Feb. 3, 1970 F. J. BASTASCH 3,492,780

AUTOMATIC BAG PACKAGING MACHINE

Filed Dec. 26, 1967 5 Sheets-Sheet 1

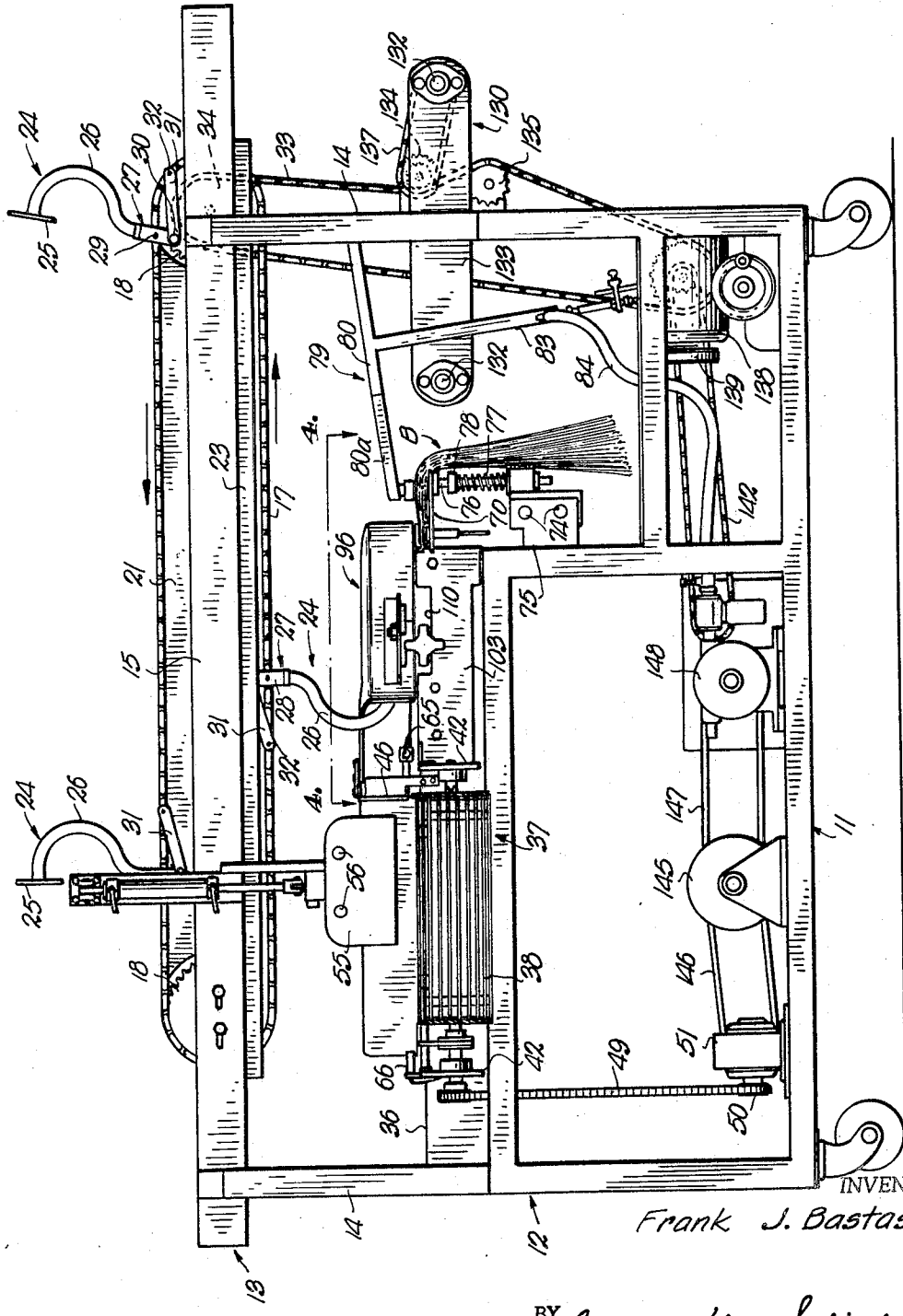


Fig. 1.

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Filed Dec. 26, 1967 5 Sheets-Sheet 2

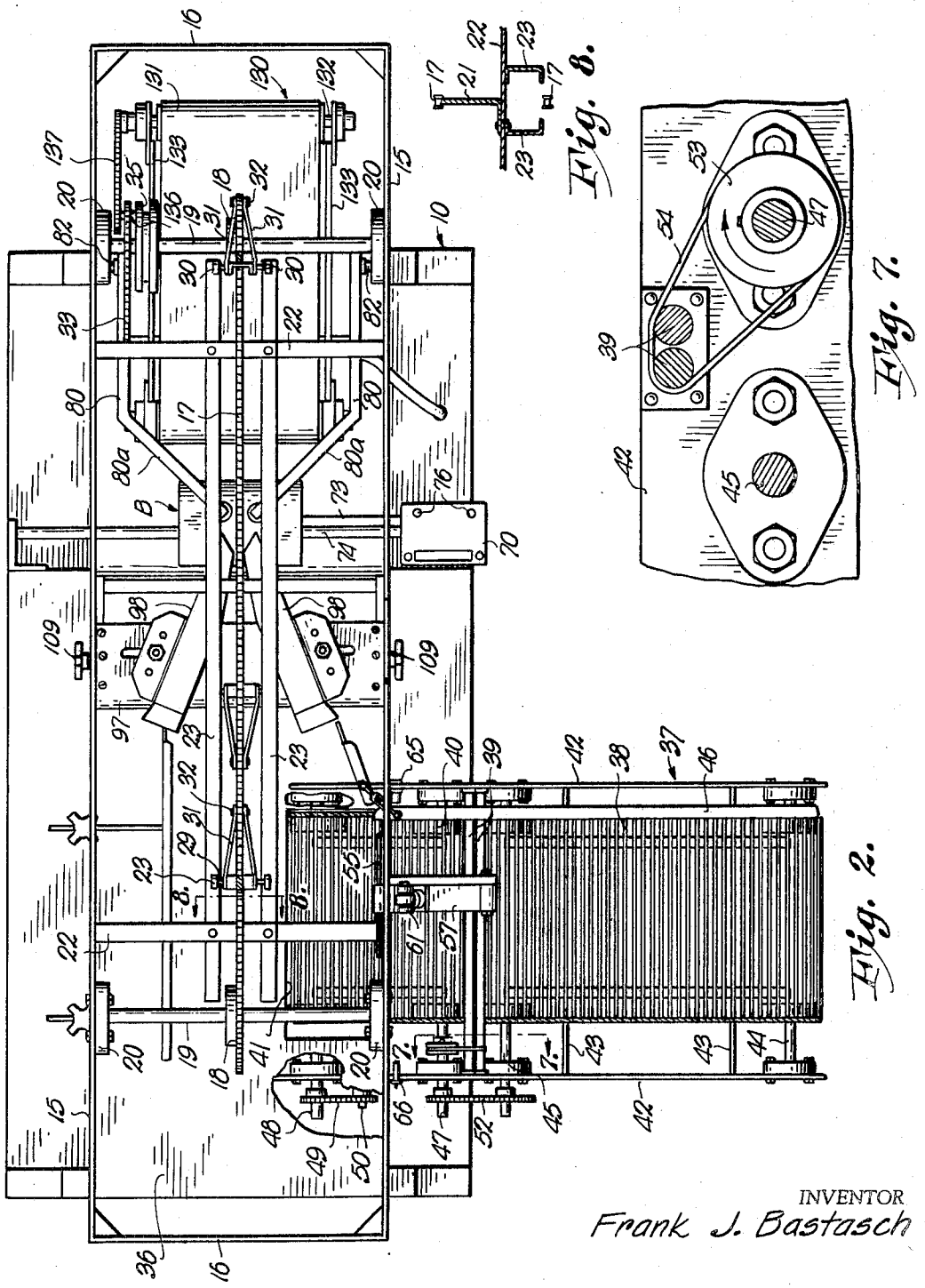


Fig. 2.

Fig. 7.

Fig. 8.

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AUTOMATIC BAG PACKAGING MACHINE

Filed Dec. 26, 1967 5 Sheets-Sheet 3

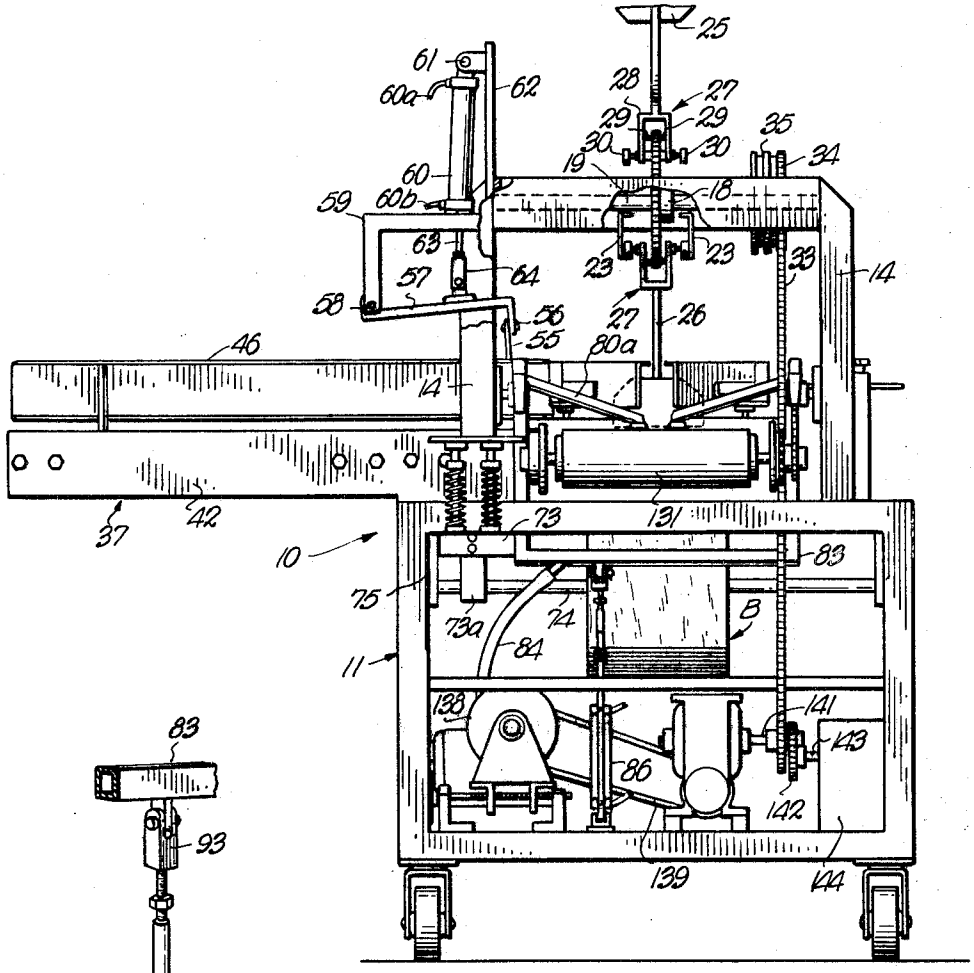


Fig. 3.

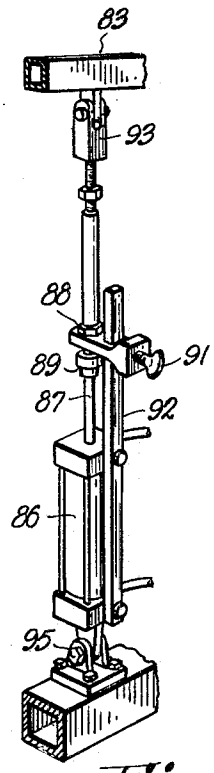


Fig. 6.

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AUTOMATIC BAG PACKAGING MACHINE

Filed Dec. 26, 1967 5 Sheets-Sheet 4

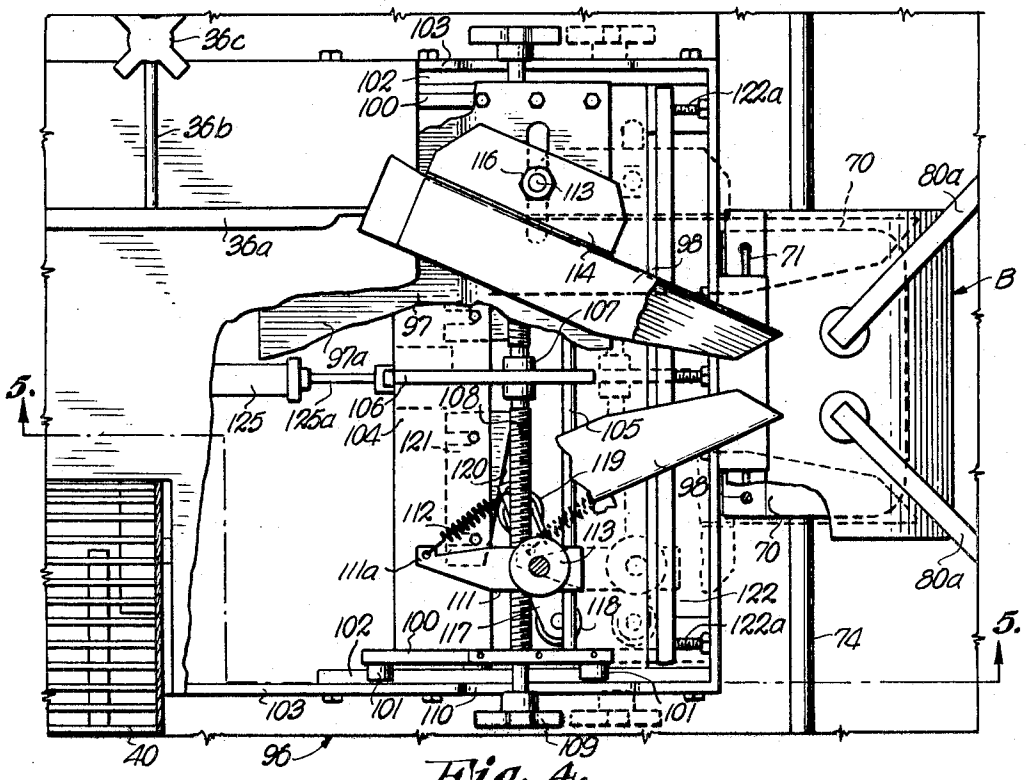


Fig. 4.

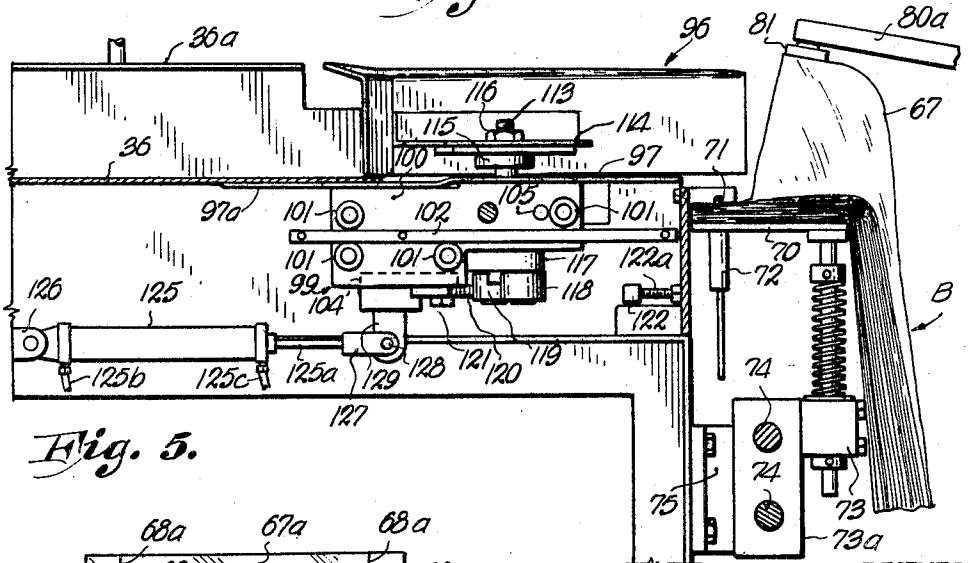


Fig. 5.

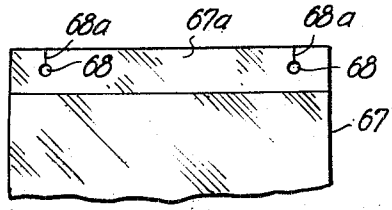


Fig. 9.

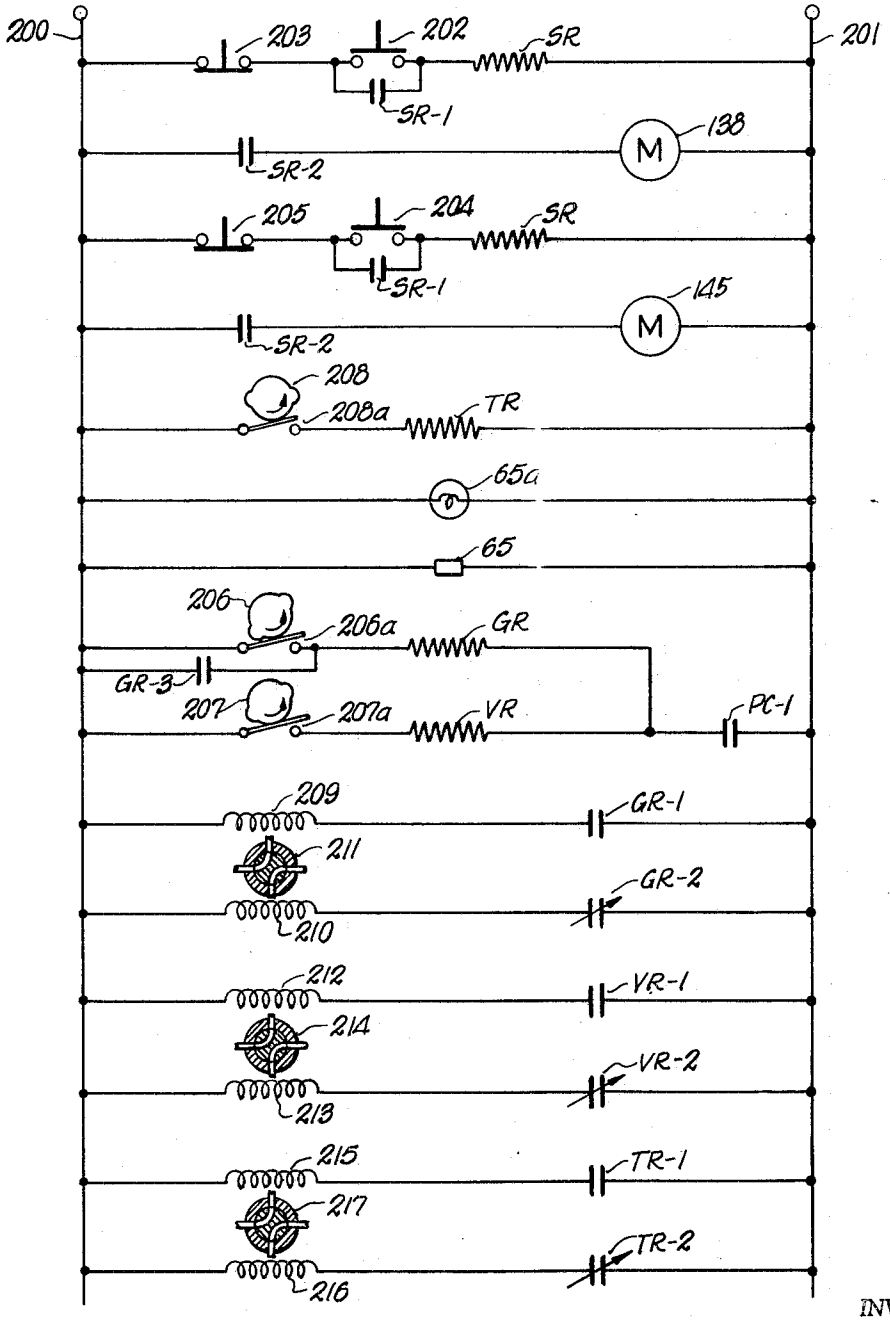
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AUTOMATIC BAG PACKAGING MACHINE

Filed Dec. 26, 1967 5 Sheets-Sheet 5



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Fig. 10.

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United States Patent Office 3,492,780
Patented Feb. 3, 1970

3,492,780

AUTOMATIC BAG PACKAGING MACHINE

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Int. Cl. B65b 35/24, 43/28; B65g 25/02
U.S. Cl. 53—59 10 Claims

ABSTRACT OF THE DISCLOSURE

An endless chain carries a plurality of pusher members which move during a portion of their travel along a horizontal table or platform. Items of product are fed automatically and sequentially onto the table between the pusher members and are individually propelled thereby toward and into the open mouth of the topmost bag of a draped stack of bags positioned in the path of the product. Means are provided for preparing each bag for the incoming product. The bagged product is pushed from the stack by the pusher member onto an out-feed conveyor which, moving faster than the pusher members, draws the bag off its associated pusher member and delivers the bagged product to a selected location for further handling. The pusher members return to the opposite end of the machine for repetition of the cycle.

SUMMARY OF THE INVENTION

It has become rather commonplace in the baking industry to package clusters of buns and rolls (and other products as well) in plastic bags. Considerable effort and expense has gone into designing complex machinery for automatically loading the clusters into the bags. The resulting equipment has been rather cumbersome, difficult to maintain in effective operating condition without close and continued supervision by one or more operators and, not least, quite expensive.

One of the principal objects of the present invention is to provide a bagging machine which is capable of loading bakery products (and other products as well) into plastic bags in rapid, substantially fully automatic fashion and which is a good deal simpler in construction than similarly purposed equipment of which I am presently aware. My bagging machine employs what for machines of this general type is very a limited number of complex moving parts and linkages. As a result, the first cost is reduced substantially and maintenance is no great problem.

Another object of my invention is to provide a machine in which the timing of the feed of products to the machine is positively and fully controlled in relation to the operation of the bag loading mechanisms so that optimum use is made of the operation time of the machine and the operator need not concern himself with manually feeding the machine. In my machine, the feeding of items to be packaged into and through the bag loading is at constant speed which not only permits short intervals between the arrival of successive items at the loading zone, but also permits the use of simple conveyor equipment for moving the product.

Still another object of my invention is to provide an automatic bagging machine which is capable of handling items of different size and which can be readied for a run of differently sized items quickly and easily with a few simple manual adjustments.

Other and further objects of the invention, together with the features of novelty pertaining thereto, will appear in the course of the following description.

Briefly summarized, my bagging machine comprises an endless transfer conveyor having a plurality of spaced pusher members between which individual clusters of

buns or other items to be packaged are automatically fed. The pusher members slide the product on a table or platform toward and into the open mouth of a bag which is prepared for reception of the product by automatically timed equipment. The product moves at constant velocity into the bag and carries the bag with it onto an outfeed conveyor which has a surface velocity greater than the velocity of the pusher member. The bag is thus advanced away from the pusher member, the out-feed conveyor drawing the open end of the bag off of the pusher member and freeing the packaged product from the pusher member for further handling, which ordinarily is the tying or sealing of the bag. Means are provided for automatically starting and stopping the operation of the bag loading mechanism in response to presence or absence of product to be bagged. Also, mechanism is provided for adjusting the equipment to handle runs of items of differing sizes.

DETAILED DESCRIPTION

In the accompanying drawings, which form a part of the specification and are to be read in conjunction therewith, and in which like reference numerals indicate like parts in the various views:

FIG. 1 is a side elevational view of a preferred bagging machine embodying the invention;

FIG. 2 is a top plan view of same;

FIG. 3 is a partial end elevational view of same taken from the right hand end of FIG. 1;

FIG. 4 is an enlarged fragmentary sectional view taken generally along the line 4—4 of FIG. 1 in the direction of the arrows, parts being broken away for purposes of illustration;

FIG. 5 is a sectional view taken generally along the line 5—5 of FIG. 4 in the direction of the arrows, but showing the vacuum bag opening members in the raised position with the bag mouth open;

FIG. 6 is an enlarged perspective view showing the vacuum member operating mechanism separated from the machine;

FIG. 7 is an enlarged sectional view taken along line 7—7 of FIG. 2 in the direction of the arrows;

FIG. 8 is a fragmentary sectional view taken along the line 8—8 of FIG. 2 in the direction of the arrows;

FIG. 9 is a fragmentary plan view of the open end portion of a typical bag of the type utilized in my machine; and

FIG. 10 is a diagrammatic showing of the automatic control system for the preferred machine.

Referring to the drawings, in the preferred commercial machine the mechanism is mounted on a mobile frame which may be constructed of any desired material and in conventional fashion. In the illustrated embodiment, the frame is indicated generally at **10**, the frame comprising a generally rectilinear network of square tube members arranged to provide a bottom frame section **11** and a main table support section **12**. The over-all frame includes a superstructure **13** supported at opposite ends by upright posts **14**. The superstructure includes the parallel side members **15** and transverse end members **16**. which are connected at the corners to define a generally closed rectangle.

The superstructure **13** provides a means of supporting an elongate endless chain **17**, which comprises the main element of what is known as the transfer conveyor portion of the machine. Chain **17** is trained about end sprockets **18** which in turn are supported on horizontal shafts **19** near the opposite ends of the superstructure **13**. The shafts are suitably journaled in bearings **20**, respectively secured to the inside faces of the side rails **15** of the superstructure.

The chain **17** is a conventional roller link chain. The upper flight is supported on the upper edge of a horizontal rail-like member **21** which in turn is supported on a pair of spaced transverse cross members **22** whose ends are welded or otherwise fixedly secured to the opposite sides **15** of the superstructure. The cross members also serve as supports for two underlying channel shaped rails **23** which run alongside of and slightly above the lower flight of chain **17** and which serve a function later to be described.

Mounted on the chain **17** at uniformly spaced intervals are a plurality of pusher members **24**. The pusher members in each case include a transversely oriented pusher plate **25** which is secured to the leading end (in terms of the direction of movement of the chain **17**) of a generally C-shaped arm **26**. The arm is connected at its inner end with a bracket assembly **27** which secures it to the chain.

The construction of the bracket assembly **27** may be best understood by referring to FIGS. 1 and 3. The main element of the bracket assembly comprises a U-shaped yoke **28** which straddles the chain and is pivoted thereto on pins **29**. The arm **26** is rigidly affixed to the bight of the yoke. The ends of the yoke carry coaxial rotatable rollers **30** which extend laterally to each side of the yoke and are adapted to engage and ride upon the lower flanges of the channel-like rail members **23** earlier described. In order to stabilize the yoke during its movement along the upper and lower flights, links **31** are pivotally connected to the ends of the yoke legs and to the chain, the latter connection being indicated at **32**. Obviously, the pivotal mounting of the yoke **27** and the pivotal connection of link **31** therewith and with the chain permits the necessary movement of the pusher arm during its travel around the sockets **18**.

The transfer conveyor is driven in the direction indicated by the arrows by means of a drive chain **33** which engages a sprocket **34** which is interconnected with shaft **19** through a one-way clutch **35**.

Turning now to the lower part of the apparatus, the table frame section **12** supports a flat horizontal table surface **36** which, as will be subsequently seen, constitutes the surface on which the product to be bagged is initially delivered for pick-up and displacement by the pusher assemblies **24**. This table surface underlies the left hand end of the transfer conveyor **24** (as viewed in FIGS. 1 and 2). Product is delivered to the table by an in-feed conveyor assembly **37**. A laterally adjustable vertical partition **36***a* extends upwardly from the table. This partition is mounted on shafts **36***b* which in turn are received in releasable locking clamps **36***c*.

The in-feed conveyor assembly is an assembly of three separate conveying elements comprising a first endless lined rod conveyor **38**, a pair of transition rolls **39** and a second endless linked end conveyor **40** which fits within a rectilinear cut-out **41** formed in the table surface **36**. The upper surface of the conveyor **40** is substantially flush with the horizontal surface of table **36** and its inner end lies closely adjacent the edge of the opening **41** so that the product carried by this conveyor **40** will be delivered directly onto the surface in the path of the pusher elements **24**.

The conveyor **38** is supported between two laterally extending parallel structurals **42**, which extend outwardly from and are secured in any convenient fashion to the frame **12** and table **36**. Cross braces **43** serve to interconnect the sides **42** to provide a substantially rigid structure. The conveyor **38** is supported on rollers which in turn are carried by transverse shafts **44**, **45**, which are journaled in bearings mounted to the sides **42**. The shaft **45** constitutes the drive shaft for the conveyor **38**. An upper guard rail **46** is located along the right hand side and above the conveyor and is supported on the side support **42** for the conveyor.

The second conveyor **40**, which is part of the in-feed conveyor assembly, is trained about rollers supported respectively on shafts **47** and **48**, which in turn are journaled in bearings supported from appropriate structurals secured to the frame. The conveyor **40** is powered by means of a drive chain **49** which is trained about a sprocket on shaft **48** and about a sprocket on the output shaft **50** of a gear box **51**.

The in-feed conveyors **38** and **40** are drivingly interconnected by a chain **52** which is trained about sprockets on shafts **47** and **45**. The conveyors **38** and **40** move at different speeds, the conveyor **40** moving at substantially four times the speed of conveyor **38**. To this end, the sprockets on shafts **45** and **47**, about which chains **52** are trained, are, in the illustrated embodiment, sized in a 4 to 1 ratio with naturally the smaller sprocket on shaft **47**.

As earlier noted, interposed between the adjoining ends of conveyors **38** and **40** are the transfer rollers **39**. These comprise parallel cylindrical rods appropriately journaled for rotation between the sides **42** of the in-feed conveyor frame structure. Preferably, the surfaces of these rods are roughened in order to improve the fricitional contact between the surfaces and the product to be conveyed. The rollers are driven from the shaft **47** for conveyor **40** and at a roller surface speed intermediate the speeds of the two conveyors. The drive arrangement is shown in detail in FIG. **7**. A sheave **53** is secured to shaft **47**. This sheave serves to drive an endless rubber belt **54**, preferably of circular cross section, which is trained about and engages in grooves formed in the rollers **39**. The uppermost points on rollers **39** are substantially in the same plane as the top surfaces of the upper flights of conveyors **38** and **40** in order to provide a substantially continuous moving surface feeding laterally in toward the table **36** for the machine.

Flow of product from the in-feed conveyor assembly **37** onto table **36** is controlled through the medium of an intermittently acting gate assembly having the gate **55** which is positioned substantially centrally above the conveyor **40**. Gate **55** is in the form of a flat panel which is secured as at **56** to the free end of a pivoted lever member **57**. Lever **57** is pivoted at its other end at **58** to the lower end of a generally L shaped bracket **59** fixed to and extending laterally from the machine frame.

The pivotal operation of lever **57** is effected by a pneumatic cylinder **60** which has its upper end pivoted at **61** to a vertical extension **62** on the frame. The reciprocal piston rod **63** of piston **60** carries a clevis **64** at its lower end which is pivotally pinned to an upstanding lug secured to the top of lever **57**. The cylinder **60** is a double acting cylinder having the lines **60***a*, **60***b* connected to opposite ends and supplied alternately from a source of compressed air in a manner later to be described.

For purposes subsequently to be set forth, a photoelectric cell **65** and cooperating light source **66** are positioned across from one another just ahead of gate **55**. The cell operates to sense the presence of product in position at the gate and to initiate the operating cycle of the machine. Operation of the cylinder, and thus opening and closing of the gate **55**, is controlled in time sequence with the advance of the pushers **24** and other components later to be described.

The bags in which the product is to be placed are located in a draped stack as indicated at B. The bags **67** are conventional bags, preferably formed from polyethylene or other synthetic film, and are open at one end. The open end of the bag is provided (as shown in FIG. 9) with an extension flap **67***a* which in turn is provided with a pair of transversely spaced perforations **68** which connect with slits **68***a* running to the edge of the bag. The flaps are stacked on one another and the flaps and open end portions are supported on a bag support plate **70** to which the bags are secured by a U-shaped wire **71**. The legs of wire **71** are threaded through the openings **68** of the bag extensions and down through openings in alignment sleeves **72** depending from the underside of the bag support plate

70. It will be noted that a substantial portion of the bags are draped over and hang downwardly over the rearward edge of the plate 70.

There are actually two support plates 70 adapted to carry bags, these being spaced laterally from one another (see FIGS. 2 and 3). The plates are each supported on a carrier bar 73 which is slidably mounted for reciprocal movement sidewise of the machine on a pair of horizontal rods 74 extending transversely of the machine. The rods 74 are each supported at their ends by support members 75 secured to the upright legs of the frame. The carrier bar is connected with the rods by means of apertured slide blocks 73*a* which are secured to the slide bar beneath the respective bag support plates and slidably mount on rods 74.

It will be noted that the bag support plates 70 are positione dwell above the carrier bar 73 and are supported thereon by means of downwardly extending shafts or rods 76 which are slidably received in registering apertures in the carrier bar 73. The support members are resiliently maintained in the uppermost position by means of coil springs 77 which encircle the vertical support rods and bear upwardly against appropriate washers or retainer members 78 keyed to the rods.

The opening of the individual bags preparatory to insertion of an article is accomplished through the medium of a vacuum or suction head assembly 79. This assembly includes a pair of tubular arms 80 having the converging end portions 80*a* which terminate in inverted cup-like suction heads 81 positioned above the bag plate 70. The arms 80 are each pivoted at their rearward ends to the posts 14 of the frame on stub axles 82. Arms 80 are square tubes, although closed at their rearward end, and are interconnected by a depending U-shaped hollow tube section 83. The interior of the U-shaped connector tube 83 is in communication with the respective arms 80. A flexible suction line 84 is connected with tube 83, the suction line being connected at its other end with a vacuum pump, later to be identified. Each cup-like suction head 81 has an opening therein which communicates with the interior of arms 80.

The suction head assembly 79 is adapted to be pivotally reciprocated between the down position illustrated in FIG. 1 and the raised position illustrated in FIG. 5 by means of the reciprocating assembly detailed in FIG. 6. This includes the pneumatic cylinder 86 having the piston rod 87. Rod 87 has stops 88, 89 secured thereto and passes through an aperture in a lug 90. The lug 90 is adjustable by means of a wing bolt 91 upon a shaft 92 extending upwardly from and secured to the body of the cylinder. The upper end of the rod 87 is joined by a clevis 93 to an ear 94 secured to the underside of tube 83. The lower end of cylinder 86 is pivotally connected as at 95 to a horizontal structural forming part of the main machine frame. It will be evident that through adjustment of the relative positions of the stops and the lug 90, the stroke of the piston rod 87 may be varied, thus to control the displacement and end positions of the vacuum head assembly 79.

Located immediately in advance of the suction assembly 79 is a horizontally reciprocable tucker assembly 96, the details of which are most clearly shown in FIGS. 4 and 5.

The tucker assembly includes as basic elements a horizontal tucker table 97 and a pair of pivotal tuckers 98. The tucker table serves to support the product from the stationary table 36, while the tuckers 98 spread the bag sufficiently for the product to enter freely into the bag.

The tucker table 97 is provided with a downwardly offset portion 97*a* which when the table is in the retracted position illustrated in solid lines in FIGS. 4 and 5, underlies the table 36. The table is carried by a reciprocable carriage 99 having two side members 100 at opposite sides of the machine. The side members 100 have mounted thereon rollers 101 which engage the upper and lower horizontal surfaces of stationary bar-like rails 102, one of which is affixed to each of the side structurals 103 of the frame. The two side members 100 are interconnected by a horizontal cross member 104 and a rod 105, both of which extend between and are secured to the side member.

Located substantially centrally of the reciprocable carriage and forming a rigid part thereof is a vertical or upright plate 106 best seen in FIG. 4. The plate 106 carries a bushing 107 which serves to rotatably support the unthreaded central portion of a horizontally extending threaded shaft 108. Shaft 108 extends rotatably at opposite ends through its carriage side plate 100 and terminates to the outside of a frame at each end in a hand knob 109. The side rails 103 are longitudinally slotted as at 110 in order to permit the reciprocatory motion of the shafts 108 as the tucker carriage reciprocates. The shafts 108 are reversely threaded on opposite sides of the nonthreaded mid portion.

Each of the rods 108 serves as a thrust member for adjusting a tucker support member 111 inwardly and outwardly with respect to the line of movement of the carriage. Each tucker support member is essentially a solid body having a smooth base which slidably receives the rod 105 and having a threaded bore through which the associated threaded shaft 108 extends. Each support member further has a rearwardly projecting portion provided with an ear 111*a* apertured to receive the hook at one end of a tension spring 112.

Each tucker support member 111 journals a vertical shaft 113 which passes upwardly through a slot in the plate member 97 and provides the mounting support for a tucker member 98. Each tucker member is generally C-shaped in vertical section toward its forward end, and has a top flange 98 which flares slightly upwardly at the rearward end. The tucker members are symmetrically disposed relative to the fore and aft center line of the tucker carriage. Each tucker member 98 is connected with its upstanding support shaft 113 through the medium of a horizontal bracket 114 secured to the outside of the tucker member and which is apertured to receive the shaft therethrough. The shaft is provided with a stationary collar 115 which underlies and provides a bearing support against flange 114. A nut 116 serves to tighten the flange down upon the collar 115.

Located at the lower end of each shaft 113 is a cross head 117, the major axis of which is oriented at an angle with respect to the direction of fore and aft travel of the tucker carriage. The cross head is maintained biased in the inclined position by means of the spring 112 which is connected thereto as seen in FIG. 4. The opposite ends of cross member 117 carry rollers 118, 119, respectively. In the retracted position for the tucker carriage illustrated in FIG. 4, roller 118 is free from contact with any surface while roller 119 bears against the edge surface 120 of a plate 121 secured to the underside of the cross member 104 forming part of the tucker carriage. Plates 121 are symmetrically arranged on opposite sides of the fore and aft center line of the tucker carriage and the surfaces 120 are oppositely inclined (yet symmetrically arranged) with respect to the longitudinal center line. It will be evident that the angular inclination of the cross head 117 at the retracted position can be varied by moving the carrier members 111 inwardly or outwardly. The reason for providing this arrangement will be subsequently explained.

Positioned forwardly of rollers 118 and rigidly supported from the transverse portion of the main frame is a camming bar 122. In the preferred embodiment, the camming bar is a continuous bar extending completely across the frame and located in a horizontal plane which places its endmost portions in the path of the rollers 118 as the tucker carriage advances. For noise reduction purposes, the bar preferably is made of Teflon, nylon or some other strong yet slightly resilient plastic material. Referring to FIG. 4, when the tucker carriage is advanced from left to right the rollers 118 will each strike the bar 122 and as the carriage continues to move forward the reaction

will cause shaft **113** to pivot, causing its connected tucker member **98** also to pivot; as a consequence, tip portions of the tucker members are spread apart to the broken line positions. The tip portions of the tucker members are so located that as they are spread, they lie within the open end of a bag B, thus operating to form the bag into open condition for easy reception of product.

The bar **122** is adjustably supported on threaded posts **122***a*, and its position can be changed to control the point at which spreading of the tucker tips is initiated. The bar also serves incidentally as the limit stop for controlling the angular displacement of the tucker members since as the inner and rearward rollers **119** are brought around by the pivotal action induced through rollers **118** striking the bar, the rollers **119** will engage the bar and prevent any further rotation. Upon retraction of the tucker table, the springs **112** will return the cross heads **117** and their associated shafts **113** to the retracted position, thus returning the tucker members to the converging tip arrangement illustrated in solid lines in FIG. 4.

Reciprocation of the tucker table between retracted and extended positions above described, is effected by means of a double acting air cylinder **125** positioned generally centrally of and longitudinally below the table **36**. The cylinder **125** is connected at one end with a rigid connector bracket **126** supported by appropriate structurals connected with the frame. The piston rod **125***a* carries a clevis **127** which is pivotally pinned as at **128** to a lug **129** depending below and secured to the underside of the tucker table carriage.

Referring now again to FIG. 1, located on the downstream (in the sense of direction of movement of the product) side of the tucker table and bags is the out-feed conveyor assembly **130**. This assembly includes as its main element an endless belt **131**. The belt **131** is supported between and on transverse rollers carried by axles **132** which in turn are journaled in appropriate bearings mounted on stationary side support members **133**.

As can best be seen in FIG. 1, the out-feed conveyor is driven from the same chain **33** as drives the upper transfer conveyor. The manner of drive is by contacting one run of the chain with a sprocket **134**, the chain being held in driving engagement with the sprocket **134** by an idler sprocket **135** positioned therebelow. The sprocket **134** is in turn mounted on a shaft **136** which carries another sprocket which is connected by a chain **137** to a sprocket on the end of the axle **132** at the discharge end of the out-feed conveyor. The diameter of sprocket **134** is substantially less than that of the sprocket for the upper transfer conveyor which is connected with chains **33** so that the out-feed conveyor is driven at a substantially greater surface speed than the speed at which pushers **24** move.

Power for driving the chain **33** and thus supplying motive power to the transfer conveyor and out-feed conveyor is supplied by a motor **138**. As can be seen in FIG. 3, the motor **138** is drivingly connected by a belt **139** to the input shaft of a gear box **140** having an output shaft **141**. The chain **33** is trained at its lower end around a sprocket on the shaft **141**. A second sprocket on shaft **141** mounts a chain **142** which serves as a timing chain. The chain **142** leads to a sprocket mounted on a shaft **143** which extends into a control box **144** and on which is mounted the timing cams subsequently to be described.

The in-feed conveyor assembly **37** is driven by a separate electric motor **145**. Motor **145** is connected by a belt **146** to the input shaft of the gear **51**. A second belt **147** connects the motor to the vacuum pump **148**.

The operation of the machine is, in general, automatically controlled by an automatic control system which is illustrated schematically in FIG. 10. The basic purpose of this system is to determine and effect the proper sequential operation of the product in-feed gate **55**, the tucker assembly **96** and bag opening suction head assembly **79**.

The control circuit is energized from a pair of terminals **200**, **201** which may be connected to any appropriate source of potential (not shown). The motor **138** which powers the upper transfer conveyor and the out-feed conveyor is started through the medium of a starter switch **202**, which energizes the starter relay SR and closes the starter relay contact SR–1 in the circuit to hold the starter relay closed upon the release of the starter switch. The energization of the start relay also closes switch SR–2 in the circuit to motor **138** which starts the motor. A normally closed push button switch **203** is provided for breaking the circuit through the start relay in order to stop the motor **138** when desired.

A similar starter switch **204** and stop switch **205** are operationally connected with the in-feed conveyor motor **145** which, in the preferred embodiment, also drives the vacuum pump **147**. It will be understood that, if desired, a separate motor can be provided for the vacuum pump. The switch **204** has its starter relay SR which closes the lock-in contact SR–1 and the contact SR–2, which is in the circuit to the in-feed conveyor motor **145**.

Starting of the motor **138** also serves to initiate rotation of a series of timing cams **206**, **207**, **208** which are driven from motor **138** by the chain **142** earlier described. Each of these cams is a lobe type cam and operates to momentarily close and then permit reopening of an associated open switch **206***a*, **207***a* or **208***a*.

Switches **206***a* and **207***a* lie in circuits which are commonly controlled by the contact PC–1 which is under control of the circuit in the photocell **65** which is associated with the in-feed conveyor and which intercepts a light beam having its source in lamp **65***a* and passing across the in-feed conveyor just ahead of gate **55**. The lamp and phototube of the photocell assembly are seen in FIGS. 1 and 2. It will be evident that the arrangement is such that so long as the beam from the lamp strikes the photocell, PC–1 remains open. Whenever the beam is interrupted, as by the presence of product in front of the gate **55**, PC–1 is closed, thus permitting the cams to control the energization of the relay coils GR and VR. Switch **208***a* controls the relay winding TR.

The relay winding GR controls contacts GR–1 and G–2 which in turn are respectively interposed in circuits having solenoid windings **209**, **210** which influence a solenoid operated air valve **211**. One side of this valve is connected with a source of pressurized air, for example, a compressor (not shown) and the other side with the flow lines **60***a*, **60***b* to the operating cylinder **60** which raises and lowers gate **55**. In the normal condition of the gate, GR–2 is closed and air is being supplied to the upper end of the cylinder in order to hold the gate in the closed position. Relay GR also controls the contact GR–3 which, once closed, and so long as PC–1 remains closed, maintains coil G in the energized state and holds the gate open.

The relay winding VR controls contacts VR–1 and VR–2 which in turn are respectively interposed in circuits having solenoid windings **212**, **213** which influence the solenoid operated air valve **214**. One side of this valve is connected with the source of pressurized air and the other side with the flow line **86***a*, **86***b* to the air cylinder **86** which controls the raising and lowering of the bag opening suction head assembly **79**. The standby or ready condition of the suction arms **80** is in the raised position illustrated in FIG. 5; in this condition, air is being supplied to the lower end of cylinder **86** through line **86***b*.

The relay winding TR controls contacts TR–1 and TR–2 which in turn are respectively interposed in circuits having windings **215**, **216** which influence the solenoid operated air valve **217**. One side of this valve is connected with the pressurized air source and the other side with the flow lines **125***b*, **125***c* to the air cylinder **125** which operates to reciprocate the tucker assembly **96**. The normal condition of cylinder **125** is the retracted condition with air being supplied to the air inlet line **125***c*.

Taking the machine now through a full operating cycle, the product to be bagged, for example, clusters of hamburger buns (not shown) is placed on the inlet end portion of the in-feed conveyor assembly **37** and is thereby carried laterally toward the gate **55**. Once the product moves across the transfer rollers **39** and onto the high speed conveyor **40**, it is intercepted by the gate and prevented from advancing onto the main table **36** of the packaging machine. If added fast enough, subsequent clusters, tend to stack up behind the cluster against the gate. However, as the initial cluster reaches gate **55**, it breaks the beam to the photocell **65**, thus closing the contact PC–**1** in the timer circuits.

As the lobe of timer cam **206** reaches and closes the switch **206***a*, the gate relay winding GR is energized, thus closing relay contact GR–**1** and opening the normally closed contact GR–**2**, thereby causing valve **211** to shift positions. The shifting of the valve position reverses the air flow to and from the gate cylinder **60**, thus causing the lever **57** to be pivoted and the gate to be swung inwardly and upwardly out of the path of the product. The product thus moves under the gate and is delivered by th conveyor **40** onto the table **36** into the path of the pushers carried by the upper transfer conveyor. It will be understood that the lobes on the cam **206** are so arranged that the opening of the gate is timed so that product will be delivered onto the platform into the path of the pusher members between two of the pusher members. So long as there is product on the in-feed conveyor **40**, gate **55** will remain open since GR–**3** is closed. In the absence of product, the photocell circuit opens PC–**1** and the cam again takes over. When the lobe on the cam **206** releases switch **206***a*, the winding GR is deenergized, thus causing the contacts GR–**1** and GR–**2** to assume their original positions, thereby causing the valve **211** to return to its initial position which corresponds to the closed position for gate **55**.

It is important to note that the length of conveyor **40** between the gate and its in-feed end is preferably less than the corresponding dimension of the items to be packaged. Thus, when the gate is opened, the item which is positioned in advance of the gate occupies substantially the entire area of the conveyor in advance of the gate. Once the gate opens, the intercepted item will be moved rapidly onto the platform. The conveyors **38** and **40** are timed to feed product at a rate which will deliver each succeeding item between a pair of pusher members.

The mounting of the gate on the lever **57** provides for a motion of the gate which facilitates release of the product as the gate opens. As will be evident, the motion of the gate is not only upwardly, but also relatively away from the product so that the gate moves immediately out of contact with the product and there is no tendency to lift or otherwise displace it.

After the product is passed into the pusher conveyor path it is engaged by an arriving pusher plate **25** and propelled along the table toward the tucker assembly **96**.

As the product is being picked up and moved along the table by the pusher assembly, the bag suction assembly **79** is being activated. Normally, the bag suction arms **80** are in the raised condition. When the lobe on timer **207** closes its switch **207***a*, the winding VR is energized, thus closing contact VR–**1** and opening contact VR–**2**. The windings **212**, **213** are respectively energized and deenergized, thus shifting valve **214** and reversing the flow of air to the cylinder **86**. The suction arms **80** are thus dropped to the FIG. 1 position. Upon reopening of switch **207***a*, the suction tips **81** carry the upper ply of the bag upwardly, thus to present an open mouth bag just ahead of the tips of the tucker members **98**.

Once the bag mouth is open, it is in condition to receive the tuckers **98**. Timer cam **209** is so formed as to cause its switch **208***a* to close after the suction assembly has been raised, thus energizing winding TR which controls the contacts TR–**1**, TR–**2**. The closing and opening of the latter contacts causes solenoid valve **217** to change its position so that air flow to the cylinder **125** is reversed. This causes the tucker assembly to move toward the bag. The ends of the tucker **98** enter the bag and, once inside the bag and as the tucker assembly continues to move forward, the tuckers are spread through the pivoting of the shafts **113** on which they are mounted by contact of rollers **118** with the camming bar **122**. The timing of the movement of the tucker is such that the bag is spread as product is pushed into it by the pusher members. The C-shaped configuration of the pusher arms permits the product to be pushed fully into the bag. It should be understood that the tucker members are so sized with respect to each other and the bags that upon spreading they will put the bag in lateral tension so that there is a substantial frictional resistance to lengthwise sliding of the bag from the tucker members. Thus the bag is held both by the tucker members and wire **71** during insertion of the product therein.

As product is moved into the bag, the lower end of the bag is pulled upwardly and comes into contact with the belt **131** of the out-feed conveyor. This belt has a tendency to pick up the lower end of the bag and carry it upwardly on top of the conveyor. The action of the pusher on the product and bag as the product strikes the ends of the bag serves to pull the bag away from its mounting on the bag plate **70**. It should be understood that the timing of operation of the tucker members is such that the holding force on the bag is released when the product reaches the desired position in the bag.

It will be recalled that the surface speed of the outfeed conveyor is greater than the speed of movement of the pusher **24**. Accordingly, when the bagged product is pushed onto the outfeed conveyor, the bag is pulled by the conveyor away from the pusher member and the completely bagged product is discharged off the end of the out-feed conveyor and into any appropriate receptacle or into the in-feed end of a tying or sealing machine (not shown).

I have found my machine to be particularly useful in the bagging of products which are generally rectangular in plan, such as clusters of hamburger or hot dogs buns and the like. It can handle such products with rapidity and ease. The tuckers **98** serve to spread the bag and the lower surfaces thereof serve to provide a means of supporting the opposite bottom edge portions of the cluster of buns as they depart the tucker table and move into the bag. The tuckers **98** are set at a spacing to comfortably accommodate the cluster. Obviously, this spacing can be adjusted as desired through the medium of the hand knobs **109**. Likewise, where desired, tuckers of different shapes can be substituted simply by removing the tie down nuts, removing the installed set, putting on the new ones, and replacing the nuts. The adjustable baffle and guide **36***a* is subject to being changed in position to accommodate differently sized products through longitudinal adjustment of the shafts **36***b* and retightening of the clamping members **36***c*.

Shifting of a new supply of bags into position is easily accomplished by means of the alternate bag carriers **70**. Whenever the stack which is in product receiving position is depleted, a new stack mounted on the other plate **70** is simply pushed into position. At the same time, the plate from which the bags have been taken will be moved to one side of the machine and a new stack can be mounted thereon.

From the foregoing, it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth together with other advantages which are obvious and which are inherent to the structure.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is

to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. In an article bagging machine, the combination of
a table providing a surface for sliding support of articles to be bagged,
a transfer conveyor positioned above said table,
means for driving said conveyor,
pusher means carried by said conveyor and operable to engage and propel an article in a predetermined path along said surface, said pusher means including a pusher member and an arm portion aligned with the direction of movement of the pusher means and substantially parallel with said surface, the pusher member being on the leading end of said arm portion relative to the direction of movement of said pusher means,
means for releasably holding a stack of open mouthed, normally collapsed bags with the topmost bag in said path of movement of said articles,
means for opening and supporting the topmost bag mouth so that an article being propelled by said pusher means is propelled into the bag and thereafter the bag and contained article are moved away from the stack in response to continued motion of the pusher means,
out-feed conveyor means including a movable surface onto which the bagged article is propelled by said pusher means, and
means for driving said movable surface in the direction of movement of the pusher means at a velocity greater than that of said pusher means whereby to pull said bag off said pusher means and deliver said bagged article to a preselected discharge zone.

2. In an article bagging machine as in claim 1,
said transfer conveyor comprising an endless carrier having a lower advancing and upper return flight, and a plurality of said pusher means spaced along said flights,
said out-feed conveyor so positioned as to effect withdrawal of the bag off a given pusher means before said pusher means moves upwardly from said advancing to said return flight.

3. In an article bagging machine as in claim 2,
in-feed means for feeding articles onto said table surface in timed relation with the movement of said pusher means whereby to deliver an article between two such means.

4. An article bagging machine as in claim 3,
said in-feed means comprising an endless in-feed conveyor having a top surface moving laterally toward said table surface, intermittently operable gate means positioned across said in-feed conveyor top surface for limiting the advance of articles thereby, and control means for causing said gate to open at predetermined times.

5. In an article bagging machine as in claim 4,
said in-feed means also including product sensing means operable to govern the operation of said control means.

6. In an article bagging machine as in claim 1,
control means connected with said means for opening and supporting said bag mouths and operable to time same with the advance of said pusher members.

7. A sequential feeding mechanism for packaging machines comprising
an endless conveyor having a top flight moving in a predetermined direction,
a normally closed gate positioned across said top flight,
operating means connected with said gate for opening and reclosing same,
means for delivering articles in sequential fashion onto said top flight,
control means connected with said operating means for causing said gate to open and reclose in timed relationship to the operation of said packaging machine, and
article sensing means operably associated with said control means and operable to prevent reclosing of said gate so long as articles are being fed in a predetermined sequential spacing across said top flight and to permit reclosing when articles are not being fed across said top flight at said spacing.

8. A sequential feeding mechanism as in claim 7,
said operating means including means supporting said gate for swinging movement of said gate while opening upwardly and away from said articles.

9. A sequential feeding mechanism as in claim 7,
said article sensing means including a photocell and lamp on opposite sides of said flight and ahead of said gate.

10. A sequential feeding mechanism as in claim 7, including
a second endless conveyor located ahead of the first named conveyor with its discharge end adjacent the intake end of said first named conveyor, said second conveyor having a top flight moving at a speed less than said first named conveyor, the relative speed of the conveyors such as to cause discharge of articles from the first named conveyor at a preselected rate with respect to delivery of articles to said first named conveyor.

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