April 1, 1969 K. E. PRECHTER 3,435,584

PACKAGING MACHINE

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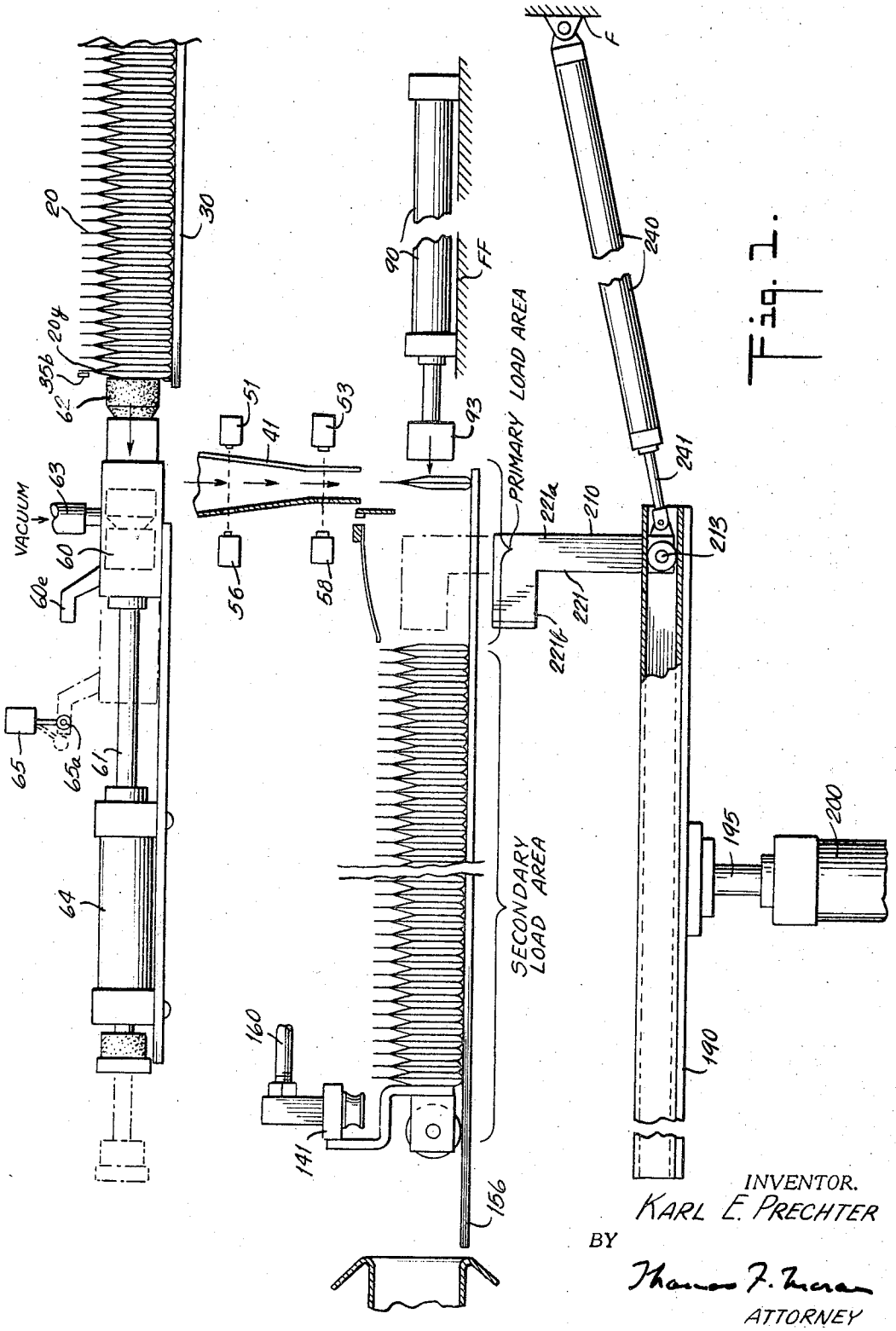


Fig. 1.

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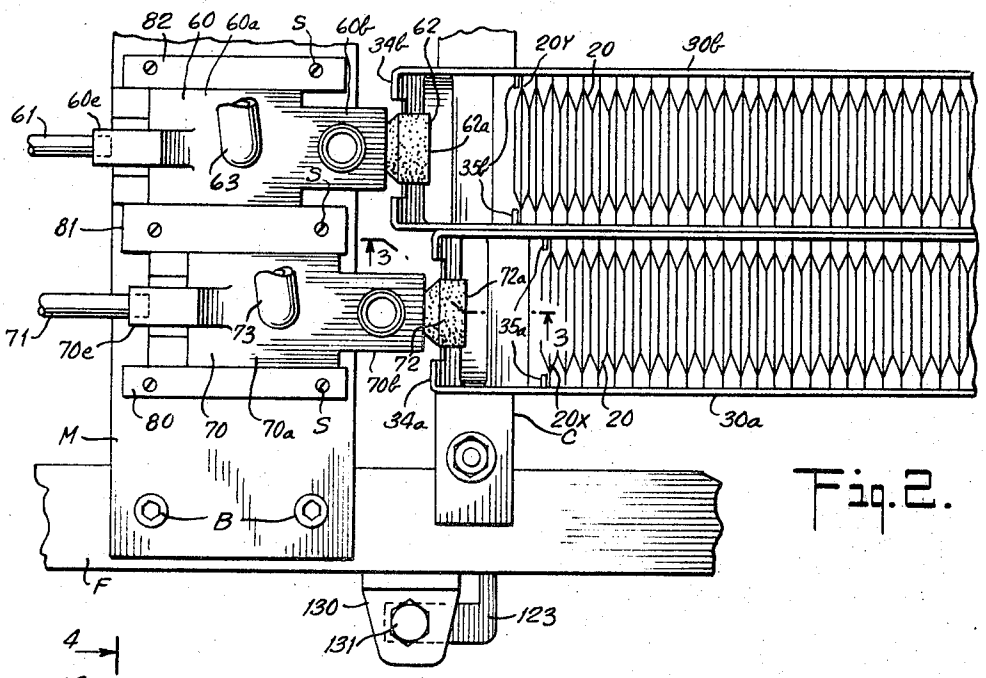


Fig. 2.

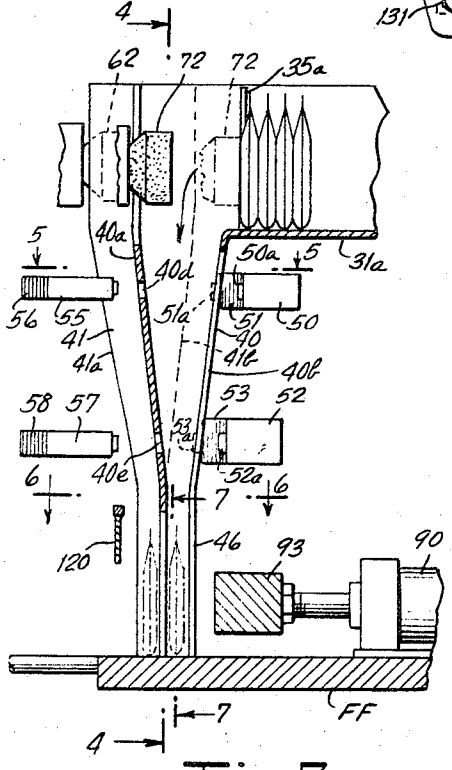


Fig. 3.

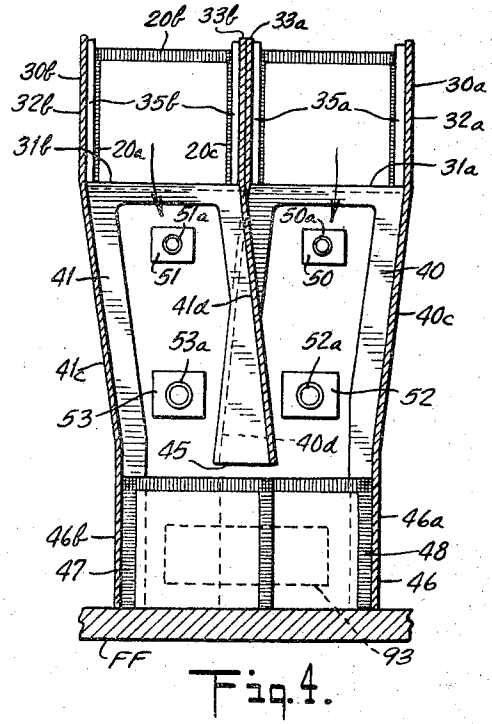


Fig. 4.

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PACKAGING MACHINE

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Fig. 5.

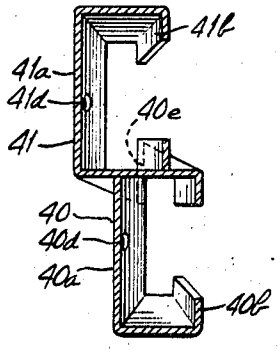
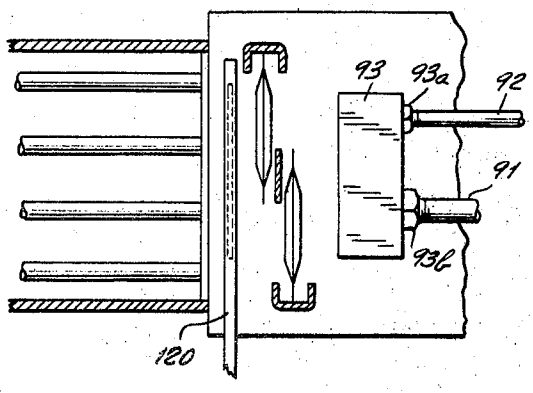


Fig. 6.



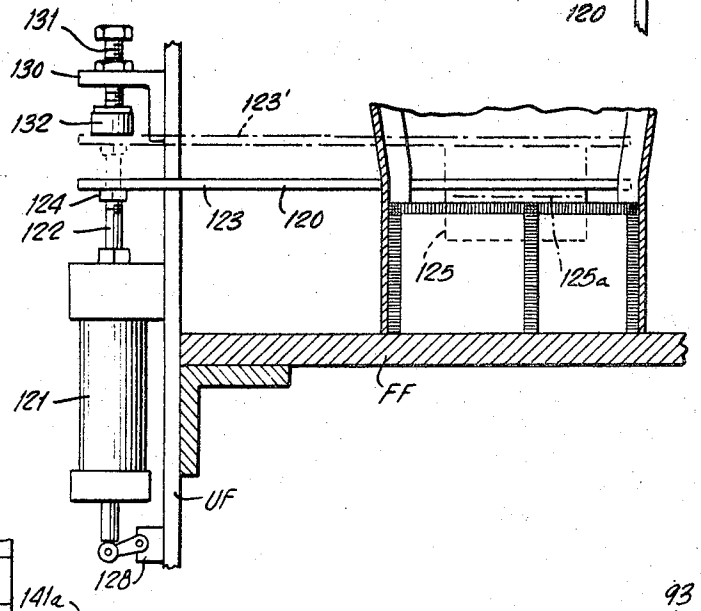


Fig. 7.

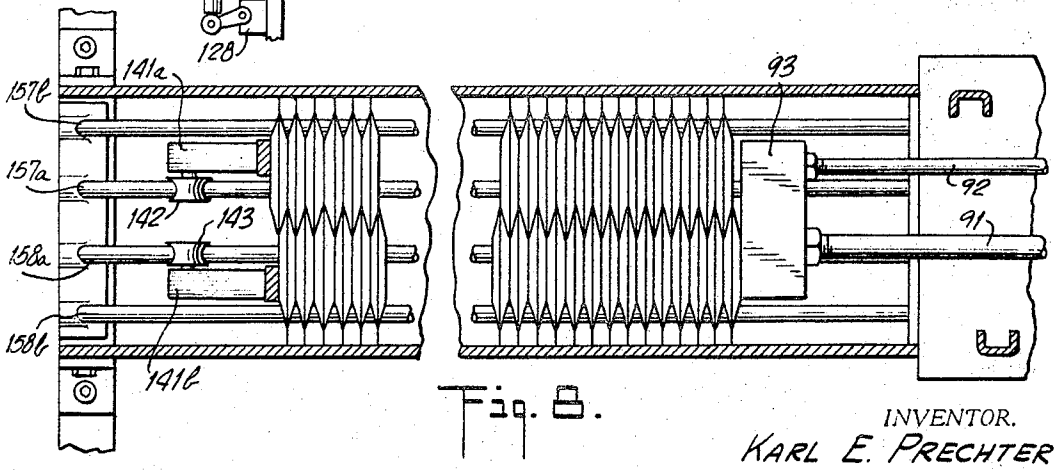


Fig. 8.

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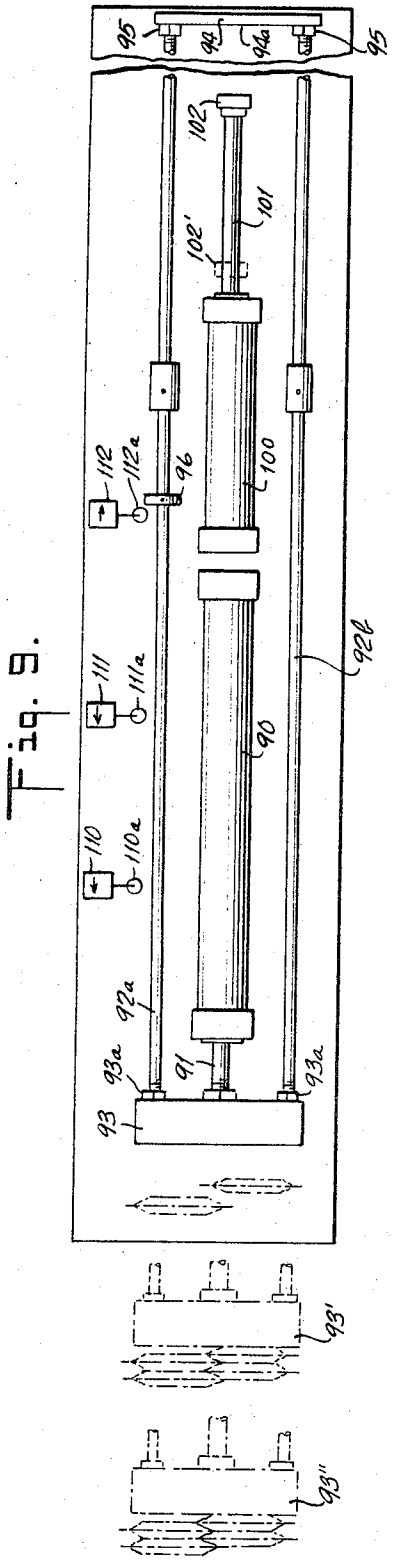


Fig. 9.

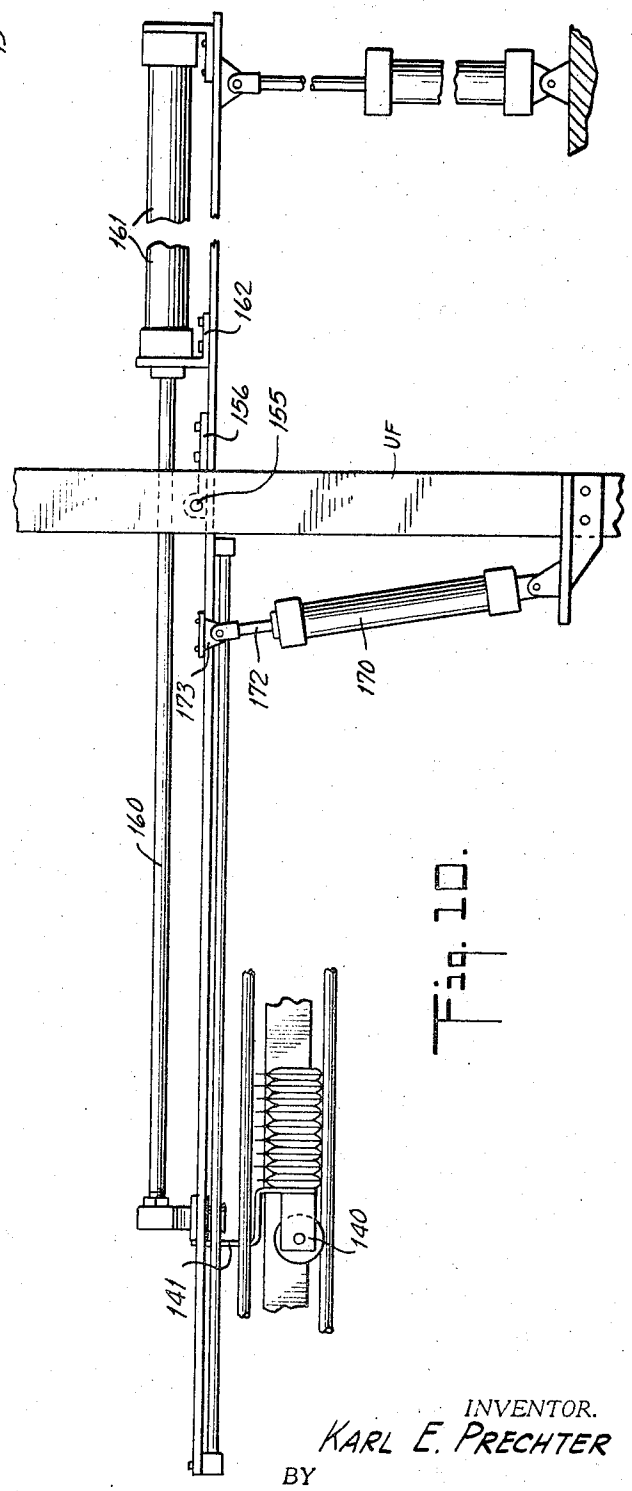


Fig. 10.

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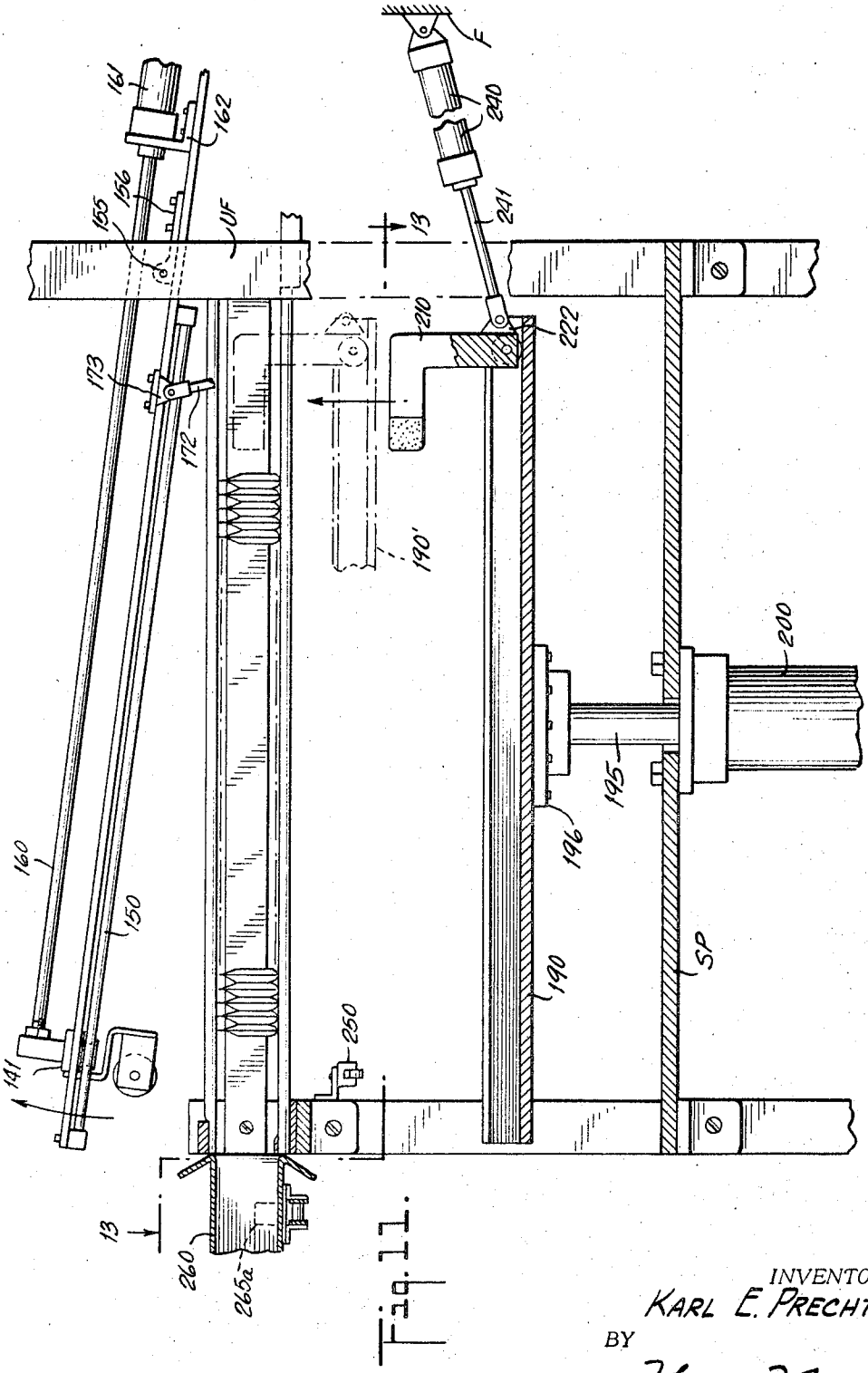


Fig. 11.

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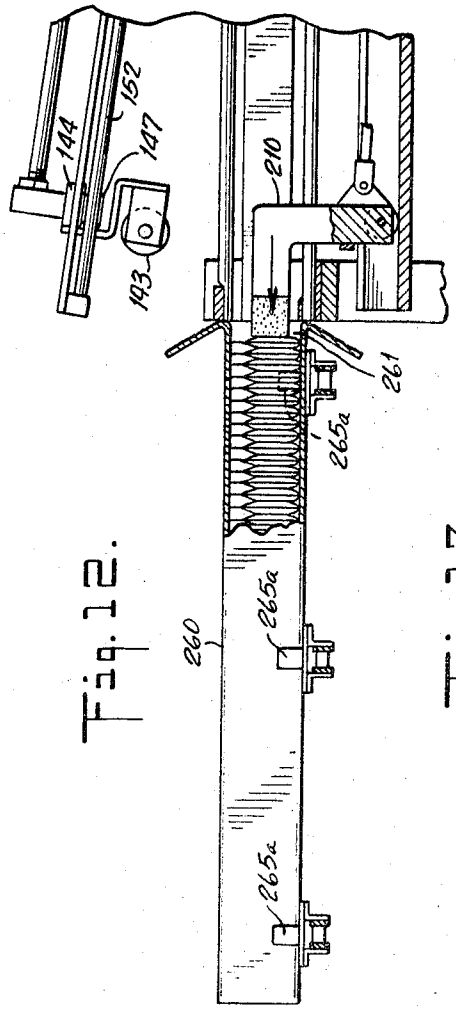


Fig. 12.

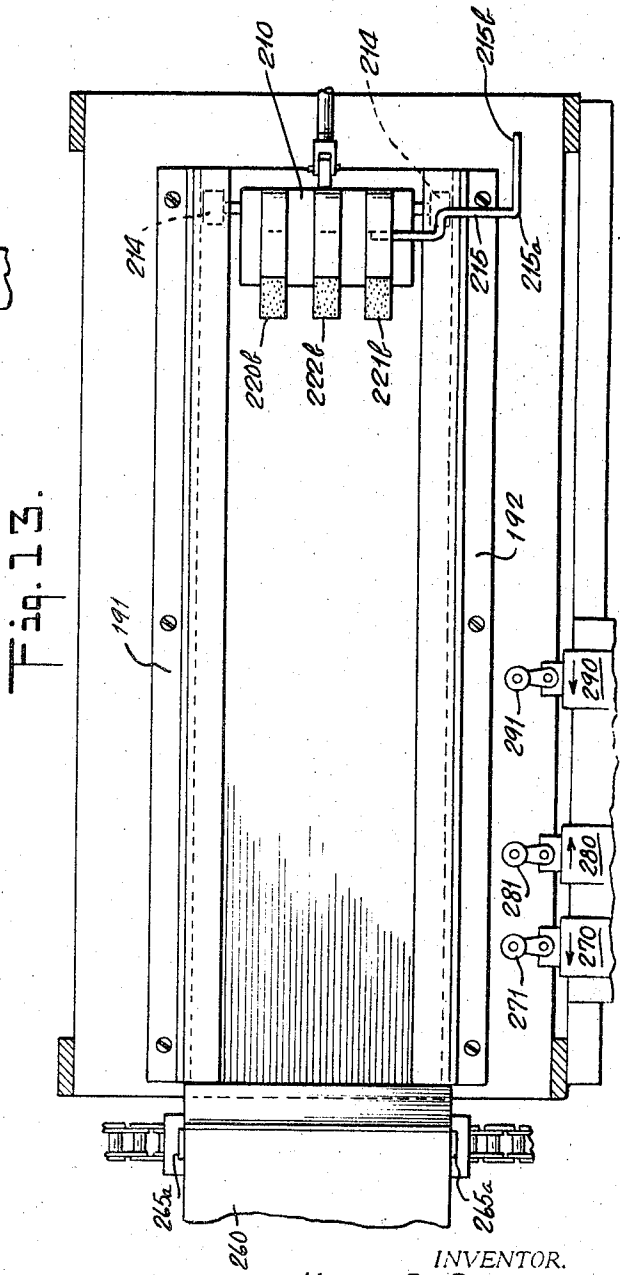


Fig. 13.

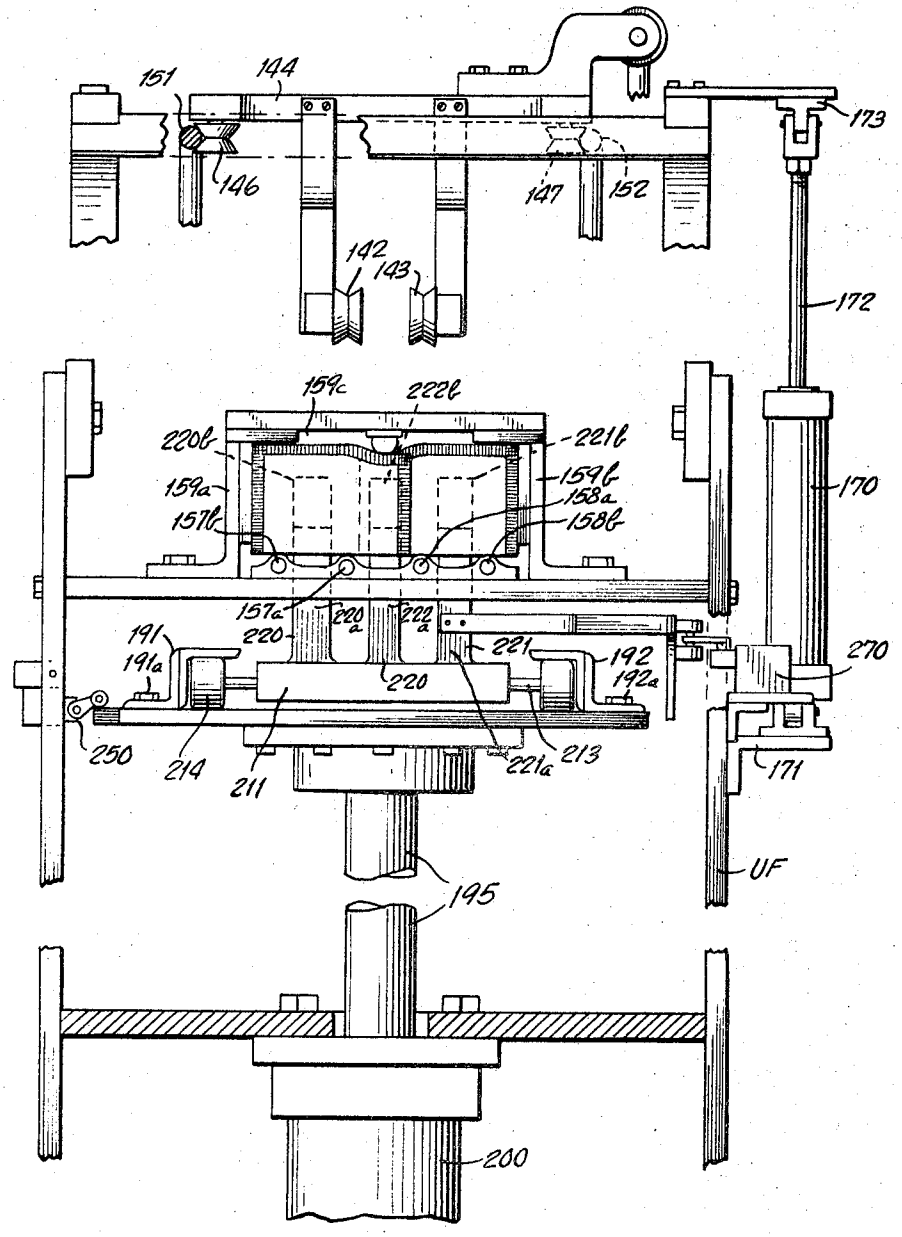
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PACKAGING MACHINE

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Fig. 14.



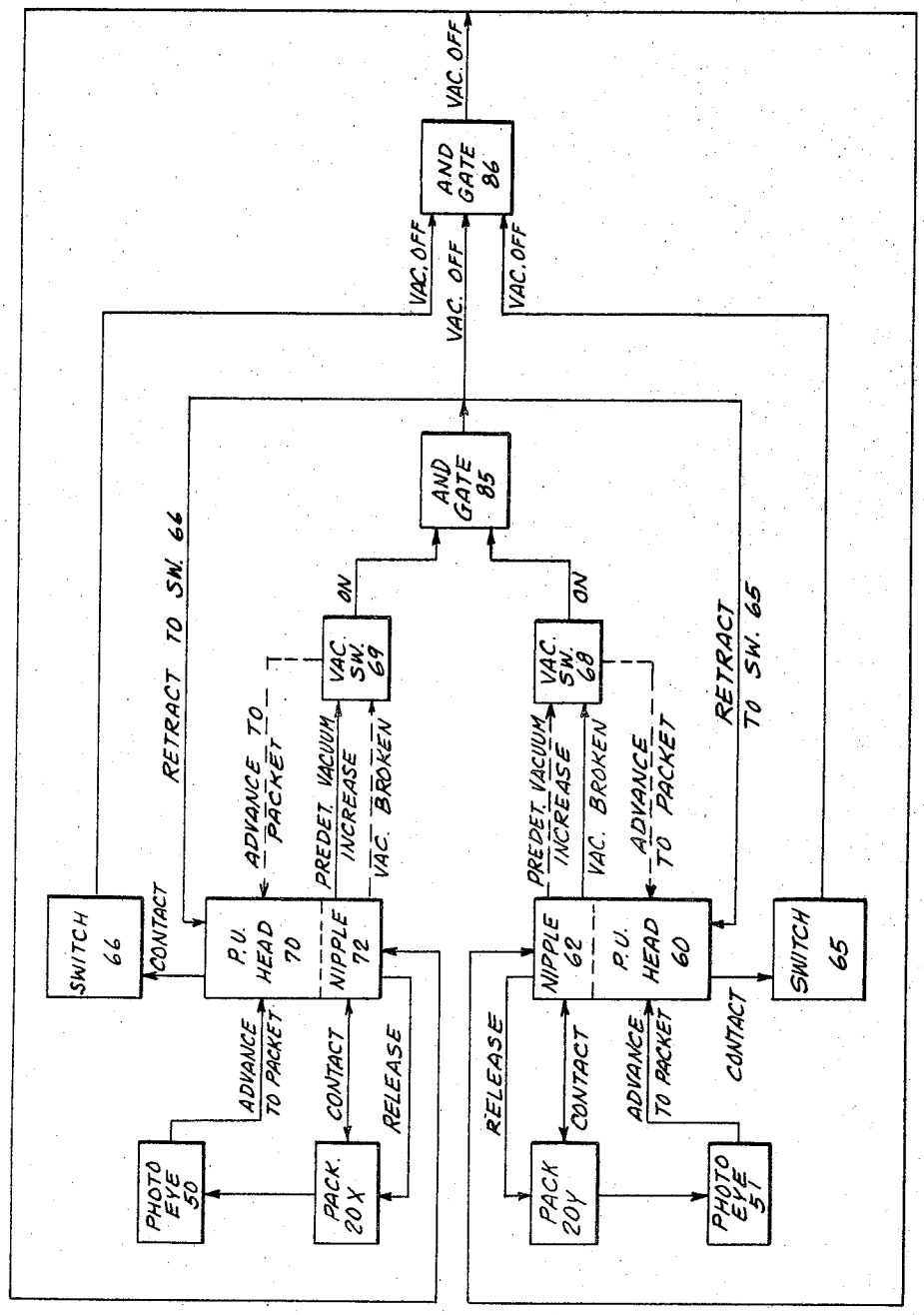
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PACKAGING MACHINE

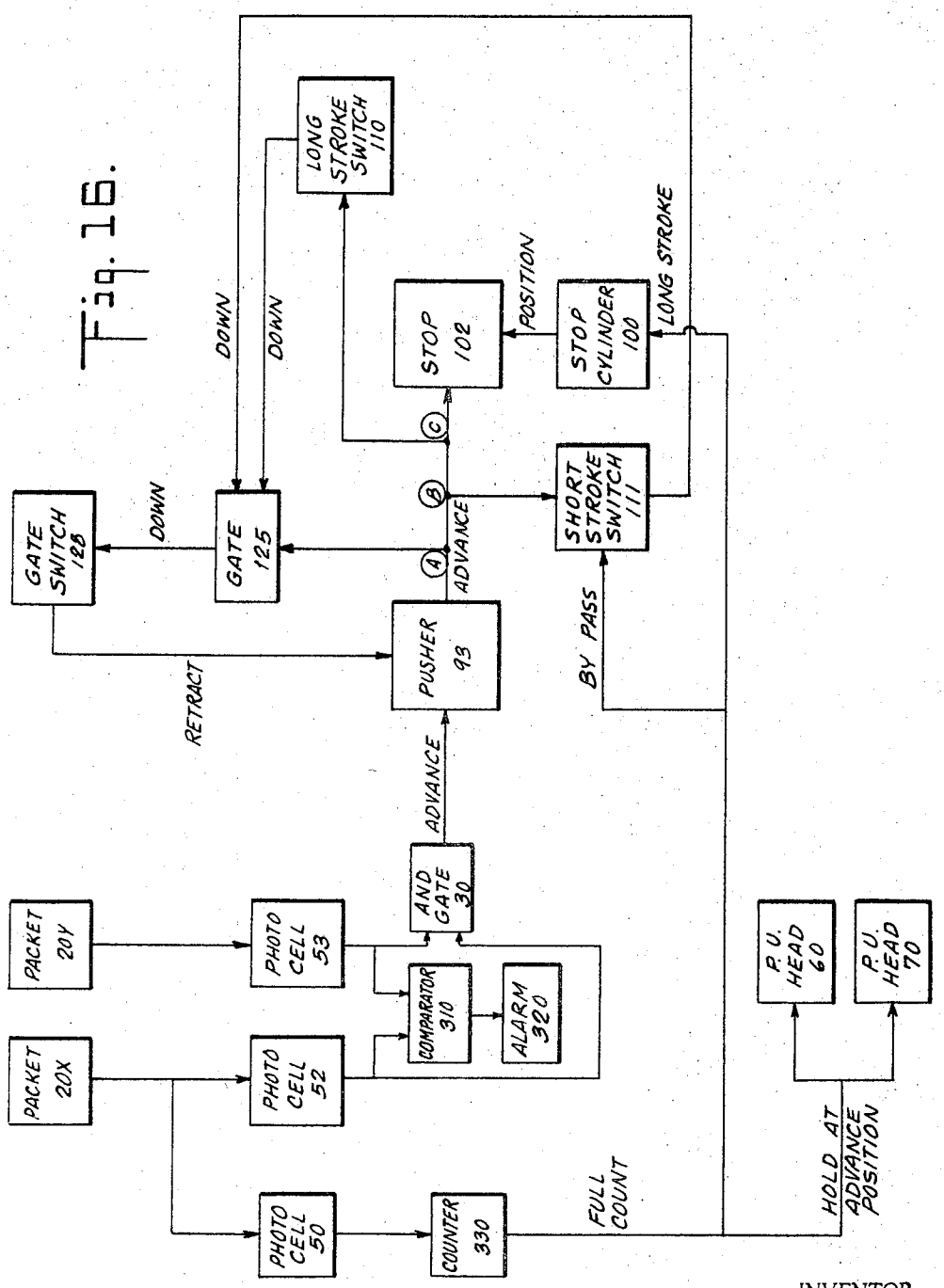
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Fig. 15.



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Fig. 16.



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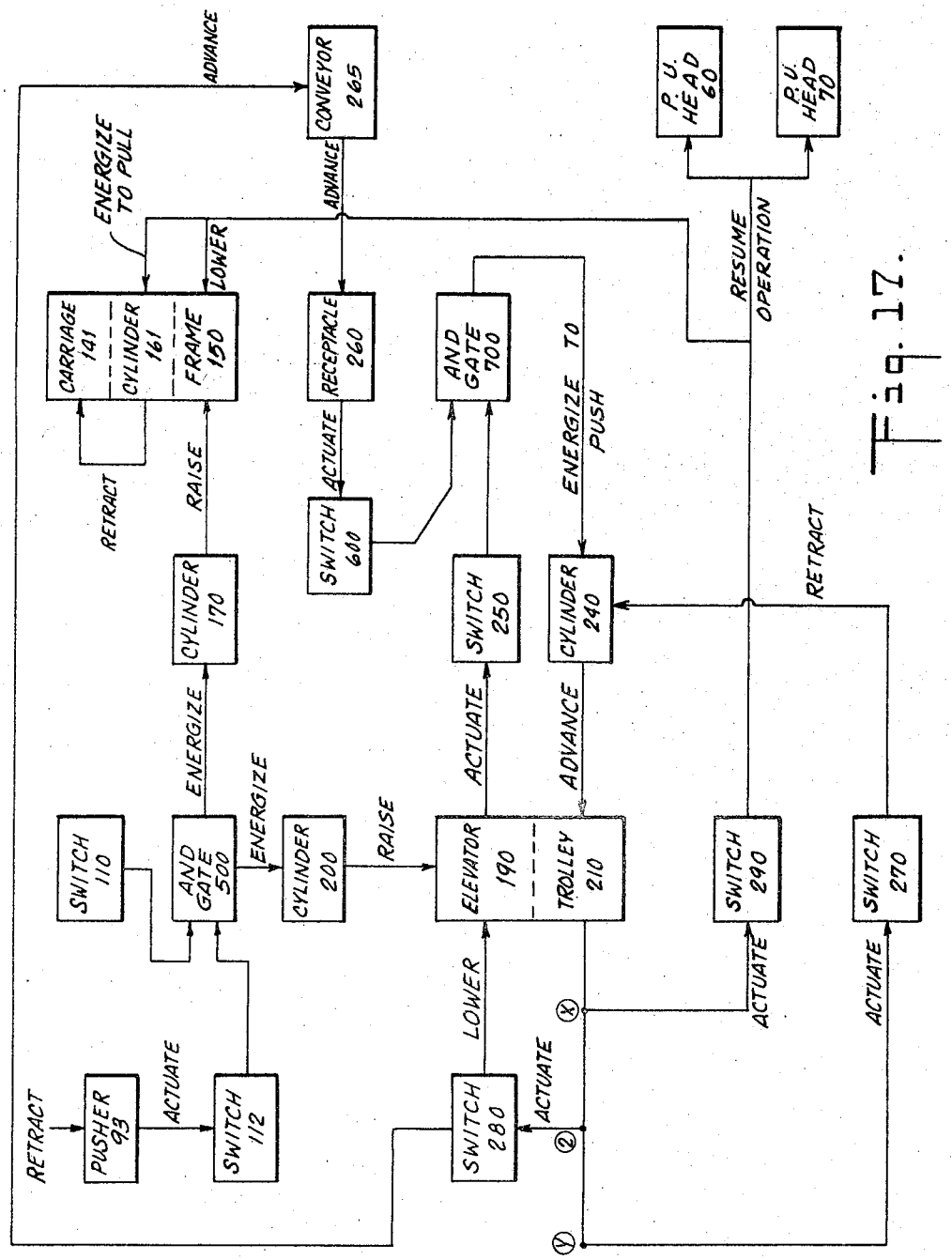


Fig. 17.

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United States Patent Office 3,435,584 Patented Apr. 1, 1969

3,435,584

PACKAGING MACHINE

Karl E. Prechter, Middletown, N.J., assignor to Domino Sugar Company, a corporation of Delaware

Filed June 14, 1966, Ser. No. 557,582
Int. Cl. B65b 57/10, 35/54, 35/50
U.S. Cl. 53—62 9 Claims

ABSTRACT OF THE DISCLOSURE

A packaging machine for filling a succession of receptacles with a measured number of packets in plural columnar arrangement is made up of a station adapted to accommodate an interleafed, side-by-side, plurality of columns of said packets, each column having said packets contiguous with one another along the major portion of their broad faces and standing on edge, means for supplying packets on edge to said station in pluralities equal to the number of said columns, the individual packets in said pluralities being arranged side-by-side and being overlapped at the edges thereof to provide interleafing of said columns, means for counting the number of said packets supplied to form said columns and means for moving said interleafed plurality of columns as a unit and on edge into said receptacle upon reaching a predetermined packet count by said counting means.

This invention relates to packaging machines, and more particularly relates to apparatus for accepting and transferring measured numbers of packets into package receptacles.

One common form of packaging is to place an article or substance into a packet, and to stack or arrange a plurality of such packets into a packaging receptacle such as a box. By use herein of the term packet, is meant a relatively small envelope-shaped container having major opposed faces joined at a periphery, either directly or by folds or the like, and also other forms of package similar to the aforesaid in relative proportions and overall size. The walls of a packet are generally flexible webbing, e.g. paper, plastic, etc. The substance contained within the packets may be edible or non-edible, may be particulate or emulsified or in other conditions, and ultimately may be employed by rending the packet to deliver the contents thereof, or by crushing the packet, or by soaking the packet in a liquid, or by other methods. For example, the packet may be fabricated of easily rendable paper, and the substance within may be edible, for example granular or powdered sugar, the use for which is flavoring or sweetening edible products such as coffee or the like. Alternatively, the contents of such a rendable packet may be inedible, as for example sewing articles such as buttons or beads. Tea bags illustrated a form of packets in which the substance is edible (tea leaves) yet wherein the ultimate use does not involve rending the packet, but instead involves soaking the whole packet in hot water. In other forms, the packet webbing may be, for example, polyethylene, and the ultimate use may be to extrude a substance therefrom, such for example as mustard, paint, and the like, by squeezing or crushing the packet.

The present invention will be described with particular reference to the packaging of a measured plurality of individual packets of sugar into a packaging receptacle, e.g. a box, by automatic and/or in-line apparatus, but it should be understood that the invention is equally applicable to other forms of the basic packaging problem solved by the present invetnion. These other forms of the problem may relate to the examples already cited above, or to other situations involving substantially packet-like packages and packaging receptacles such as boxes. The

packaging of sugar is merely one highly advantageous example of the use of the invention.

When sugar is packaged in packets, an endless sleeve of paper is alternately sealed transversely and charged with granular sugar, so as to form end-linked rectangular (usually square) packets which are subsequently cut apart thereby constituting individual packets containing measured amounts of sugar. Such packet-forming-and-filling apparatus does not form part of the present invention, but a problem is presented by such apparatus in the rapid build-up of individual packets which must be placed in measured numbers into packaging receptacles such as boxes or the like for transportation and/or marketing.

Heretofore, the packets of sugar have been counted by hand by a human operator and transferred manually in measured amounts into boxes or transfer cases preliminary to transfer of boxes. Such manual operations have been inherently inefficient and expensive, and have presented production difficulties whenever an attendant was absent or could not manage the production of the one or more packeting machines under his charge. What has been desired is an automatic mechanism for accepting individual packets and, upon attainment of predetermined measured numbers thereof, transferring them into an appropriate packaging receptacle, which might be either a transfer receptacle or the ultimate package such as a box.

It is an object of the invention to provide automatic means for accepting individual packets and transferring measured numbers thereof into a packaging receptacle.

Another object of the invention is to provide automatic packaging of measured quantities of packets with improved efficiency and economy.

Another object of the invention is to provide means for packing a predetermined number of packets into a packaging receptacle with closer packing than has heretofore been possible.

Another object of the invention is to provide means for packaging a plurality of rows of packets in a single packaging receptacle with improved efficiency and closeness of packing.

These and other objects and advantages of the invention are attained by an apparatus according to the invention, one presently preferred but merely illustrative embodiment of which is described hereinbelow in detail, with reference to the drawings, in which:

FIG. 1 is a schematic elevation view of an apparatus according to the invention illustrating the overall operation of the apparatus by showing at upper, lower, and intermediate levels, the relationship between various of the elements which act directly upon the packets at the various stages in the sequence of operations according to the invention;

FIG. 2 is a plan view of a portion of the upper level elements shown in FIG. 1;

FIG. 3 is an elevational section view of the elements of FIG. 2 taken along planes 3—3 therein;

FIG. 4 is a section view of the elements shown in FIG. 3 taken along plane 4—4 therein;

FIG. 5 is a detail section view of a portion of the elements shown in FIG. 3 taken along plane 5—5 therein;

FIG. 6 is a section view of a portion of the elements shown in FIG. 3 taken along plane 6—6 therein;

FIG. 7 is a section view of a portion of the elements shown in FIG. 3 taken along plane 7—7 therein;

FIG. 8 is a plan view of a portion of the intermediate level elements shown in FIG. 1;

FIG. 9 is a plan view of another portion of the intermediate level elements shown in FIG. 1;

FIG. 10 is an elevational view of a portion of the elements shown in FIG. 8 together with motive and control elements therefor;

FIG. 11 is an elevational view of a portion of the elements of an apparatus according to the invention showing the detailed interrelation between a portion of the elements shown in the intermediate and lower levels in FIG. 1;

FIG. 12 shows a portion of the apparatus illustrated in FIG. 11 and a packaging receptacle being loaded thereby;

FIG. 13 is a section view of the elements shown in FIG. 11 viewed along plane 13—13 therein;

FIG. 14 is an enlarged end view of the apparatus shown in FIG. 11; and

FIGS. 15–17 are diagrammatic representations of the sequencing and control of the various parts of an apparatus according to the invention.

Referring now to the figures, and particularly with reference to FIG. 1 in conjunction with FIGS. 2–7, a plurality of individual packets **20** are carried upon a guide table indicated generally at **30** in FIG. 1, so that each packet touches each adjacent packet along one of its broad faces. In the figures an example form of packet is shown, and in FIGS. 1 and 4 it may be seen that this example packet is folded-over along one edge and press-sealed along the remaining edges **20***a*, **20***b*, **20***c*. Of course, the packet may instead be press sealed along all four edges and may have many other variations in form and arrangement. The individual packets **20** may, for purposes of the present invention, be deposited upon guide table **30** by any appropriate means. Typically however, the machinery (not shown) which produces packets **20** will deposit the packets directly onto guide table **30**, e.g., from a chute, or the packets **20** will be brought into the illustrated single-file broad-side relationship by other means not forming part of the present invention.

Guide table **30** (FIG. 1) is divided into two parallel guide table portions designated respectively **30***a* and **30***b* (FIG. 2). Each of the guide table portions **30***a*, **30***b* includes a horizontal bottom surface **31***a*, **31***b* which cooperates with a pair of parallel vertical portions **32***a* and **33***a*, **32***b* and **33***b*, respectively, so that table portions **30***a*, **30***b* constitute a pair of parallel upwardly open U-shaped channels. Guide table portions **30***a*, **30***b* are mounted to a plurality of cross-members C carried by a frame F, and are offset axially with respect to one another so that their respective end portions **34***a*, **34***b* are staggered as is illustrated in FIG. 2. A pair of peripheral stop members **35***a*, and another pair **35***b* (FIGS. 2 and 4) are secured respectively to guide table portions **30***a*, **30***b* a short distance from end portions **34***a*, **34***b* respectively. When packets **20** are loaded by any of the aforesaid means onto table **30**, their progression toward end portions **34***a*, **34***b* will be correctly paced to keep the guide tables **30** in the illustrated loaded condition whereby a lead packet **20***x*, **20***y* in the respective guide tables **30***a*, **30***b* will be arrested at their respective side edges **20***a*, **20***c* by the pair of stops **35***a* and the pair of stops **35***b* respectively. In general, the packets **20** will be progressed by powered pushing from other packets further back in line, but the progression being under the influence of relatively gentle forces so that the lead packets will be arrested at their side edges by stop **35***a*, **35***b*. Feed systems other than powered may also be employed, for example, gravity chutes conducting packets **20** to guide table portions **30***a*, **30***b*. Just as end portions **34***a*, **34***b* are staggered, so the pair of stops **35***a* and the pair of stops **35***b* are correspondingly staggered so each is spaced in relatively the same relationship to its respective end portion.

Intermediate each of stop pairs **35***a*, **35***b* and the associated end portions **34***a*, **34***b* is a downwardly open chute **40**, **41** respectively (FIGS. 1–5). Chutes **40**, **41** are staggered because of the staggering of end portions **34***a*, **34***b* and each includes a principal wall **40***a*, **41***a* which cooperates wtih an incomplete facing principal wall **40***b*, **41***b* (FIG. 5) in a downward taper toward each other.

Walls **40***b*, **41***b* are incomplete by virtue of a slotted opening extending downwardly for essentially the entire length thereof for a purpose to be presently described. Each of chutes **40**, **41** further comprises a pair of minor walls **40***c*, **40***d*, and **41***c*, **41***d* connecting the respective principal walls **40***a*, **40***b*, and **41***a*, **41***b*. As is best shown in FIG. 5, chutes **40**, **41** in addition to being staggered, are intersected. Thus, minor walls **40***d* of chute **40** and **41***d* of chute **41** each intrude into the other chute so that the two chutes are gradually intersected as they progress downwardly from their upwardly open mouths. The minor walls **40***d*, **41***d* are terminated at the blunt common end **45**. A packet station is defined by a frame **46**, located at the lower portion of chutes **40**, **41** below blunt end **45**, and having a rectangular cross-section interior communicating with both of chutes **40**, **41**. The tapered minor walls **40***c*, **41***c* join a pair of vertically upstanding packet station minor walls **46***a*, **46***b* at about the level of blunt end **45**.

A peripheral stop **47** is located within packet station frame **46** at a first side thereof adjacent minor wall **46***b* under chute **41**, and a second peripheral stop **48** is located adjacent minor wall **46***a* under chute **40**, so that the stops **47**, **48** are staggered due to the staggering of chutes **40**, **41**. When pairs of packets **20** are dropped down chutes **40**, **41** they are automatically staggered and overlapped in the descent down the chutes so that upon resting as a pair at station **46** (FIG. 6) one packet is spaced slightly ahead of the other, and the adjacent edges of the packets are overlapped to a considerable extent. In the illustrated embodiment, chutes **40**, **41** intersect by a total of about one-third of their major transverse dimension (FIG. 5) and accordingly packets descending chutes **40**, **41** will overlap at their adjacent edges by a corresponding proportion (FIG. 6). It will be appreciated that by so staggering and overlapping successive pairs of packets **20**, a double row of interleaved packets may be built up pair-by-pair. Since such a double row will be interleaved, closer and more efficient packing into a single package receptacle than has heretofore been possible employing manual techniques, may be attained. The substantial saving in package volume and expense which results is an important feature of the present invention.

Each of chutes **40**, **41** is equipped with a first pair of photoelectric cells **50**, **51** respectively (FIGS. 3 and 4) which are located at the upper portions of the respective chutes and adjacent the slotted portion of major walls **40***b*, **41***b*. Lower in each chute, immediately above packet station **46**, is a second pair of photoelectric cells **52**, **53**. Each of major walls **40***a*, **41***a* (FIG. 5) includes an upper aperture **40***d*, **41***d* respectively, which is aligned with a lens **50***a*, **51***a* respectively of photoelectric cells **50**, **51**, and a lower aperture **40***e*, **41***e*, which is aligned with a lens **52***a*, **53***a* respectively of photoelectric cells **52**, **53**. In FIG. 3 a pair of light sources **55**, **56** (partially hidden in FIG. 3) is shown aligned with apertures **40***d*, **41***d* and lenses **50***a*, **51***a* of photoelectric cells **50**, **51** respectively. Similarly, a pair of light sources **57**, **58** is aligned with apertures **40***e*, **41***e* and lenses **52***a*, **53***a* on photoelectric cells **52**, **53** respectively. It will be appreciated that a beam of light issues from each of the respective light sources and travels through the respective apertures to the respective lenses of the respective photoelectric cells. When a packet passes down either of chutes **40** or **41** the light beam between either source **55** and cell **50** or source **56** and cell **51** (depending upon which chute is concerned) is first interrupted, and then the light beam between either source **57** and cell **52** or source **58** and cell **53** is next interrupted. The information imparted by such interruption is employed in a manner presently to be described.

As is best shown in FIGS. 1–3, a pair of pick-up heads **60**, **70** are mounted on a mounting plate M which is bolted to frame F by a pair of bolts B. Each of pick-up heads **60**, **70** includes a housing **60***a*, **70***a* of generally rectan-

gular outline having a forward end 60*b*, 70*b* of diminished cross-section, and an upwardly extending arm 60*e*, 70*e*. Three guide bars 80, 81, 82 are secured to mounting plate M by machine screws S, so that guide bars 80 and 81 guide pick-up head 70 on the mounting plate M, and guide bars 81 and 82 similarly guide pick-up head 60 on the mounting plate M. Each of pick-up heads 60, 70 is connected to a driving plunger 61, 71 respectively, and under driving impetus as hereinafter described driving plungers 61, 71 are adapted to move pick-up heads 60, 70 in reciprocal sliding relation relative to the pairs of guide bars 81, 82 and 81, 80 respectively.

At the forward ends 60*b*, 70*b* pick-up heads 60, 70 include a resilient generally cylindrical nipple 62, 72, each said nipple having a large diameter axial aperture therein communicating with an internal passageway (not shown) in each of the respective pick-up heads 60, 70. Affixed to pick-up heads 60, 70 is a fitting 63, 73 which also communicates with the aforesaid internal passageway, and thereby affords a direct communication between nipples 62, 72 and fittings 63, 73 respectively. The fittings 63, 73 are connected to appropriate sources of vacuum (not shown) and the vacuum available at fittings 63, 73 may be valved on and off in a manner and for a purpose to be hereinafter described. While the pick-up heads 60, 70 are essentially identifical, they are arranged in staggered relationship to one another to exactly the same degree of stagger as guide tables 30*b*, 30*a* and all the elements appurtenant thereto. In FIGS. 2 and 3 the pick-up heads 60, 70 are shown retracted to one extreme of their reciprocal motion, wherein the nipples 62, 72 are positioned with their lead faces 62*a*, 72*a* respectively positioned over chutes 41, 40. At the other extreme of their reciprocal movement nipples 62, 72 have their lead faces 62*a*, 72*a* advanced beyond chutes 41, 40 and to the position where lead packets 20*y*, 20*x* are resting against stops 35*b*, 35*a* respectively, as may best be seen in full outline for nipple 62 in FIG. 1 and in phantom outline for nipple 72 in FIG. 3.

Each of driving plungers 61, 71 is powered by a pneumatic cylinder, identical to pneumatic cylinder 64 shown connected to driving plunger 61 in FIG. 1. Each of these pneumatic cylinders is double-acting, to power its respective pick-up heads 60, 70 in both the aforesaid reciprocal directions. Associated with each of pick-up heads 60, 70 is a microswitch such as microswitch 65 shown in FIG. 1 associated with pick-up head 60. In its normal position (full outline in FIG. 1) each of these microswitches is in a state corresponding to the "on" state of the vacuum applied to heads 60, 70. When lever 65*a* of microswitch 65, for example, is moved from the full to the phantom position (FIG. 1) by the full retraction of head 60 with switch actuating arm 60*e* to intercept lever 65*a*, the state of microswitch 65 is changed to that corresponding to the "off" state of the vacuum applied to heads 60, 70.

The sequence of events whereby successive pairs of packets 20, one each from guide tables 30*a*, 30*b*, e.g. packets 20*x* and 20*y*, are picked up by heads 70, 60 and dropped as pairs into chutes 40, 41 to descend to station 46, will now be described, with particular reference to the diagrammatic control diagram of FIG. 15. When heads 60, 70 are advanced to the position shown at nipple 62 in FIG. 1, i.e. into contact with lead packets 20*y*, 20*x* on tables 30*b*, 30*a*, the microswitches 65 and 66 (FIG. 15) will already have been released to the normal "on" position, so that vacuum will be supplied to each of nipples 62, 72. The heads 60, 70 may advance to tables 30*b*, 30*a* individually. When the nipple of either head contacts a packet 20 there, e.g. when the nipple 62 of head 60 contacts lead packet 20*y*, blocking of the orifice of that nipple by that packet occurs, causing a build-up of vacuum in the line supplying vacuum to that nipple. In FIG. 15 it may be seen that when a nipple contacts a packet, e.g. when nipple 62 contacts packet 20*y*, a vacuum actuatable switch 68 is actuated to its "on" position. A similar vacuum actuatable switch 69 is controlled by the vacuum level at nipple 72. Switches 68, 69 may be any conventional vacuum actuatable switches, designed to be in the "off" state below a certain predetermined vacuum level, and in the "on" state at greater vacuum levels. The switches 68, 69 are calibrated so that when either nipple 62 or 72 is free, the corresponding switch 68 or 69 is in the "off" state, and when either nipple 62 or 72 is in full contact with a packet 20 the higher vacuum developed thereat causes the associated switch 68 or 69 to be in the "on" state.

Continuing with reference to FIG. 15, it will be seen that it is necessary for both of vacuum actuatable switches 68 and 69 to be in the "on" state before anything else happens, i.e. that both nipples 62, 72 must be in contact with packets before anything else can happen, so that if one head advances to table 30 ahead of the other, the earlier one will wait until both have made contact before the next step is begun. The AND gate 85 shown receiving the "on" signals from vacuum switches 68, 69 performs the function of producing an output signal only when both of switches 68, 69 supply an "on" input thereto. AND gate 85 may constitute, for example, a series arrangement of vacuum switches 68, 69 energizing the control contacts of a relay (not shown), the power contacts of which yield the aforesaid output signal. This output signal from AND gate 85 is employed (FIG. 15) for three purposes. It constitutes a retract signal to the pneumatic valve (not shown) controlling each of heads 60, 70. Thus, when both heads advance (one at a time, or together) so that nipples 62, 72 both securely contact packets 20*y*, 20*x*, the aforesaid events cause retraction of heads 60, 70 in tandem, fixedly staggered, relation. Its third purpose is to supply an input signal to AND gate 86.

The heads 60, 70 retract until one of two events occurs. Either they retract until they actuate switch 65 and switch 66 (FIG. 15), to drop their packets down chutes 41, 40, or one or both of them lose contact with their packet at an earlier stage of retraction. To drop their packets simultaneously down chutes 40, 41, three conditions must obtain. The heads 60, 70 retract in tandem, as aforesaid, so that they will strike switches 65, 66 together, and will simultaneously be over chutes 41, 40 (FIGS. 1–3). The "off" signal produced by each of switches 65, 66 is fed to AND gate 86 together with the output signal of AND gate 85. When these three input signals are impressed upon AND gate 86, it produces an output signal. Again, AND gate 86 may constitute a relay (not shown) having the control winding energized by the output signal of AND gate 85, subject to switches 65, 66 in series therewith. The output signal of AND gate 86 constitutes a command to the vacuum source for nipples 62, 72 to cut off their vacuum. This is accomplished by using the signal to valve off the vacuum to the nipples. Thus, when the heads are being retracted, and switches 65, 66 are both actuated, AND gate 86 will respond by cutting off the vacuum holding the packets to the nipples 62, 72. Since the input conditions to AND gate 86 demand that the nipples 62, 72 be simultaneously over their respective chutes 41, 40, this means that the packets 20*y*, 20*x* are simultaneously dropped down those chutes as a pair. An advance cycle can then be commenced to reinstitute the process to pick up and drop the next pair of packets down the chutes 41, 40.

As aforesaid, one or both heads may lose contact with a packet after both heads have attained contact and retraction has been commanded or even commenced. The broken arrows in FIG. 15 indicate that when one or both nipples have their elevated vacuum (indicating contact) broken, i.e. lowered to the free orifice valve, the associated vacuum switch 68 or 69 is thereby put into the "off" state, thus commanding the associated head to advance again to re-establish contact with a packet. The other head will continue its retraction, and dropping of

the packets down the chutes **40**, **41** will not occur until the other head catches up again and actuates its switch **65** or **66**. This broken arrow sequence can also be employed to institute automatic cycling into advance after the drop into chutes **40**, **41**, which was mentioned above. Thus, when the vacuum is valved off as aforesaid to drop the packets into the chutes **40**, **41**, the vacuum switches **68**, **69** will be turned "off," and unless over-ridden so that another event can cause recycling of heads **60**, **70** into advance movement, the "off" state of switches **68**, **69** will cause the heads to advance, as shown by the broken arrows in FIG. 15, by appropriately valving their pneumatic cylinders. However, it is preferred that command of advance of heads **60**, **70** be controlled by photoelectric cells **51**, **50** (FIG. 3). Thus, when a packet drops down chute **40**, or **41**, the cell **50** or **51** associated therewith commands the pick-up head **70** or **60** associated therewith to advance to table **30** to start another cycle. If the packets in a pair are dropped together, the heads advance together. If they are dropped one at a time, the pick-up heads so advance. It will be remembered that an earlier advanced pick-up head awaits the later advanced pick-up head, and that the pick-up heads are always retracted together. Cells **50**, **51** give a more definite indication of the descent of the packets into chutes **40**, **41** than do vacuum switches **69**, **68**, and accordingly employment of cells **51**, **50** to valve the pneumatic cylinders to advance heads **60**, **70** is preferred. In addition, the packets dropping down chute **40**, passing cell **50**, provide counting pulses in so doing, and the count is utilized to predetermine the number of packets ultimately packed into an individual packaging receptacle.

The elements located on the intermediate level (FIG. 1) of the apparatus according to the invention, i.e. the level of station **46** (FIG. 3) will now be described, with additional reference to FIGS. 6–9. As is best shown in FIGS. 1, 3 and 9, a pneumatic cylinder is mounted to a frame portion FF on the level of packet station **46**, and includes a driving rod **91** connected to pusher **93** at a pusher fitting **93***b*. As is illustrated in phantom outline in FIG. 9, pusher **93** is reciprocally movable by pneumatic cylinder **90** in a short stroke cycle (at **93'**) or a long stroke cycle (at **93''**). A pneumatic stop cylinder **100** (FIG. 9) controls a rod **101** having a stop **102** at the free end thereof, for selective extension between a first position shown in full outline (at **102**) and a second position shown in broken outline (at **102'**). When a short stroke of pusher **93** is to be effected, auxiliary pneumatic cylinder **100** positions stop **102** at the full outline location illustrated in FIG. 9, and when a long stroke of pusher **93** is to be effected, auxiliary pneumatic cylinder **100** positions stop **102** at the broken outline position illustrated in FIG. 9. A pair of connecting rods **92***a*, **92***b* is connected by a pair of pusher fittings **93***a* to pusher **93**, and extends on opposite sides along the entire length of cylinders **90** and **100** and the full length of rod **101**, and includes an arm **94** secured thereto at the free ends thereof by a pair of fittings **95**. The arm **94** is disposed normal to rods **92***a*, **92***b* and a central portion **94***a* is aligned axially with rod **101**, so as to advance toward and away from stop **102** during reciprocal movement of pusher **93**. The pneumatic force exerted by auxiliary cylinder **100** is greater than that exerted by cylinder **90**, so that when **94** is driven against stop **102**, pusher **93** is stopped from further movement in that direction.

Three microswitches **110**, **111**, and **112** are secured to frame portion FF along the length of connecting rod **92***a*, and including actuating levers **110***a*, **111***a*, and **112***a* respectively. Connecting rod **92***a* carries a disc **96** which is of sufficient radius to intercept any of levers **110***a*, **111***a*, and **112***a* as it is carried past each of them during the reciprocal motion of pusher **93**. Each of microswitches **110**, **111**, and **112** has its state momentarily changed (e.g. closed) when its associated lever is driven in the direction indicated by the schematic arrow on the body portion thereof. In short stroke operation stop cylinder **100** is actuated to drive stop **102** to the fully extended position shown in full outline at **102** in FIG. 9 and to hold it there. Upon actuation of cylinder **90**, pusher **93** is driven from the full outline position shown in FIG. 9 to the broken outline position shown at **93'**, which is the extreme of the short stroke cycle. This extreme is determined by the abutment of arm **94** against the fully extended stop **102**. Just before arm **94** is bottomed on stop **102**, disc **96** engages lever **111***a* in the direction indicated in the arow on the body of microswitch **111**, thereby actuating microswitch **111** to provide a signal indicating that the short stroke has been completed. The pusher **93** will, after the short stroke is completed, be withdrawn from the broken outline position **93'** (FIG. 9) to the full outline position **93**. In long stroke operation stop cylinder **100** withdraws stop **102** to broken outline position **102'** (FIG. 9) and holds it there. Cylinder **90** drives pusher **93** until it abuts the stop **102** at position **102'**. Just before such abutment, disc **96** actuates microswitch **110** to indicate that the long stroke is completed. The pusher **93**, after the long stroke, will be withdrawn by cylinder **90** from position **93''** to position **93** (FIG. 9). The microswitch **112** will be passed by disc **96** in the direction of the arrow thereon, at the termination of the return of pusher **93** from the long and the short strokes thereof.

It will be appreciated that each short stroke of pusher **93** drives a pair of packets from station **46** to a primary loading area (FIG. 1) outside station **46** on the side thereof opposite cylinder **90**. It will also be appreciated that when a number of pairs of packets has been accumulated, by successive short strokes, at and beyond the primary loading area, the next long stroke will drive the entire accumulation of packets entirely into the secondary loading area (FIG. 9) for a purpose to be explained presently. By adjusting the number of short strokes preceding each long stroke, the number of packets driven into the secondary loading area, and subsequently into a packaging receptacle, is determined.

Referring now to FIGS. 1, 3, 6 and 7, there is shown a gate stop assembly indicated generally at **20**, comprising a pneumatic cylinder **121** (FIG. 7) mounted to an upright frame member UF having an extensible rod **122** to which is connected at right angles a gate tail **123** by means of a fitting **124**. Horizontally spaced from rod **122** along gate tail **123** is a generally rectangular gate **125** which is disposed adjacent packet station frame **46**. On vertical frame member UF, a short distance above pneumatic cylinder **121**, is mounted a bracket **130** through which is adjustably secured a threaded stop screw **131** including a stop **132** at the lower end thereof. The pneumatic cylinder **121** is equipped with suitable valving mechanisms (not shown) so that rod **122** may be extended and retracted, and stop **132** may be adjusted so that the limits of upward and downward movement of rod **122** drives gate tail **123** between the positions shown in full outline at **123** and phantom outline at **123'** in FIG. 7. The proportions of gate **125** are such that with the proper setting of stop **132** the lower edge **125***a* of gate **125** just clears packets advanced by pusher **93** whenever rod **122** is extended upwardly against stop **132** so that the gate tail occupies the aforesaid broken outline position **123'**. When gate **125** is in that position, the packets advanced by pusher **93** may move through a long or short stroke cycle without interference. Thus in the short stroke cycle any packets held within packet station **46** may be pushed out of station **46** under and beyond gate **125** into the primary loading area, and in the long stroke cycle the pusher **93** may be projected beyond the primary loading area to push the accumulated packet rows entirely into the secondary loading area.

When rod **122** is retracted so that gate tail **123** is lowered to the full outline position shown in FIG. 7, the bottom edge **125***a* of gate **125** intrudes appreciably below

the upper portions of the packets **20** in packet station **46**, thereby preventing easy translation of those packets in one direction or the other past gate **125**. Pneumatic cylinder **121** is thus capable of blocking or unblocking the packets in packet station **46**, and in the present invention this is employed to assure that packets previously driven out of packet station **46** by pusher **93** do not back-up into station **46** after pusher **93** is retracted.

As is best shown in FIGS. 8 and 14, the packets driven out of station **46** to the primary and secondary loading areas ride on four rails **157***a*, **158***a*, **157***b*, **158***b* which are arranged to be coplanar with frame member FF, and thereby the floor of station **46**. A pair of side plates **159***a*, **159***b* and a top plate **159***c* (FIG. 14) define, with rails **157***a*–**158***b*, a rectangular passageway in which the packets are accumulated into rows prior to being driven off the rails to the left (as viewed in FIG. 12) into a packaging receptacle, as explained hereinafter. While the packets are on rails **157***a*–**158***b*, the friction forces at their edges from the rails and plates **159***a*–**159***c* help keep them in place and upright. In addition, and as is best shown in FIG. 10, the rows of packets are accumulated against the pressure of a movable trolley indicated generally at **140**. As may be further understood by additional recourse to FIGS. 1, 8, 11, and 14, trolley **140** includes a carriage **141** in the form of a pair of generally S-shaped brackets **141***a*, **141***b* each having a vertically oriented V-groove roller **142**, **143** thereto, and an upper bracket **144** (FIG. 14) connecting the brackets **141***a*, **141***b* and carrying a depending pair of horizontally oriented V-grooved roller wheels **146**, **147** at spaced positions thereon. The carriage **141** is mounted for movement on a frame **150** (FIG. 11) including a pair of spaced laterally disposed rails **151**, **152** (FIG. 14) upon which rollers **146**, **147** ride so as to support the carriage **141** for movement along frame **150**. The frame **150** is pivoted by a horizontal pin **155** through a bracket **156** secured to frame **150** and to upstanding frame member UF. Rollers **142**, **143** are so spaced as to ride the inner pair of rails **157***a*, **158***a* when frame **150** is pivoted downwardly into the position shown in FIG. 10. The bracket portions **141***a*, **141***b* of carriage **141** act to support the forward end of any adjacent row of packets when the frame **150** is in the aforesaid downwardly pivoted position, but when the frame **150** is pivoted upwardly to the position shown in FIG. 11 the rows of packets are free to be pushed as a unit into a packaging receptacle, by means to be presently described.

Before the transfer to a packaging receptacle occurs, a series of short strokes and one long stroke of pusher **93** will have occurred as previously described. Carriage **141** is connected by a rod **160** to a pneumatic cylinder **161** which is in turn bracketed by a bracket **162** to frame **150**. When carriage **141** is moved to the left (as viewed in FIG. 11) pneumatic cylinder **161** acts as a damper, i.e. acts to supply a yieldable restraint upon such movement, but pneumatic cylinder **161** may also be valved to retract rod **160** thus returning carriage **141** to the right (as viewed in FIG. 11) for a new sequence of short strokes preparatory to filling another packaging receptacle. As each short stroke of pusher **93** adds another pair of packets to the rows of packets beyond packet station **46**, carriage **141** is moved another step to the left under the force of pusher **93** moving to the same primary loading area position each time, but with additional packets. Carriage **141** moves a larger step to the left when the long stroke of pusher **93** occurs. Between strokes the rows of packets are maintained in close packed relation by the various frictions on the packets as aforesaid, the presence of lowered gate **125**, and the restraint of carriage **141**.

The sequence of events whereby successive pairs of packets **20**, e.g. packets **20***x* and **20***y*, are driven from packet station **46** at the mutual bottom of chutes **40**, **41** to the primary loading area and then entirely to the secondary loading area by pusher **93**, with the cooperation of carriage **141** and gate **125**, will now be described, with particular reference to the control diagram of FIG. 16. When a pair of packets, **20***x*, **20***y* are dropped down chutes **40**, **41**, that fact will be recorded by photo cells **52**, **53** which are far enough down those chutes to positively indicate that station **46** has two side-by-side packets therein. This fact initiates the sequence of steps whereby the pair is pushed out of station **46**. But if only one chute receives a packet, the sequence will not be initiated, and if that chute receives another packet while the first is still therein, that fact will cause an alarm to ring so that the extra packet can be manually removed. This discrimination is effected by feeding the output of photo cells **52**, **53** to an AND gate **300**, and also to a comparator **310**. If a packet appears in each of chutes **40**, **41**, AND gate **300** is satisfied and generates a signal, while comparator **310** is inactive. On the other hand, if two packets pass down the same chute, with or without a packet in the other chute, comparator **310** will note the extra or unbalanced count, and will sound an alarm **320**, and override the AND gate **300** if necessary (i.e. if at least one packet appears in each chute with an excess thereover in one chute). AND gate **300** may constitute series switches, one each closed by photo cells **52**, **53**. Comparator **310** may constitute any mechanical or electrical device that will provide a signal when either of cells **52**, **53** register more packet counts than the other Comparator **310** is reset every time pusher **93** receives an advance signal from AND gate **300**.

When a pair of packets **20***x*, **20***y* register on cells **52**, **53**, and AND gate **300** emits an advance signal to pusher **93**, the packets will be pushed out of station **46**. The stop **102** will normally be held by cylinder **100** in the short stroke position, so when pusher **93** advances it will normally advance only the distance needed to push packets **20***x*, **20***y* from station **46** to the aforesaid primary loading area, before abutting stop **102**. As soon as pusher **93** advances, gate **125** will move upward out of the way of packets **20***x*, **20***y*. This can be actuated by the advance signal from AND gate **300** itself, or by pusher **93** reaching position A, as illustrated in FIG. 16. When pusher **93** reaches and actuates the short stroke switch **111** (at position B, FIG. 16) a down signal is emitted by switch **111** which causes gate **125** to move down. The pusher **93** is meanwhile abutting stop **102**, and will retract only when gate **125** has moved completely down to actuate gate switch **128**. The pusher **93** is then retracted to start another pushing cycle when another pair of packets **20***x*, **20***y* enter station **46**.

The pusher **93** continues back and forth against stop **102**, which continues to be held in the short stroke position, until a predetermined count is reached. Photo cell **50** is employed to perform the count, together with other functions already described with reference to FIG. 15. Photo cell **50** counts the packets passing down one chute, and when the final count to be packed into the packaging receptacle is reached, a counter **330** emits a signal which initiates long stroke operation. For example, if fifteen pairs of packets are to be packed into the packaging receptacle, fifteen counts of cell **50** will be registered by counter **330**, and on the fifteenth, the full count signal will be emitted. This signal performs three functions. It holds pick-up heads **60**, **70** at the advanced position so that the extra time for the long stroke cycle is provided. It bypasses short stroke switch **111**, so that long stroke switch **110** controls the lowering of gate **125**. It retracts stop **102** into cylinder **100** to allow pusher **93** to advance all the way to the secondary loading area, in the long stroke.

Thus, counter **330** initiates the long stroke by retracting stop **102**, and pusher **93** is free to travel further, on command of AND gate **300** on the next pair of packet **20***x*, **20***y* (the final pair in the predetermined count), than in the short strokes. Gate **125** is raised as in the

short stroke operation, but actuation of switch **111** does not lower gate **125** when pusher **93** reaches position B (FIG. 16). That switch has been bypassed, e.g. by opening a switch in series therewith in response to the aforesaid full count signal of counter **330**. When pusher **93** pushes the last pair of packets **20***x*, **20***y* from station **46** to and beyond the primary loading area and into the secondary loading area together with the whole columns of previous packets before them, the long stroke switch **110** will be reached (at C in FIG. 16) and actuated, lowering gate **125**. Meanwhile the pusher **93** will bottom on stop **102** in the long stroke position. The lowered gate **125** will actuate switch **128**, as before, and pusher **93** will be retracted in response thereto. Upon retraction, pusher **93** will actuate another switch that will initiate a sequence of operations regarding primarily the lower level elements, presently to be described, that push the packet rows from the secondary loading area into the packaging receptacle. A certain amount of overlap between the operations of this third level of elements and the reinstitution of pickup and pushing of a new series of packets on the upper and intermediate levels is practiced, and the means for phasing the two by the long stroke operation just described will be explained after the lower level elements are descrbied.

Referring now to FIGS. 1 and 11–14, there is shown the means whereby the rows of packets are driven completely off the apparatus according to the invention and into a package receptacle. A pneumatic cylinder **170** (FIG. 14) is pivotally secured to vertical frame member UF at bracket **171** and includes a rod **172** which is pivotally connected via bracket **173** to frame **150** on the opposite side of pivot pin **155** from pneumatic cylinder **161**. The extension and retraction of rod **172** upon the appropriate valving of pneumatic cylinder **170** forces the raising and lowering respectively of frame **150** by pivoting action thereof at pivot pin **155**. When frame **150** with carriage **141** is raised upwardly away from the row of packets, they are freed for movement as a unit off the rails **157***a*–**158***b* and into a waiting packaging receptacle. An elevator platform **190** (FIG. 11) is secured to a piston rod **195** by a bolted flange **196**, and rod **195** is arranged to be driven upwardly and downwardly by a pneumatic cylinder **200** which is in turn bolted to a subplatform SP. As is best seen in FIG. 14, elevator **190** includes a pair of spaced S-shaped rails **191**, **192** which are bolted thereto by a series of bolts **191***a*, **192***a* respectively. A pusher trolley **210** includes a platform **211** through which is mounted an axle **213**. Two roller wheels **214** are carried at the ends of axle **213**. The diameter of roller wheels **214**, and the placing of axle **213** relative to platform **211** is such that the roller wheels **214** are carried within rails **191**, **192** for rolling action over the surface of elevator **190**. Mounted to platform **211** are three upright L-shaped pusher bars **220**–**222**, each of which includes an upstanding portion **220***a*–**222***a* surmounted by an arm portion **220***b*–**222***b* extending from upstanding portions **220***a*–**222***a* in the forward direction, i.e. the direction of movement of the rows of packets. Pusher bars **220**–**222** are spaced apart sufficiently on platform **210** so that upon elevation of platform **210** pusher bars **220**, **221**, and **222** pass respectively between rail pairs **157***a*, **157***b*, and **157***a*, **158***a*, and **158***a*, **158***b*.

A pneumatic cylinder **240** (FIGS. 1 and 11) is pivotally connected at one end to frame F and includes a piston rod **241** which is pivotally connected to a bracket **222** on pusher trolley **210**. Pneumatic cylinder **240** may be valved to extend and retract piston rod **241**, thereby driving pusher trolley **210** from the near end to the far end of elevator **190**. Completion of the long stroke of pusher **93** actuates the raising of platform **150** as aforesaid, and additionally actuates pneumatic cylinder **200** which drives platform **190** from the full outline position to the broken outline position **190'** illustrated in FIG. **11**, so that the pusher bars **220**–**222** are extended through and above the various rails **157***a*–**158***b*. This movement is coordinated (as will presently be described) with the withdrawal of pusher **93** from the long stroke so that pusher bars **220**–**222** are introduced in place of pusher **93** behind the rearmost of the rows of packets. When elevator **190** reaches the fully raised position it operates a microswitch **250** (FIG. 11) which valves pneumatic cylinder **240** to extend piston rod **241** and drive pusher trolley **210** against the rows of packets. The contemporaneous raising of platform **150** frees the packets to be pushed by pusher trolley **210**, and the friction forces associated with the scraping of the edges of the packets as they are pushed keeps them in close packed and vertical orientation. The pneumatic cylinder **240** extends rod **241** until pusher trolley **210** is driven completely to the opposite end of elevator **190**, as is best illustrated in FIG. 12, i.e. until the entire rows of packets are driven off rails **157***a*–**158***b* and into a packaging receptacle.

Pusher trolley **210** includes a generally Z-shaped arm **215** having an outermost elbow **215***a* and a depending arm portion **215***b* aligned with but rearwardly spaced from elbow **215***a*. Three microswitches **270**, **280**, and **290** are mounted in the path of arm **215**, and microswitches **270**, **280** and **290** include roller lever arms **271**, **281**, **291** respectively which are aligned with and may be intercepted by elbow **215***a* during travel of pusher trolley **210** thereby. The switches **270**,**280**, **290** are actuated when their lever is moved in the direction of the arrows thereon (FIG. 13). Thus, switches **270** and **290** are actuated when arm **215** moves in a first direction, and switch **280** is actuated when arm **215** moves in the opposite direction, past the respective switches. These microswitches are employed to sequence the operations which occur coordinate with and subsequent to the loading of a package receptable **260** by pusher trolley **210**, as will presently be described.

As is best shown in FIG. 12, the packaging receptacle **260** is positioned with an open end **261** contiguous with the end rails **151**, **152**, and **230**, **231**. The lateral dimension of the packaging receptacle is sufficient to be aligned with (FIG. 14) the side plates **159***a* and **159***b* and the vertical dimension is sufficient to be aligned at the lower edge thereof with rods **157***a*–**158***b* and at the upper edge thereof with upper plate **159***c*. It is contemplated that packaging receptacle **260** may either be the ultimate packaging receptacle for the packets, e.g. a box, or may be a transfer packaging receptacle, e.g. a metal cannister which is ultimately emptied directly into the final packaging receptacle. Also it is contemplated that when receptacle **260** is a transfer receptacle, receipt of the periodic deliveries of pusher trolley **210** may be achieved with a single transfer packaging receptacle **260** which is repeatedly filled and then emptied into ultimate receptacles at another location and returned in time to the next delivery by trolley **210**, or alternatively receipt may be achieved with a series of such transfer packaging receptacles which are endlessly circulated to and from the aforesaid contiguous relationship, again being emptied to the ultimate receptacles at another location. Of course when the ultimate packaging receptacle itself comprises receptacle **260**, the continuous supply of such receptacles involves no return as it does when a transfer receptacle is employed. Finally, each receptacle **260** may be moved into alignment with pusher trolley **210** by vertical motion, horizontal motion, or any combined motion which results in the appropriate aforesaid contiguous relationship for at least the period of time necessary for the complete transfer of the rows of packets thereinto by pusher trolley **210**.

In the illustrated embodiment (FIGS. 12, 13) the receptacle **260** is moved stepwise laterally, i.e. horizontally, to and away from the egress end of rods **157***a*–**158***b*, and a plurality of cleats **265***a* holds each receptacle **260** to a driven chain belt **265** which motivates it. The chain belt **265** is coordinated with trolley pusher **210** so that

the rows of packets are driven into a dwelling receptacle **260** (FIG. 12). It will be understood that the relationship between the various packets, both in a single row and in the interleaved rows, is the same when they are within the packaging receptacle **260** as it was in the previously described relationship when they were carried on the rails **157***a*–**158***a*. The result is a very close packing of the packets, particularly when multiple interleaved rows of packets are employed, and the number of packets in the packaging receptacle **260** is accurately controlled so that extra margins to guarantee a correct minimum count need not be employed.

The sequence of events whereby the packets in the secondary loading area are driven, as a unit, into a dwelling package receptacle **260**, will now be described, with particular reference to the control diagram of FIG. 17. The pusher **93** is retracted by means shown in FIG. 16, and then, as shown in FIG. 17, actuates switch **112**, which can only be actuated on a return stroke of pusher **93**. Such return strokes occur on both long and short stroke operation, so the actuation of long stroke switch **110** forms one input to AND gate **500**, and the actuation of return switch **112** forms the other input thereto, so that the output of AND gate **500** indicates return from a long stroke only. AND gate **500** may, for example, merely constitute a series connection of switches **110**, **112**.

The output of AND gate **500** sets into motion the driving of the packets into the waiting packaging receptacle **260**. Cylinders **170** and **200** are energized by the output of gate **500**, and they respectively raise frame **150** and elevator **190**. The raising of frame **150** raises carriage **141** and cylinder **161** therewith, thus freeing the accumulated packets for movement toward receptacle **260**. Elevator **190** carries trolley **210** up behind the accumulated packets, as aforesaid, and when the elevator **190** is completely up it actuates switch **250** indicating same, and supplying an input to AND gate **700**. The other input to AND gate **700** is supplied by a switch **600** only when a packaging receptacle **260** is in position for receipt of the packets, as aforesaid. Accordingly the packets will not be driven off the apparatus until a receptacle **260** is in place. AND gate **700** may be merely a series connection of switches **250**, **600**.

When the conditions on AND gate **700** are met, an energizing signal is produced thereby to energize cylinder **240**, thereby advancing trolley **210**, with the accumulated packets in front thereof, toward receptacle **260**. When the position in space occupied by switch **290** (FIG. 13) is reached, that switch will be actuated by trolley **210**. In FIG. 17 that point of travel of trolley **210** is diagrammatically represented at X. The actuation of switch **290** causes the resumption of operation of pickup heads **60**, **70**, and the lowering of frame **150**. There is of course lead time involved there, and the parts are easily timed so that the new sequence of packets instituted by heads, **60**, **70** does not interfere with the end of the sequence involving driving of the previous packets into receptacle **260**. Overlap is desirable since total time is thereby reduced. Similarly, the lowering of frame **150** causes no problem since the previously accumulated packets are now in advance thereof, and since the switch **290** causes cylinder **161** to retract carriage **141** at the same time that frame **150** is commenced to lower.

Meanwhile, trolley **210** is continuing to push the accumulated packets toward receptacle **260**. Switch **280** is passed without actuation, since it actuates only on the return motion of trolley **210**. When switch **270** is reached it is actuated (indicated at position Y in FIG. 17), thereby causing cylinder **240** to retract, drawing trolley **210** back. The point of actuation of switch **270** of course corresponds to the point where the trolley **210** has reached receptacle **260** with all the accumulated packets shoved thereinto. When trolley **210** has withdrawn a short distance to switch **280** (FIG. 13), that switch is actuated since it is sensitive to return motion of trolley **210**. This is indicated at point Z in FIG. 17. Switch **280** causes conveyor **280** to advance, thus taking the full receptacle **260** away and supplying an empty receptacle **260** in its place. When the latter reaches the loading position it will actuate switch **600**, as aforesaid, providing an input to AND gate **700** for the next cycle. Switch **280** also causes elevator **190** to lower, so that the remainder of the return of trolley **210** occurs below rails **157***a*–**158***b*, thus leaving those rails free for the imediate accumulation of the next cycle of packets.

While the invention has been described with a certain degree of particularity and with reference to an illustrative embodiment thereof, it will be understood by those skilled in the art that variations in the form and arrangement of parts may be practiced without departing from the spirit and scope of the inventive principles.

What is claimed is:

1. A packaging machine for filling a succession of packaging receptacles with measured numbers of packets in plural-columnar interleaved arrangement comprising:

(a) a station adapted to accommodate an interleaved, side-by-side, plurality of columns of said packets, each column having said packets contiguous with one another along the major portion of their broad faces, and standing on edge;

(b) means for supplying said packets, on edge, to said station, in pluralities equal to the number of said columns, the individual packets in said pluralities being arranged side-by-side and being overlapped at the lateral edges thereof to the extent of interleaving of said columns, for formation of said interleaved plurality of columns;

(c) means for counting the number of said packets supplied to form said column; and

(d) means for moving said interleaved plurality of columns, as a unit and on edge, into said packaging receptacle in response to attainment of a predetermined packet count by said counting means.

2. A packaging machine for filling, inplural-columnar interleaved arrangement, a succession of packaging receptacles with measured numbers of packets from a packet source, comprising:

(a) a first station having a plurality of packet positions, to accommodate a plurality of side-by-side, side-edge-overlapped, packets standing on edge;

(b) means for moving packets into said first station to fill said positions in successive instances;

(c) a second station adapted to accommodate an interleaved, side-by-side, plurality of columns of said packets, each column having said packets contiguous with one another along the major portion of their broad faces, and standing on edge;

(d) first means for moving each successive plurality of packets from said first station to said second station in response to arrival of all of that plurality of packets in said first station, to accumulate in said second station as said plurality of interleaved columns;

(e) means sensitive to the number of packets moved from said first station to said second station; and

(f) second means for moving said plurality of interleved columns, as a unit, into one of said packaging receptacles in response to a predetermined packet count being attained by said counting means.

3. A packaging machine according to claim **2** wherein said means for moving packets into said first station comprises, a plurality of chutes, one leading to each of said packet positions, each said chute having a major, transverse axis arranged parallel to but spaced from the corresponding axis of each immediately adjacent chute, adjacent chutes progressively intersecting laterally from their mutual upper to lower portions, the amount of intersection at the lower portions adjacent said first station being a minor fraction of the major transverse dimension of one of said packets.

4. A packaging machine according to claim 3 wherein, said means for moving packets into said first station further comprises, pick-up means adapted to move reciprocally between said packet source and the upper portion of said chutes, to pick up individual packets at said source and deposit them into each of said chutes.

5. A packaging machine according to claim 3 wherein, said first means for moving packets from said first to said second station comprises, a photoelectric cell located in each of said chutes to indicate passage of packets downwardly therein to the various packet positions in said first station, motive means for powering movement of said packets from said first to said second stations, and means responsive to the output of said cells and adapted to actuate said motive means when every one of said cells indicates passage of a packet through the chute associated therewith.

6. A packaging machine according to claim 2 wherein, said second station comprises, means for supporting the mutual bottom edges of said packets, advanceable means supporting the frontmost of said packets remote from said first station, and gate means supporting the rearmost of said packets adjacent said first station.

7. A packaging machine according to claim 2 wherein, said second station comprises, means for supporting the mutual bottom edges of said packets, advanceable means supporting the frontmost of said packets remote from said first station and adapted to be forced ahead step by step by increase in the number of said packets, and gate means mounted at the rearmost of said packets to support same against backing-up into said first station, movable between a first position in line with said rearmost packets and a second position out of line therewith.

8. A packaging machine according to claim 7 wherein, said gate means is moved out of line with said rearmost packets in response to each movement of said first moving means toward said second station, and is moved back into line with said rearmost packets before return of said first moving means back past said gate to said first station.

9. A packaging machine according to claim 2 wherein, said first means for moving said packets from said first to said second station is adapted to drive successive pluralities of packets from said first station to a primary loading area of said second station, and to drive the last plurality of packets completing said predetermined packet count beyond said primary loading area and to a secondary loading area of said second station with the columns of accumulated packets therebefore, and wherein, said second means for moving said plurality of columns into said receptacle comprises, motive means normally located out of line with said plurality of columns, and adapted to move into line behind the rearmost packets of said plurality of columns in response to completion of movement of said columns from said primary to said secondary loading areas and to thereupon push said plurality of columns as a unit into said receptacle.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,435,584 April 1, 1969

Karl E. Prechter

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

Column 1, line 55, "illustrated" should read -- illustrate --. Column 8, line 11, "arow" should read -- arrow --; line 43, "20" should read -- 120 --. Column 10, line 29, after "other" insert a period. Column 14, line 39, "inplural-columna should read -- in plural-columnar --.

Signed and sealed this 14th day of April 1970.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR
Commissioner of Patents