United States Patent [19]

Roberts et al.

[11] **3,793,797**

[45] **Feb. 26, 1974**

[54] **METHOD OF PACKAGING ITEMS IN BAGS**

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[73] Assignee: **W. R. Grace & Co.**, Duncan, S.C.

[22] Filed: **Aug. 10, 1972**

[21] Appl. No.: **279,414**

Related U.S. Application Data

[62] Division of Ser. No. 47,926, May 7, 1970, Pat. No. 3,698,847.

[52] **U.S. Cl.** **53/29**

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

[58] **Field of Search** 53/29, 385

[56] **References Cited**

UNITED STATES PATENTS

3,507,090 4/1970 D'Angelo ..... 53/385 X

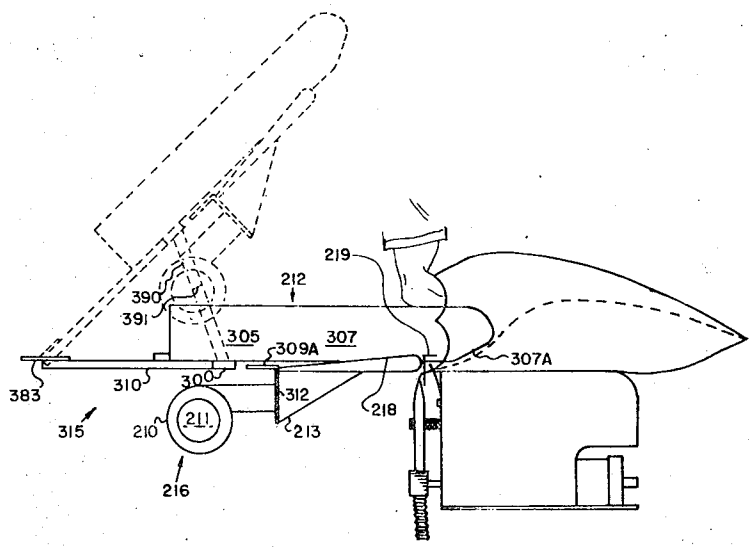
3,490,195 1/1970 Abramson 53/29

Primary Examiner—Travis S. McGehee

[57] **ABSTRACT**

This invention is directed to apparatus for sequentially packaging 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 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.

1 Claim, 13 Drawing Figures



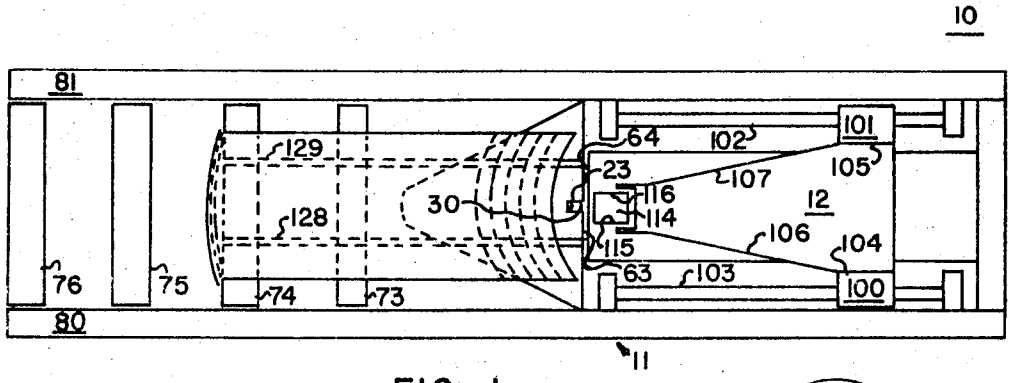


FIG. 1

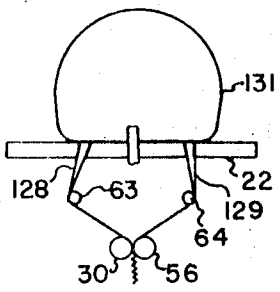


FIG. 7

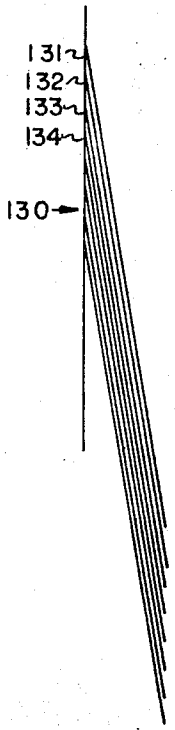


FIG. 6

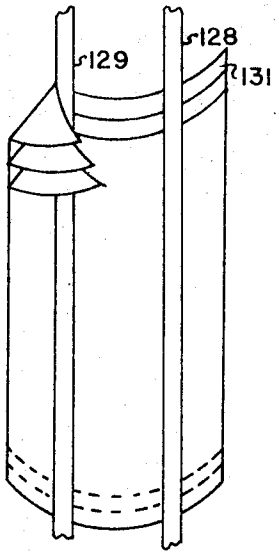


FIG. 5

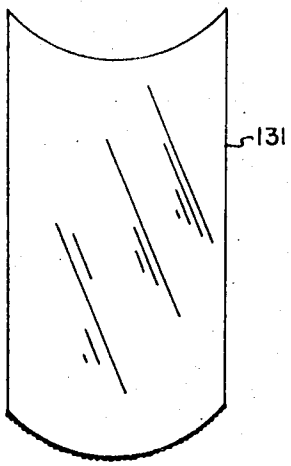


FIG. 4

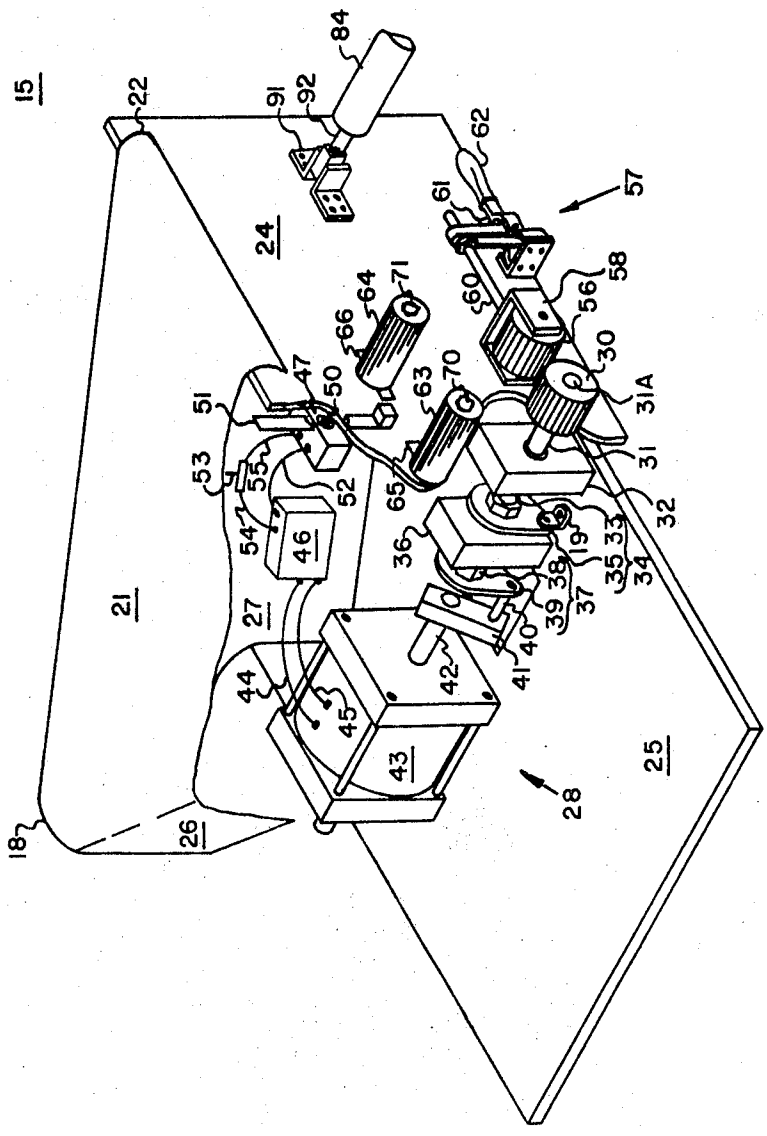

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FIG. 2

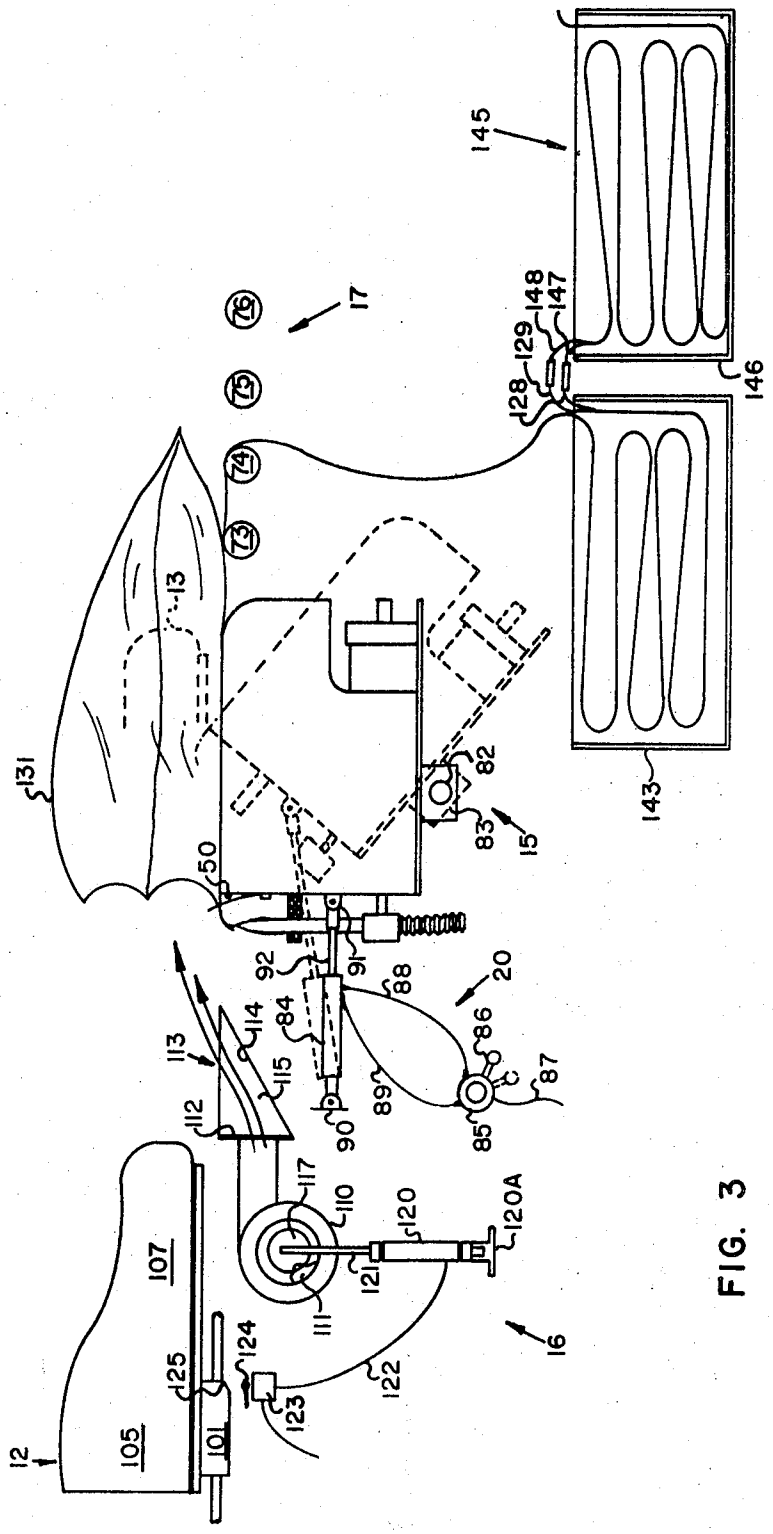

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FIG. 3

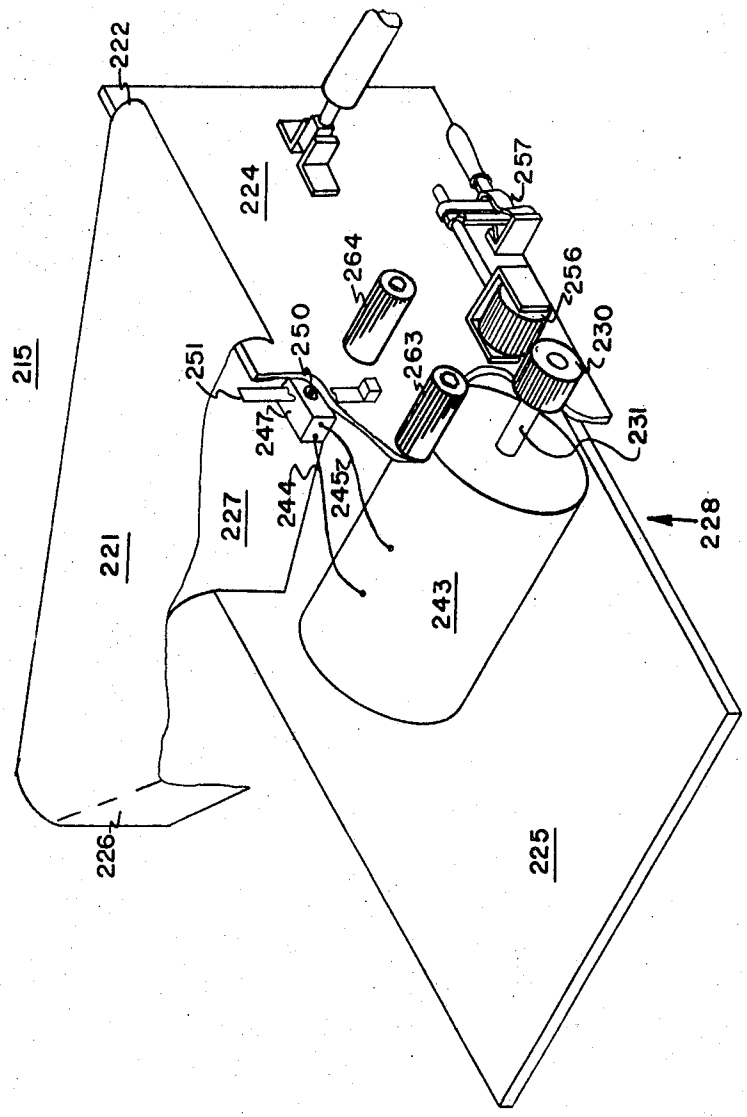

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FIG. 8

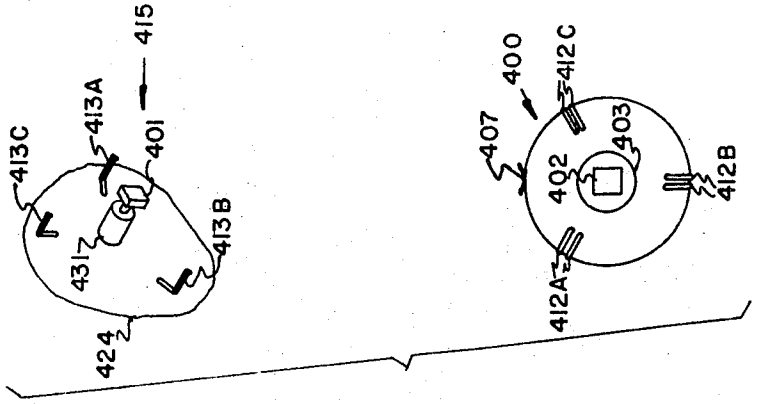

415
413A
413C
401
413B
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424
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412C
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403
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412B
412A

FIG. 11

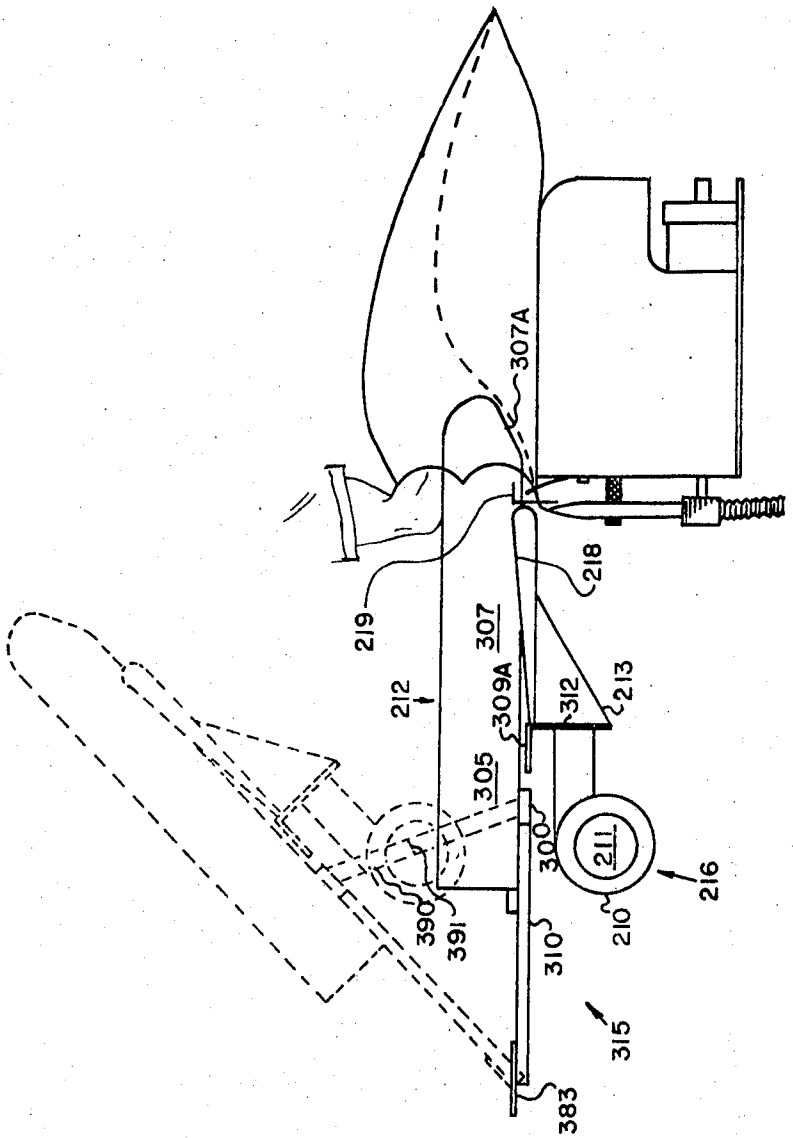

307A
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FIG. 9

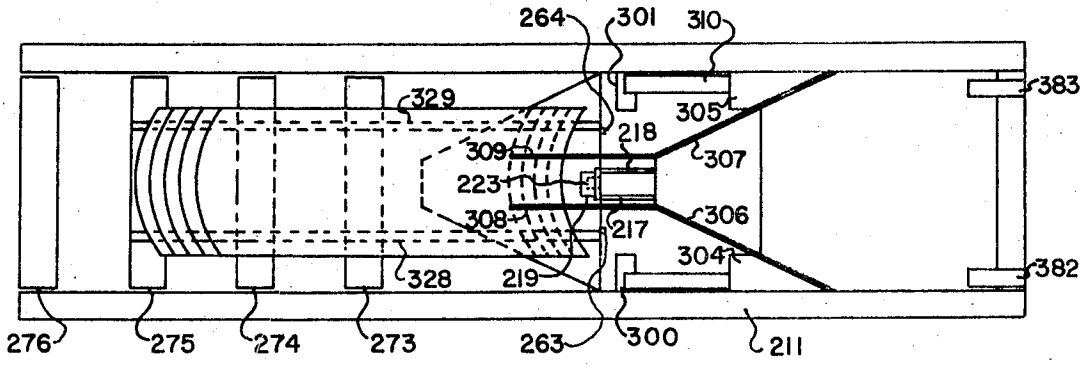


FIG. 10

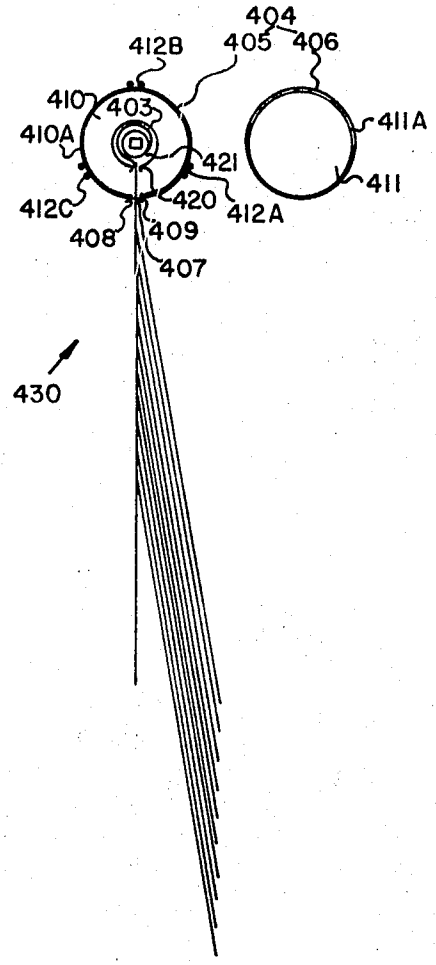


FIG. 13

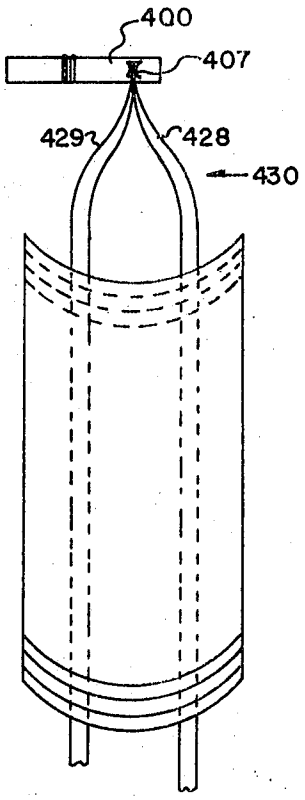


FIG. 12

METHOD OF PACKAGING ITEMS IN BAGS

This is a division, of application Ser. No. 047,926, filed May 7, 1970 now U.S. Pat. No. 3,698,847.

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 a further 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 still further object of this invention to provide a method and an apparatus for bagging items 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 summary, carrying out my invention in one form 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 surface support table that defines 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 therebeyond, adherring 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 adherring 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 projects through and extends above the forward edge of the support table, an 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 lead bag 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 mounted propelled force for opening the bag. A tray is munted 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 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 expedicious 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 therein. 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 side to both of the tapes. The open end of 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 overlies the opening of the underlying bag. The tapes are spaced apart about 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 apparatus is modified to provide a coupling member at the end of the rotating shaft. The cartridge containing package 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 dropping 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 dropping mechanism includes an air cylinder for closing and retaining the support table and tape pulling unit in closed position. A 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 bars 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 the bag and subsequently directing a stream of air into the partially open bag to increase the pressure inside the bag and fully open the bag. A tray is engaged in the open 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 diagramatic top plan view of one specie of the apparatus of our invention.

FIG. 2 is a diagramatic 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 diagramatic side plan view of the apparatus 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 diagramatic front plan view of a chain of imbricated bags mounted on tape suitable for use with the apparatus.

FIG. 6 is a diagramatic side plan view of the chain of imbricated bags of FIG. 5.

FIG. 7 is a diagramatic front end view of the support table and inflated bag of FIG. 3.

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

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

FIG. 10 is a diagramatic top plan view similar to FIG. 1 of the specie of our apparatus shown in FIG. 9.

FIG. 11 is a diagramatic perspective view of a still further specie 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 diagramatic front view similar to FIG. 5 of another specie of a chain of imbricated bags mounted on tape and suitable for use with the apparatus of FIG. 11.

FIG. 13 is a diagramatic side plan 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 a frame 11 with an article inserting tray 12 reciprocally mounted thereon for reciprocation from the out position shown in solid lines in FIG. 3 to the inserted position 13 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 provided at one end of the apparatus 10. A table dropping 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 forward. The triangle tapers 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 downwardly 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 rearmost bottom edges to expose the power means 28. A housing for the units 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 beveled 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 an arm 41 which is connected by shaft 42 to a reciprocating rotary actuator or reversing air motor 43. Clutches 34 and 37 are override 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. 2) when the pressure is on line 44 which drives the driven wheel 30. Clutch 37 is engaged with driving shaft 31 and clutch 34 is disengaged allowing 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 twoway 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 the 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 in meshed engagement. 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 and 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 adjustably in slots 65 and 66 respectively. Screws 70 and 71 serve to tighten the inner shaft of the wheels in fixed position in the slots in any selected position along the slots.

Looking now at FIGS. 1 and 3, 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 scared 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 unfold 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 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, communserate 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 proper tensioning and staightening 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 2 ½ inches to 3 inches using bags that are from 10 inches wide and 24 inches long and weigh 0.08 pounds to 18 inches wide and 32 inches long and weigh 0.13 pounds each when the bags are spaced ¾ inch apart with a tolerance of ¼ 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 ¼ 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 mils 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 is 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 **88** and thepiston (not shown) is driven forward pulling the table into its closed operable 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** psi and this provides a safety feature because an operator can manually overcome the closing pressure by pushing against the unit. This 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 the piston's rod **92.**

The reciprocating table **12** may be seen in FIGS. **1** and **3** to include sleeves **100** and **101** which are slidably 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 inside casing **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. **1**). 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 **121** connects the cylinder to the gate **117.** The cylinder **120** is connected to the frame **11** by mounting bracket **120**a. 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** across the inlet **111** 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 once again into 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. **1, 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 numerous individual bags **131, 132, 133** and **134,** in FIG. **6,** for example. These bags are adherred 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, pulled down over 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 **30** 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 **145** of imbricated bags.

The tapes **128** and **129** are spaced apart on the imbricated bags about ¼ the width of the bag in from each side within a tolerance of ⅛ the 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 ½ inch if the bags are to be optimally pulled into the 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 5 ½ 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 offset from one another along the tape ¾ inch. The tape contact surface is 1 ⅛ square inches on each bag, 9/16 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 strengh should be such that from 2–4 pounds, more preferably about 2 pounds, will separate the bag from the tapes and 1-½ 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 strengh 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 SLO-SYN Trademark, "Driving Motor" having a torque capacity of 400 amps inches at 16.6 rpm obtained from the Superior Electric Company, Bristol, Connecticut. The shaft **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 other respects 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** which has an opening **223** shown in 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 pivotally 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 non-laterally adjustable 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 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 **307***a* to guide the bag from under the arms to full inflation above the arms. It may be seen in FIG. **9** that the spring arms straddle the guard **219.**

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 exits 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 as a surface bridging 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 accomodating 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 puling 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 through 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** has two members, a back member **405** and a front member **406** which are frictionally held together with the rim **410***a* of member **405** fitting inside of the rim **411***a* of member **406.** The rim's project from circular walls **410** and **411** respectively and with the rims form shallow cup shaped members **405** and **406.** The rotatable spool is mounted in the wall of housing member **405.** A slot **407** enters through the rim of the housing **404.** Lips **408** and **409** are integrally molded with the housing member **405** and prevent the tearing of the tape as it passes through the slot **407.** The housing member **406** may have similar lip portions or 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 **412***a*, **412***b* and **412***c* 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 **413***a*, **413***b* and **413***c* are formed on the front plate **424** of the unit **415.** When the tape windup cartridge **400** is secured to the unit **415** the pairs of bosses **412***a*, **412***b* and **412***c* cooperatively receive respectively bosses **413***a*, **413***b* and **413***c* therebetween to secure the cartridge housing **404** nonrotatably 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 packaged in a package such as package **143** of FIG. **3.** 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 packaging it would be in place. 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 ⅛ 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 ½ inch if the bags are to be optinally 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 4 ½ 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 1 ⅛ square inches on each bag, 9/16 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 prefereably about 2 pounds will separate the bag from the tapes and 1-½ 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 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 postiioned in the loading position the tape extends 18 inches beyond the lead bag in the chain. The tapes are adherred together 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 **409** and **408** as they are drawn into the slot **409** because the nontacky 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 adherred together and then fed through the slot **420** and the tape is twisted one to several times, as necessary, and the twisted portion is pushed down in the annulus **421.** This prevents the tape from pulling out through the slot **420** and provides a grip on the tape for its windup 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 step wise 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 squeezed together 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 any substantial 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 opening and loading without providing compensation for irregularity in the bag's position.

It is preferably 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 abruptly desirably 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 tape. The bottom side of 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 peels 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 the tape. 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 motion in the manner 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, using 12 inch wide 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 roller 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 surfaces. Then tape 128 is twisted 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 crimped 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 bags and inflating them before the apparatus 10 is ready for sequential operation. Of course, the machine may be loaded with bags with its power both air and electric off. The air would then 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 inflates 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 catches inside 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 operable. The powder prevents the sides of the bags from adherring together and exluding 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 cornstarch if edibles are to be placed in the bags.

Turning now to the sequential operation of the apparatus, an operator deposits an item to be packaged on tha 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 conveying arms enter the mouth of the bag 131. After the arms have entered about 1/5 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 upward camming of the arms is excentuated by the downward 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 progressing into the bag thus loading the bag. The article being loaded into the bag is shoved simultaneously as the tray approaches is fully in position out through the spring arms **106** and **107** opening the arms apart and spreading the bag further thus pulling some at the outside edge of the bags contact with the tape. The article is also simultaneously shoved from the tray and the bag is shoved from the loading position of the support table and, because of its relatively slick surface, it slides easily across the other bags and onto a second station (not shown) which may be a conveyor or a table for moving it to a separate position for further processing such as closing by a person standing just beyond the bagging position. The rollers **72** and **73** aid in moving the bags out of the way to the next station for further processing so that another bag may be loaded. Alternatively if the tray does not have the upper camming shape to the arms **106** and **107,** the operator may hold her arm tilted upwardly and engage the forward edge of the bag stripping it from the tape.

As the bag is stripped from the tape the trigger **51** is released by the lower lip of the bag. The trigger **51** moves inwardly due to its spring action engaging the spring loaded slide actuator **50** which closes the pilot valve **47** cutting off the air to line **52** which allows the air through line **54** to move the slide in the valve **46** to open line **44** and reverse the rotary actuator **43** driving gear **30** clockwise through the power train. The tape is thus conveyed 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 **50** which opens the pilot valve **46** admitting air through line **52** against the slide in the valve **47** which switches the air to line **45** reversing the reciprocating actuator to a counterclockwise rotation. This reverses the movement of the shaft **42** opening clutch **37** and breaking the power train. Clutch **34** engages so that the drive wheel **30** is locked and cannot reverse its motion. Thus the tapes **128** and **129** are held crimped between gears **30** and **56** and the bag **131** thus is secured in loading position.

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 is pulled by the gears **30** and **56** 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 wheels in response to only very slight separating forces. This reduces the power requirements for machine operation.

As the tray is manually moved back to the loading position for reloading, lever **124** is released by the camming surface **125** thereby 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** propels 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 adherring 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 tacky 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 **145** 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 normally present the 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 cleansing mediums. Electrical apparatuses also present 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 used. The use of the air cylinder **84** to raise and lower the support table and tape pulling unit **21** has been found to be particularly desirable because the **30** pounds of pressure required to pivotally 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 a safety hazard should someone get a hand or another body part in the way of the movement of 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 table 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 therebetween. 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.

To place an 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 opened pivoting at hinges **382** and **383** to expose the front face of the support table and tap 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 being loaded 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** percent without undue difficulty. The chain of imbricated bags is shown in FIG. **10** to be drawn up between rollers **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** reciving a counter clockwise twist and engaged over 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 therebetween. 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 not reciprocate during the operation of the apparatus. Once the assembly **315** has been lowered and the power is turned on by an electric switch (not shown) the bags will be drawn forward across the support table **221** until the forwardmost bag's lips engage against the trigger means **251.** This will open switch **247** (FIG. **8**) shutting off the motor **243.** The fan **210** (FIG. **9**) is then activated either by the same switch that cuts on the power to motor **243** or by another switch. The fan will usually be operated 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 bars **217** and **218** across the chute **213,** pushing the spring arms **306** and **307** outward 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 slanted 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 **251** and begins to inflate. 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** positioned 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 **309***a* deflects the air downwardly and also serves as a top 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 pass into the bag rather than over 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 cartridge **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 cartridge is then pulled across the support table and down across the curved front edge and connected to the shaft coupler **401** (FIG. **11**). The pairs of bosses **412***a*, **412***b* and **412***c* on the cartridge are aligned with the bosses **413***a*, **413***b* and **413***c* respectively which closely fit between the bosses on the cartridge and the cartridge 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 cartridge only accomodates 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 our invention, and we, therefore, aim in the following claims to cover all such equivalent variations as fall within the true spirit and scope of this invention.

What we claim is:

1. A method of sequentially loading a chain of imbricated bags comprising sequentially moving a bag into a loading position, firmly supporting the bottom of the bag in the loading position, reducing the air pressure above said bag and partially opening the bag, directing a stream of fluid into the partially open bag and increasing the pressure inside the bag and fully opening the ag, positioning the front inward portion of the bag under the bag, edge of the tray, and when the stream of fluid is directed into the partially open bag the bag is caused to ride up under the forward portions of the tray and hump up so that its upper lip is drawn up along the forward edge of the tray and caused to flip out above the forward edge of the tray, the article is loaded into the tray and shoved from the tray into the bag without moving the tray further into the bag and the bag is then removed from the tray.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,793,797 Dated February 26, 1974

Inventor(s) Roberts, John T. and Wing, Ralph L.

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

Claim 1, line 8 "ag" should read - - bag - -.
line 9 "bag" should read - - forward - -.
line 9 first comma should be deleted.

Signed and sealed this 11th day of June 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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