310 to support and position the assembly when it is in its operable position.

The tray 212 has sides 304 and 305 from which spring arm 306 and 307 respectively project. The spring arms 306 and 307 are positioned so that when a bag is inflated their forward ends will be inside of the bag. The spring arms have curved forward edges 308 and 309 that serve as guiding surfaces such as 307a to guide the bag from under the arms to full inflation above the arms. It may be seen in FIG. 8 that the spring arms straddle the guard 211.

The forced air system 216 includes an electrically powered centrifugal fan 210 which operates continuously when the apparatus is in operation. When the apparatus is placed in operation the fan is initially activated by a switch (not shown). The air enters the fan through inlet 211 and the through outlet 312 into chute 213 which has a number of protective bars 217 and 218 across its outlet as shown in FIG. 10. This prevents large particles of the article being packaged from falling down the chute and blocking the air passage. The bars 217 and 218 also serve to sort various sizes of products before the product to be packaged is dropped over the chute outlet over which the article to be packaged may slide.

For purposes of illustration, the bags shown in FIG. 10 on machine 210 are slightly longer than the bags shown in FIG. 1. Positioned on the machine 10 and it may be seen that the bags shown in FIG. 10 extend back across rollers 273, 274 and 275 and down over roller 275. Thus the use of the plurality of support rollers in accommodating bags of differing sizes is illustrated.

By a further aspect of our invention, in a preferred form thereof, we have provided a combination of a chain of imbricated bags and a windable cartridge. The windable cartridge 400 removably clips onto the embodiment of the support table and tape pulling unit 415 shown in a preferred form in FIG. 11. Only these portions of apparatus 415 necessary to illustrate the differences between unit 415 and units 215 and 15 are shown in FIG. 11. The power unit could, of course, be either that of unit 15 or of unit 215. A shaft 431 projects from the front plate 424 and has a coupling head 401 thereon for engagement in the spool couple 402 to rotate the spool 403 (FIG. 13) which is mounted for rotation within the housing 404. The housing 404 may have similar lip portions to the lips in the housing member 405 may simply have a slot permitting the lips 408 and 409 to extend across the slot in the housing 404 so that the tape can scrape only against the rounded lip portions as it is drawn into the tape cartridge 400.

Pairs of bosses 412a, 412b and 412c are formed on housing member 405. Each boss extends across a portion of the back of the housing member and a portion of the rim. Bosses 413a, 413b and 413c are formed on the front plate 424 of the unit 415. When the tape windup cartridge 400 is in the unit 415 the pairs of bosses 412a, 412b and 412c cooperatively receive respectively bosses 413a, 413b and 413c therebetween to secure the cartridge housing 404 non-rotatably to the unit 415.

By an aspect of this invention in a preferred embodiment a chain of imbricated bags of the type shown in FIG. 12 is used as a package such as 143 of FIG. 5. The chain of imbricated bags 430 includes the combination of the windup cartridge 400, the tapes 428 and 429 and the bags. The chain of imbricated bags is shown in FIG. 13 with the top cover 406 removed for purposes of illustration. Of course, in actual packaged the tapes 428 and 429 are spaced apart on the imbricated bags about ¼ the width of the bag in from each side within a tolerance of ½ the width of the bag so that the bags may open into a wide oval opening. The opening approaches a circular configuration or the somewhat square configuration of FIG. 7. The tapes are spaced inwardly from their respective sides about an equal distance. The tolerance for the equal inward spacing is about ¼ inch if the bags are to be optionally pulled into the loading position with the open end evenly aligned. Thus in the example shown in FIGS. 8, 9 and 10, the bag is 12 inches wide, the tapes are 4½ inches from inside edge to inside edge, the tapes are ¾ inch wide, the distance from the outside edge of each tape to the nearest side edge of the bag is 3 inches. The bags are offset from one another along the tape ¾ inch. The tape contact surface is ¾ square inches on each bag, ¾ square inch contact surface per tape. Depending on the size bag used the tape contact surface per tape may desirably vary from ¼ to 1 square inch per tape. The tack strength should be such that from 2-4 pounds more preferably about 2 pounds will separate the bag from the tape and ¼ pound more preferably 1 pound will not separate the bag from the tapes when the pull is provided on an angle of 30° in the direction toward which the bags are normally stripped from the tapes. If a high tack tape is used the width of tape and the area of contact can be substantially reduced by several fold. The tensile strength of the tape should, however, be maintained above about 25 to 55 pounds per tape, more preferably above about 55 pounds per tape. In order that the tapes not cause the lead bag to trough or curve side edge to side edge when being positioned in the loading position the tape extends 18 inches beyond the lead bag in the chain. In the twisted portion of the tape to tacky surface to tacky surface starting at a point just before they enter the slot 407. Thus the tapes will not stick to the lips 408 and 409 as they are drawn into the slot 409 because the non-tacky surface faces outwardly.

A small slot 420 is provided in the spool 403. The spool 403 also has an annular recess 421 into which the slot 420 opens. The double tapes 428 and 429 are adhered together and then fed through the slot 420 and the tape is twisted into several times, as necessary, and the twisted portion is pushed down in the annulus 421. This prevents the tape from falling out through the slot 420 and provides a grip on the tape for its winding by the support table and tape pulling unit 415. Of course, after this assembly has been completed the cover 406 is secured in position with its rim inside of the rim of housing member 405. The chain of imbricated bags 430 is then complete.

If the surfaces of the bags tend to adhere together a dusting of talc to cover the surfaces of the bags inside and out may be used to overcome the sticking together of the surfaces.

By an aspect of our invention in a preferred form thereof, a process is provided for sequentially loading a chain of imbricated bags supported by two parallel spaced apart tapes each of which has one tacky surface engaging one side of each bag. The other side of the tape is not tacky and faces outwardly. The two spaced apart tapes are pulled from a medial position between their normal spaced apart paths and at the same time their respective tacky surfaces are squeezed together by gripping the tapes between the teeth of a pair of gears and sequentially activating the gears to pull the tape in stepwise fashion. The tape accumulates below the gears and can be periodically removed by severing the tape below the gears or by waiting until a run of bags is completed. Because the respective tacky surfaces have been separated the tape is not a problem from the standpoint of sticking to everything and forming a mess and fouling the efficient operation of the apparatus.
By pulling the tapes from a medial position between their normal spaced apart paths the chain of imbricated bags is moved in a straight line without this positional problem with canting from side to side and without a requirement for constantly adjusting the pull so that the chain will move in a straight line to the loading position.

Each bag is pulled into the loading position in almost exactly the same position as the previous bag to facilitate easy alignment without providing compensation for irregularity in the bag's position.

It is preferable that the tapes be pulled from a position below the plane of the bags when they are in the loading position. It is also desirable for the tapes and bags to pass through the loading position in an even horizontal plane with the very front edge of the bags being slightly pulled down over a rounded edge. The tapes should preferably be maintained spaced apart as they pass through the loading position and the plane of the tape should be changed fairly ably by desiredly by engaging the tapes around idler wheels spaced apart about the normal distance of the tapes spacing. By positioning the tape receiving surfaces of the idler wheels both perpendicular and at right angles to the tapes original horizontal plane of movement, the orientation of the tape can be correspondingly changed.

The bags are moved into the loading position sequentially, only the topmost bag being fully in the loading position. The upwardly oriented side of this topmost bag is free of attachment so that it may be readily opened. The bottom of the chain of imbricated bags is not tacky and slides easily in response to the pulling force applied to the tapes. The loading without the forwardmost bag in the imbricated chain is firmly supported so that an item placed in the bag will not cause the entire bag to fall or otherwise deform until the bag is removed from the loading position.

The bags are sequentially inflated as they are positioned in the loading position by initially reducing the air pressure above the unattached side of the bags to partially open the bag and subsequently directing a stream of air into the partially open bag to increase the pressure inside of the bag and thereby fully open the bag. An article is loaded into a reciprocating tray and this reciprocating tray is moved forward shutting off the stream of air to the inside of the bag and the tray moves on into the bag before the bag can close and simultaneously seals the bag from the tapes starting at the bag's forward edge and proceeding toward the bottom of the bag until the bag is free from tension. Simultaneously with this action, the article is pushed from the tray into the bag and thereafter the loaded bag is disengaged from the tray and the tray is drawn back out of the way for reloading.

By peeling the bag from the tape much less force is required than if the bag is stripped from the tape in a direct plane. This is because the bag is gradually stripped from the tape by pulling upwardly against the bag starting at the edge of the top lip and pulling the bag from and lifting the bag backward away from the tape until it is free.

The bag may be separated from the tape in the manner described by employing spaced apart spring arms on the tray having reduced dimensions for first entering the bag and increasingly spaced apart and upwardly increasing dimensions that engage the upper side of the bag as the tray progresses into the bag lifting the bag off of the tapes and pushing the bag back from the tape. In the same manner, if the movement of a moving wedge, see FIG. 3, the shape of arm 107. The article being bagged can be slipped through the tray between the spring arms simultaneously with the inward movement of the tray. The outward movement of the spring arms against the sides of the bag would also tend to hold the bag in position on the tray while the article is being loaded into the bag.

This process may advantageously be used to sequentially load a chain of imbricated bags with items such as cleaned and dressed turkeys or other market ready items. To place the apparatus 10 of this invention in operation and operate it in a preferred manner by 20 inch long bags and a preferred process of this invention, the support table and tape pulling unit 15 is opened to the position shown in broken lines in FIG. 3 and the toggle lock 57 is open so that the gear 56 is spaced from gear 30. The knurled wheels 63 and 64 are adjusted apart equal distances from the center approximately the same spacing as the two lead tapes of the chain of bags.

The knurled wheels need adjusting only if the width bag being used varies substantially. If adjustment is necessary the screws 70 and 71 are loosened and the respective wheels are correspondingly moved in or out and then the screws are tightened again. To feed the chain of bags 130 into the machine the two lead tapes 128 and 129 are manually raised out of a package containing a chain of imbricated bags and fed up and over an appropriate roller so that they lay over the roller as shown in FIG. 1. The chain of imbricated bags 130 can be seen to pass between rollers 74 and 75 and to lie across the top of the rollers 73 and 74.

The chain of bags 130 is manually pulled over above the support table 21. The tapes are drawn down over the forward edge of the table so that they engage the table with their non-tacky surfaced lower surfaces. Then the forwardmost one half turn counter-clockwise and its tacky surface is engaged over the knurled wheel 63 as shown in FIG. 7. Tape 129 is twisted one-half turn clockwise and its tacky surface is engaged over knurled wheel 64 as is also shown in FIG. 7. The ends of the two tapes are stuck together tacky surface to tacky surface and positioned or threaded between the gears 30 and 56 which are open. The locking toggle 57 is then pivoted to move the idler gear 56 into mesh with the driven gear 30 and then locked by pushing the toggle over center (FIG. 2). After the toggle is locked the tape is securely held clamped between the intermeshed gears.

After the chain of imbricated bags 130 has been positioned in the machine and the tape secured between the intermeshing gears 30 and 56, the lever 86 is manually moved to open valve 85 and supply air to cylinder 84 which drives the piston and piston rod 92 forward pulling the support table and tape pulling unit 15 up into its operating position shown in solid lines in FIGS. 1 and 3.

When the imbricated bags are being fed or loaded into the machine it is desirable to have the tray 12 sufficiently forward to engage the lever 124, and cut off the air from fan 110. This prevents the air from buffeting the forward edge of the bag instead. In position 10 is ready for sequential operation. Of course, the machine may be loaded with bags with its power both air and electric off. The then would be switched on before activating lever 86 to raise the unit 15. The fan 16 could be switched on subsequently if desired. Once the table and tape pulling unit 15 is in its operating position the driving wheel 30 would convey the tape forward until the lead bag in the chain 130 engages against the trigger 51 opening valve 47 (FIG. 2). The tray 12 is then retracted to its outer position for loading, switching the air on which inflicts the lead bag.

When the tray is retracted the lever 124 is released by the cam surface 125. This closes valve 123 admitting air to cylinder 120 via line 122 and opens the gate 117 admitting air through inlet 111 into the fan which propels the air outwardly through outlet 112. The air is guided by the chute 113 across the forward edge of bag 131 and the air stream passing over the bag reduces the pressure over the bag and the air in the bag expands slightly, slightly lifting the bag. The air stream then moves the bag and further lifts the bag to fully open position. Some bags that have desirable properties such as very thin walls, clear see-through characteristics and a very flexible hand, such as Saran bags, must be powdered inside to be fully
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operable. The powder prevents the sides of the bags from adhering together and excluding air from between the two inner walls of the bags which would make the opening of the bag very difficult using only the air system employed here. The powder may be a material such as corn starch if edibles are to be placed in the bags.

Turning now to the sequential operation of the apparatus, a pusher deposit an item to be packed on the tray 12. The item may be supplied by any means such as, for example, a push cart or conveyor (not shown). The tray 12 is pushed forward by the operator. As the tray moves forward its conveyer arms enter the mouth of the bag 131. The human arms operating about 1/3 of the way into the bag, the camming surface 125 engages the lever 124 actuating the gate 117 to close off the air into the fan 110 and thereby shut off the air from the fan. It is preferable to shut off the air because as the bottom edge of the tray 12 passes over the chute 113 it deflects the air downwardly against the mouth of bag 132 that underlies the bag 131 and tends to inflate the second bag before the first bag 131 is stripped from the tape. This tends to cause the bags to be partly stripped from the tape prematurely and it also tends to tear the bags.

As the upper shoulder portions of the arms 106 and 107 enter further into the bag they strip the bag from the tape by pulling upwardly on the upper lip of the bag as the tray is pushed further into the bag drawing the bag upwardly on the arms. The arms can be seen to get higher at their base juncture with sides 104 and 105 as shown in FIG. 3. It may be seen that the forward edge of the bag at the lower lip has been pulled slightly down over the curved forward edge so that the increasing upwardly camming of the arms is counteracted by the downwardly curved position of the lower lip. This substantially assures that the lower lip of the bag will peel upwardly from the tape with the peeling progressing from the very front edge toward the rear. This greatly reduces the amount of force required to strip the bag from the tape. A much greater force would be needed to shear the bag from the tape in the plane of the tape. Even the force needed to directly pull the bag from the tape at one time straight away is very high.

As the bag is stripped from the tape the tray is generally still progressing into the bag to complete the bags loading. The tape is moved upwardly by means of the tape conveying device 30 through the meshing gears 30 and 56 a sufficient distance to pull the next bag 132 in the chain 130 against the trigger 51 drawing the trigger forward away from the spring loaded actuator 43 driving gear 30 clockwise through the power train. The tape is now in the outer position shown in FIG. 1 by the mating of the tape 30 and 56 and the bag 131 thus is secured in location.

The leaf spring trigger 51 because of its extra bending displacement provides some degree of override in response to the bags pressure against it insuring a complete disengagement of the trigger from the slide 50. The override is provided by the momentary delay in the reversal of the reciprocating rotary actuator. The override prevents the shattering type of switching of the power means that could otherwise occur due to a usually inherent slight giving and stretching of the forward lip of the plastic bags that would usually be used on the apparatus. The lip of the bag is engaged with and serves to actuate the trigger 51.

When the tape 56 carrier gear 30 moves its non-tacky surface slides over the upper surface of the support table 21 and the curved edge 22. The tacky surfaces of the tape are engaged on the knurled surfaces of the wheels 63 and 64 causing the wheels to rotate as the tape is pulled. Because the wheels 63 and 64 are knurled the tape separates from the wheel in response to only very slight separating forces. This reduces the power requirements for machine operation.

The tray is manually moved back to the loading position for reloading, lever 124 is released by the camming surface 125 whereby opening valve 123 releasing the air from the cylinder 120 allowing the spring in the cylinder to draw the piston into the cylinder opening up the inlet 111 to the fan 110. By the time the fan is open again, the loaded bag or package should have moved out of the way and the next bag is usually already in the loading position.

The fan 110 propel air through outlet 112 and the chute 113, directs the air against the forward edge of the bag where it initially proceeds on across the upper surface of the bag 131 until sufficient opening is attained in the bag for the air to fully enter the bag 131. Once the bag is fully inflated and opened by the air, the apparatus is ready for the repetition of the procedure just described which can be sequentially continued indefinitely.

When the chain of bags in the package 143 is about to be exhausted a new package 146 containing a new chain of bags may be moved up adjacent to the package 143 as shown in FIG. 3 and the end tapes 128 and 129 from the chain of imbricated bags in package 143 may be attached to the lead out ends of tapes 147 and 148, respectively, by adhering the tapes together so that the new chain will be pulled onto the apparatus and fed through the apparatus in the same manner as the chain 130. The tapes 147 and 148 must be attached so that the sticky tape sides are oriented up in the same manner as the chain of bags 130. It is obvious that this sequence can also be continued indefinitely as the trailing ends of tapes 147 and 148 may be attached to another package of bags and so on. Of course, once the package 143 is exhausted the empty package container may be removed and the package 149 may be slipped into its position.

To shut down operation it is only necessary to cut off the fan motor and the air compressor (not shown) if this is the source of air. This may be done at any time during the sequence of operation but probably it is most conveniently done at the time when tray 12 is in the outer position shown in FIG. 1.
It has been found to be preferable to power the machine with air with the exception of the fan because the air system does not provide sufficient air to other general electrical insulation, corrosion and deterioration problems presented by electrical wiring and devices under such rigorous operating conditions as meat packing plants where the apparatus is constantly wet down, washed and buffeted with water, steam and other cleaning mediums. Electrical apparatus also presents a safety hazard because of the possibility that personnel operating the machines will be shocked due to insulation failure under the wet operating conditions. The air powered machine usually provides for safe operation, lower maintenance costs and less expensive installation costs because there is a reduced need to protect electrical parts. It has been found that it is usually best to operate the fan with electrical power because of the high power requirements which necessitate the use of much higher air pressure than the 30 pound pressure which has been found sufficient to operate the apparatus when the fan is directly powered electrically. This split power means reduces the overall power requirements.

A reciprocating rotary actuator has been found to be the preferable driving means because it has low maintenance costs and low power requirements. In the embodiment shown a 150 inch pounds torque rotary actuator was chosen and mounted to provide the movement of the support and tape pulling unit 21 which weighs about 30 pounds, in the embodiment shown, is not a sufficiently large force to present the necessary power to move the support table and tape pulling unit 15 which weighs about 30 pounds, in the embodiment shown, is not a sufficiently large force to present the necessary power to move the support table and tape pulling unit 15. The air cylinder which is a double acting type air cylinder when operated at about 30 pounds of air pressure provides sufficiently slow-medium motion in opening and closing the apparatus to not delay operation and yet to give the operator time to observe and correct any binding, such as the bags not moving upwardly over the roller as the tape moves forward which could cause a break in the tape due to overstretching should the bags for some reason be held by the package due to a package being incompletely opened or some such. This speed of opening and closing requiring about 4 seconds, leaves the operator’s hands free to adjust the tape after he positions the handle 86 to actuate the cylinder 84.

When it is desired to switch the size of the bags or to change the tape for some other reason lever 86 is shifted to the position shown in dotted lines in FIG. 3. Closing the air inlet to line 88 into the cylinder 84 and opening the outlet for the air from the cylinder via line 89 allowing the tape to fall slowly backwards, the table being pulled backwards by its off-center weight about the pivot 82 which is engaged in bracket 83 and their counterparts (not shown) on the other side of the unit 15. The toggle 57 is moved to move idler wheel 56 out of mesh with wheel 30 releasing the tape from engagement therewith. The chain 130 of imbricated bags can then be lifted back and fed back between rollers 74 and 75 into the package 143. The apparatus is then ready for loading with a chain of imbricated bags in the manner previously described. Of course, a chain of bags could be used up and the ends of the tape would simply run out between the meshing gears 30 and 56. For reloading, the unit 15 would still be dropped back and the toggle 57 opened.

The apparatus incorporating the embodiments of FIGS. 8, 9 and 10 into operation and operate the apparatus in a preferred manner the operation is somewhat similar to placing the apparatus 10 of this invention into operation and operating it as previously described with the following differences. Initially the tray and blower assembly 315 is operated as pivoting at hinges 382 and 383 and expose the front face of the support table and tape pulling unit 215. This is a manual operation, the assembly is held in the raised position by support arm 390 while the chain of imbricated bags is fed upwardly in the apparatus. It will be noted that the support table and tape pulling unit 215 of FIG. 8 has no means for laterally adjusting the knurled wheels 263 and 264. Even so the device may be used with tape spacings varying about 20% without undue difficulty. The chain of imbricated bags is shown in FIG. 10 to be drawn up between rollers 275, 276 and 275 and then the chain of bags is drawn across rollers 275, 274 and 273 and across the support table 221 and over its forward edge 222 around the knurled wheels 263 and 264 respectively with tape 329 receiving a clockwise twist in being drawn over the knurled wheel 264 and with tape 328 receiving a counter clockwise twist and engaged over the knurled wheel 263. The directions of the twist being determined from a position facing the front plate 224. The tapes are then stuck tacky surface to tacky surface and positioned between the gears 230 and 256 and the toggle 257 is moved to its locked position to lock the wheels into meshing engagement with the tapes held therewith. The hinged arm 390 is then unlocked and the tray and blower assembly 315 is lowered into engagement with two stops 385 and 386 on the frame 211. It will be observed in FIGS. 9 and 10 that the tray 212 is secured in permanent position in the assembly 315. It does the operation continuously during a loading operation using the apparatus of FIGS. 9 and 10. The fan 210 supplies air through chute 213 across the front edge 222 of the support table and once the bag is partially open into the bag itself.

After the bag has been opened by the air the article to be packaged is placed by an operator in the tray 212 and pushed over bags 217 and 218 across the chute 213, pushing the spring arms 306 and 307 over against the sides of the bag. The article passes through the spring arms and into the bag. The bag is peeled from the tape and pushed out of the way. In the embodiment shown the bag is peeled from the tape by the operator. The operator holds her arm and slants upwardly and strikes the upper lip of the bag pushing the bag backwards as she pushes the article through the spring arms into the bag as shown in dotted lines in FIG. 9. As in the previous embodiment the bag is slightly pulled downwardly over the curved edge 222 which aids in peeling the bag from front to rear off of the tape. The bag could, of course, be stripped from the tape by constructing the tray arms similar to the arm 107 of FIG. 3 so that as the arms were pushed apart they would be sufficiently large to simply lift the bag from the tapes 328 and 329. The article slides over the guard 219 as it enters the bag thus preventing the article from striking the trigger 251 which would cause the motor 243 to be energized.

It is usually not necessary to provide means for shutting off the fan while the article is being inserted in the bag using the apparatus of FIGS. 8, 9 and 10 because when the article passes across the chute 213 it does not usually cause such a deflection of the air against the bag immediately under the one being loaded as to partially inflate that bag. The bottom of the tray does not pass across the chute and the article passes over the chute and into the bag so quickly that a problem has not been found to exist.

Once the bag is stripped out of the way the next bag is pulled into position against trigger 243 to prevent it from inflating. Its upper side and lip rise upwardly under the curved forward edge 308 and 309 of the arms 306 and 307. The arms 306 and 307 are shown in FIG. 10 posi-
tioned inside the mouth of the bag shown in solid lines and over the upper lip of the partially inflated bag shown in dotted lines. The upper lip of the partially inflated bag rises upwardly along the front edge of the arms until it passes above the arms at which time it flips open and straightens out above the upper surface of the arms as shown in full lines. A deflection and tray support plate 309a deflects the air downwardly and also serves as a stop to the chute 213. It is important to deliver the air into the bag at a fairly low angle in order to assure that the air will flow under the upper lip of the bag when it is bent back under the arms 306 and 307. This assures that the air will fill the bag rather than above the bag. Of course, it is also important that the air not be delivered at such a low angle as to cause the second bag down in the chain to partially inflate. Once the bag is fully opened it is then ready to be loaded with an article and the sequence is continued in the same manner as desired.

To load a subsequent chain of bags onto the apparatus of FIGS. 8, 9 and 10, an additional chain may be attached directly to the chain of bags already loaded into the machine as previously described to directly add another package into the apparatus or the chain may be fully used up or the machine may be stopped and the chain removed and a new chain of bag loaded into the machine as desired.

To place the apparatus of the embodiments shown in FIGS. 11, 12 and 13 in operation and operate it in a preferred manner, the support table and tape pulling unit 415 is opened in the same manner described with respect to the unit 15. The carriage 400 is lifted from the package containing the chain of imbricated bags 430 and fed between the appropriate rollers in the same manner as described with respect to loading imbricated bags 130 into apparatus 10. The carriage is then pulled across the support table and down across the curved front edge and connected to the shaft couple 401 (FIG. 11). The pairs of bosses 412a, 412b and 412c on the carriage are aligned with the bosses 413a, 413b and 413c respectively which closely fit between the bosses on the carriage and the carriage is clipped into a tight frictional engagement with plate 424 as it is connected to coupling 401 which passes into coupling 402. The support table and tape pulling unit 415 is then raised into operating position in the same manner described with respect to apparatus 10 and sequential operation is carried out also as previously described. However, when the chain of imbricated bags has been used up, it is necessary to substitute a new chain because generally the carriage only accommodates the tape from its own chain of bags. Thus when the chain of bags is used up, it is necessary to reload the apparatus 410 in the same manner as previously described for loading the apparatus by lowering the support table and tape pulling unit 415 and removing the full cartridge and substituting a new cartridge.

While in accordance with the patent statutes we have described what at present are considered to be the preferred embodiments of our invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and, therefore, aim in the following claims to cover all such equivalent variations as fall within the true spirit and scope of this invention.

We claim:

1. A bag feeding, opening and filling apparatus for feeding a continuous chain of imbricated bags sequentially in a loading position, sequentially opening the bags and filling the bags comprising a frame; a bag loading station positioned on said frame; a means for conveying a chain of imbricated bags to said station including a powered rotatable shaft; a power means connected to said shaft and driving said shaft in one direction periodically and sequentially; a signal producing means and said power means to activate said power means to index said bags in said loading position when the trigger is engaged and release by the lead bag in the chain of imbricated bags; and means for opening the lead bag.

2. The apparatus of claim 1 wherein an apparatus is provided for feeding, opening and filling a chain of imbricated bags supported by at least two strands of tape and wherein the loading station is a stationary support connected to said frame; the means for conveying the chain of imbricated bags is a tape puller, said tape puller being below said support and connected to said frame; there are two guide members that receive the tape and provide respective changes in its movement in relation between the support and the tape puller; the power means is a short cycle power means connected to the powered rotatable shaft and driving said shaft in one direction periodically and sequentially; means are connected to said rotatable shaft to prevent the reverse movement of said shaft sequentially when said shaft is not being rotated in said one direction; the signal producing means is an indexing trigger attached to said frame and projecting into the path of the lead bag of said chain of imbricated bags at the stationary support; the actuating means is a switch in operating engagement with said trigger and said power means to cycle said power means to index said bags in said loading position when the trigger is engaged and released by the lead bag in the chain of imbricated bags; the means for opening the bags is an air blower in air stream engagement with the forward edge of a bag engaged by said trigger at said loading position to inflate the lead bag.

3. The apparatus of claim 2 wherein the tape puller includes a powered pulling gear on the rotating shaft and a two position meshing idler gear, said gears adapted to grip two strands of tape therebetween, feed the tape thereupon and adhere the tacky surfaces of the tape together by squeezing the tape between the intermeshing gear surfaces, said intermeshing gears being cylindrical and having parallel axes.

4. The apparatus of claim 2 wherein the short cycle power means includes a reversible air motor; connecting linkage connecting said reversible air motor to said powered rotating shaft, said connecting linkage including a first one-way clutch adjacent to said motor for driving said shaft to pull the tape through the apparatus and a second one-way clutch reversed to said first one-way clutch to break the driving linkage so that the shaft will not reverse when the motor reverses to reposition the first one-way clutch for the next synchronous driving engagement; and the switch in operating engagement with the indexing trigger is an air switch and switches the air to said air motor from one circuit to another circuit to sequentially reverse the direction of said motor in response to the actuation of said trigger when the trigger is engaged and released by the lead bag in the chain of imbricated bags.

5. The apparatus of claim 2 wherein a tray is mounted on said frame for receipt within an open bag in the loading position, said tray having expanding side arms that separate into firm engagement with sides of the bag when an item is injected into the bag passing between them, the tray being reciprocally mounted on the frame, the expanding side arms of said tray are resilient and form a resilient forward end of reduced cross section on said tray for aiding in inserting items into the bags on its inward stroke, the tray being reloaded on its outward stroke; a moveable gate opening and closing the inlet of the air blower; an air cylinder connected to a frame for opening and closing said gate; a tray actuated air switch mounted on said frame in the path of said reciprocating tray on its forward motion for activating and deactivating said cylinder to open and close said gate when said tray is reciprocated; and the drooping mechanism includes a lever for operating the air cylinder for actuating the said support table and tape pulling unit in closed position and a lever for releasing the air from said cylinder for
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6. The apparatus of claim 2 wherein the stationary smooth surfaced support is a table defining a bag support opening and loading position; the support table and tape puller are assembled into an integral unit which is pivotally mounted on the frame, said support table having an isoceles triangle shape with the base side of the triangle oriented forward and tapering rearwardly, said indexing trigger is a resilient blade projecting through and extending above the forward edge of said support table; a trigger guard is attached to said support table and tape puller unit and extends in front of and over said trigger to prevent an article passing over said trigger from its front coming into contact with said trigger, the air blower is electrically powered and mounted on the frame below the tray; an air chute is in air stream engagement with the outlet of said blower and oriented to direct the air from the blower against the forward edge of a bag engaged by said trigger at the forward edge of said support table in the loading position to inflate the bag; a plurality of bridging bars are secured across the upper opening in said chute to protect said chute against particles falling therein during the loading of the bags; and a dropping mechanism is connected to said frame and said support table and tape pulling unit and pivots said unit rearwardly for reloading the machine with a new chain of imbricated bags.

7. A bag feeding, opening and filling apparatus for feeding a continuous chain of imbricated bags sequentially into a loading position, sequentially opening the bags and filling the bags comprising a frame; a bag conveyor including a powered rotating shaft, said bag conveyor connected to said frame; a short cycle power means connected to said powered rotating shaft and driving said shaft in one direction sequentially; means preventing the reverse movement of said shaft sequentially when said shaft is not being rotated in said one direction; an indexing trigger connected to said frame and projecting onto the path of the lead bag of said chain imbricated bags; a switch in operating engagement with said trigger and said power means to cycle said power means to index said bags in a loading position when the trigger is engaged and released by the lead bag in the chain of imbricated bags; an air blower in air stream engagement with the forward edge of a bag engaged by said trigger at said loading position to inflate the lead bag.

8. The apparatus of claim 7 wherein a stationary support defines the loading position, said stationary support is a table defining a bag support, opening and loading position, and said table has a smooth support surface and an isoceles triangle shape with the base side of the triangle oriented forward and tapering rearwardly, wherein a tray is mounted on said frame for receipt within an open bag in said loading position, said tray having expanding side arms that separate into firm engagement with the sides of the bag when an item is injected into the bag passing between them.

9. A bag feeding, opening and filling apparatus for feeding a continuous chain of imbricated bags sequentially into a loading position, sequentially opening the bags and filling the opened bags, such apparatus comprising a bag loading station, means for sequentially and periodically conveying a chain of imbricated bags to the bag loading station, a signal producing means located in the path of the lead bag of the chain of imbricated bags at the loading station, the signal producing means co-operating with the means for conveying the chain of imbricated bags in use on the apparatus to index the bags at the loading station when the signal producing means is engaged and released by the lead bag of the chain of imbricated bags.

10. The apparatus of claim 9 wherein the bag loading station includes a stationary support table defining a bag support, opening and loading position; and a tray is reciprocally mounted to pass over at least a portion of said stationary support for receipt within an open bag in said loading station said tray having expanding side arms that separate into firm engagement with the sides of the bag when an item is injected into the bag passing between them.

11. The apparatus of claim 9 wherein a tray is stationarily mounted adjacent to said loading station, said tray having a resilient forward end of reduced cross section, said resilient forward end including at least two oppositely disposed side arms on the respective sides of said tray, the lower outer edge of said side arms having surfaces curved outwardly so the bag's upper side when engaged by said curved surface and forced upwardly will be cammed outwardly and upwardly over said arms to encompass the arms therein and said tray extending into the loading station a sufficient distance to be so received within an open bag at said loading station.

12. The apparatus of claim 9 wherein the bag loading station includes a support table defining a bag support, opening and loading position, said support table having a triangular shape with the base of the triangle oriented forward and tapering rearwardly to a rounded end so the chain of imbricated bags will be drawn over the rounded end of the support table toward the base of said support table.

13. The apparatus of claim 9 wherein the bag loading station includes a stationary support table defining a bag support, opening and loading position; and a bag opening means is stationarily mounted adjacent to said support table, said bag opening means including an air blower mounted below the upper surface of said support table and driven by an electric motor, an air chute in air stream engagement with the outlet of said blower and oriented to direct the air from the blower against the open edge of a bag on said support table in the loading position to inflate the bag.

14. The apparatus of claim 9 wherein an apparatus is provided for feeding, opening and filling a chain of imbricated bags supported on at least two strands of tape and wherein the loading station is a table member; the means for sequentially and periodically conveying the chain of imbricated bags includes a tape puller, said tape puller being spaced below said table member and there are two guide members that receive the tape and provide respective changes in its movement orientation between said table member and said tape puller.

15. The apparatus of claim 9 wherein the loading station is a stationary support table having a downwardly curved forward edge; the means for conveying the chain of imbricated bags is a tape puller positioned below the curved edge of said support table and the tape puller includes a powered pulling gear on a rotating shaft and a two position meshing idler gear, said intermeshing gears being cylindrical and having parallel axes that project forward and lie in a plane parallel to the general plane of said support table and a means supporting said idler gear and moving said idler gear between its meshing and open positions.

16. The apparatus of claim 15 wherein an apparatus is provided for feeding, opening and filling a chain of imbricated bags supported on at least two strands of tape and wherein there are two parallel idler guide and orientation wheels positioned below the curved edge of said support table and above said intermeshing gears with their axes parallel to the axis of said intermeshing gears, said wheels serving to provide a twist in the tape as it is pulled down over the forward edge of said support table to orient the tape for passage into the meshing driven and idler gears; said stationary support table, tape puller and two parallel idler guide and orientation wheels being assembled into an integral unit.

17. The apparatus of claim 15 wherein said integral unit includes a normally closed switch that is opened in response to the signal from said signal producing means sensing a bag at the loading station and recloses in re-
21. A bag feeding, opening and filling apparatus for feeding a continuous series of bags sequentially into a loading position, sequentially opening the bags and filling the bags comprising a frame; a bag loading position adjacent to said frame; a tray reciprocally mounted on said frame for receipt within an open bag in said loading position on the tray's inward stroke, the tray being reloaded on its outward stroke, said tray having expanding side arms that separate into firm engagement with the sides of the bag when an item is injected into the bag passing between them; air impelling means for opening the bag in the loading position in air stream engagement with the forward edge of a bag in the loading position; means for shutting off the air stream engagement with the forward edge of a bag in the loading position; a tray actuated switching means in the path of said reciprocating tray on its inward movement for activating and deactivating said means for shutting off the air stream engagement with the forward edge of a bag in the loading position when said tray is reciprocated.

22. The apparatus of claim 21 wherein the expanding side arms of said tray are resilient and form a resilient forward end of reduced cross section on said tray for aiding in inserting items into the bags on the tray's inward stroke; the means for impelling air for opening the bag in the loading position is an air blower in air stream engagement with the forward edge of a bag in the loading position; and the means for shutting off the air stream engagement with the forward edge of the bag includes a moveable gate opening and closing the inlet of the air blower.

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