United States Patent

Bivans et al.

[15] **3,665,674**

[45] **May 30, 1972**

[54] AUTOMATIC CARTONING MACHINE FOR GLUE END CARTON

[72] Inventors: **Elbert L. Bivans; August Kund,** both of Glendale, Calif.

[73] Assignee: **Bivans Corporation,** Los Angeles, Calif.

[22] Filed: **Feb. 9, 1970**

[21] Appl. No.: **9,738**

[52] **U.S. Cl.** **53/74,** 53/159, 53/186, 53/202, 53/374

[51] **Int. Cl.** **B65b 57/12,** B65b 5/06, B65b 7/20

[58] **Field of Search**.....53/186, 159, 191, 374, 202, 53/284, 383, 387, 388, 393, 261, 74

[56] **References Cited**

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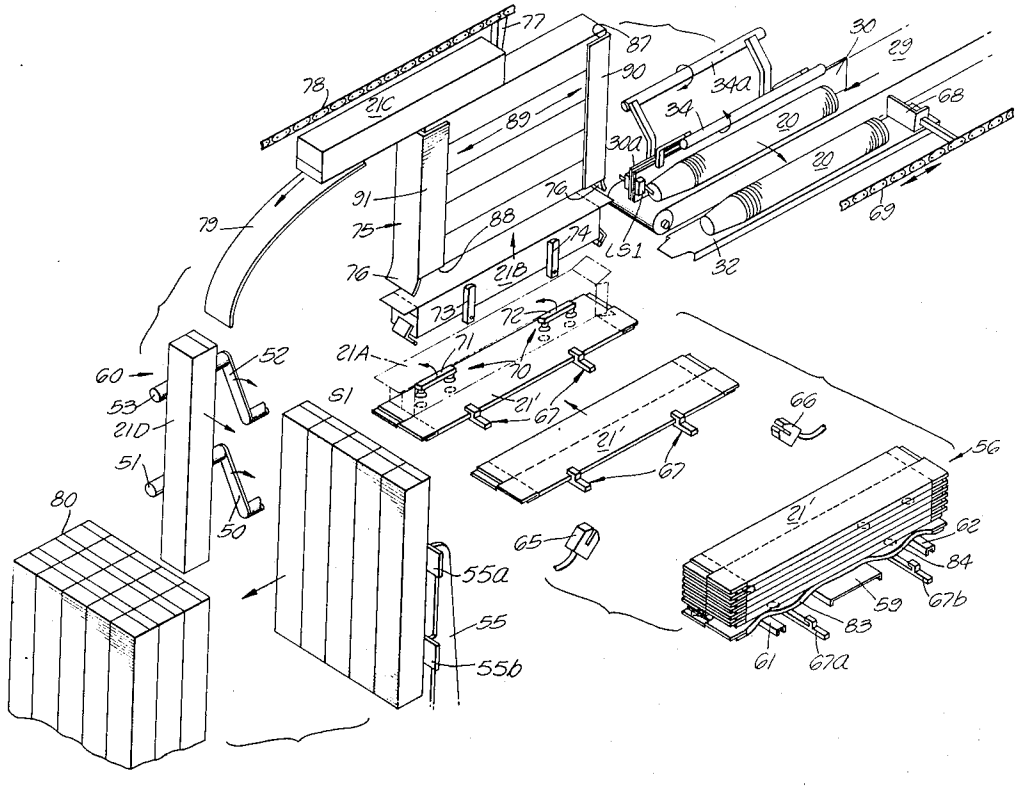
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Assistant Examiner—Horace M. Culver
Attorney—William E. Beatty

[57] **ABSTRACT**

Automatic cartoning machine for glue end carton including twin cartoning units mounted in a common framework conveying side-by-side two stacks of cups or other articles, one stack for each unit. The units are similar, having their loading stations adjacent each other to receive the articles fed to them by the conveyer. Each unit has a plurality of cams making one complete revolution for one cycle of operation. Each cycle includes removing a collapsed carton from the bottom of a magazine, transferring it to a combined loading and squaring-up station where the stack of cups is loaded into the carton. The cycle is started by arrival of a stack of cups at a station which transfers the stack to a loading tray which holds the flaps open at the adjacent or outer end of the carton for easy insertion of the stack by a plunger. The cycle is terminated by one complete revolution of the cams. The minor flaps pass through a glue applicator on the way to that station. After the flaps are partially sealed at both ends of the carton, the carton is elevated to travel through a compression chute which completes the sealing of the flaps. The carton is then ejected in upright position to an accumulator. The accumulator operates in timed relation with the transfer of the cup stack from the conveyer to the loading tray, to prepare one cycle for starting at the successful completion of the preceding cycle.

20 Claims, 35 Drawing Figures



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SHEET 01 OF 15

FIG. 1a.

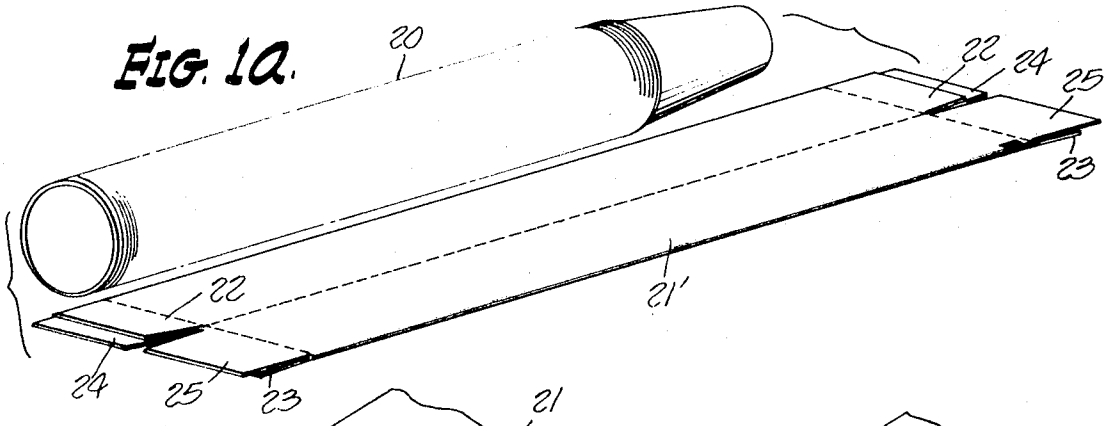
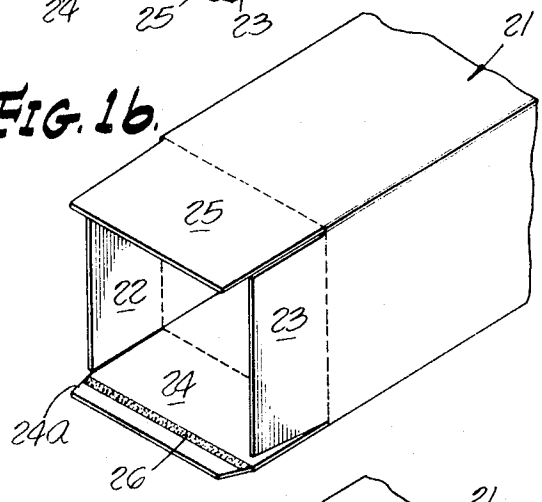


FIG. 1b.



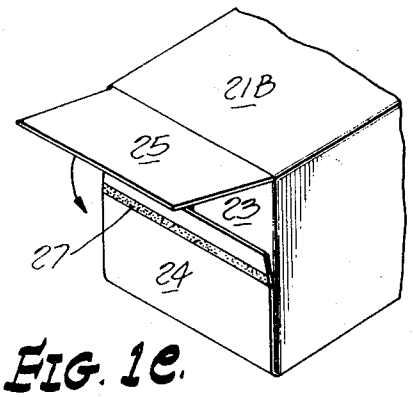
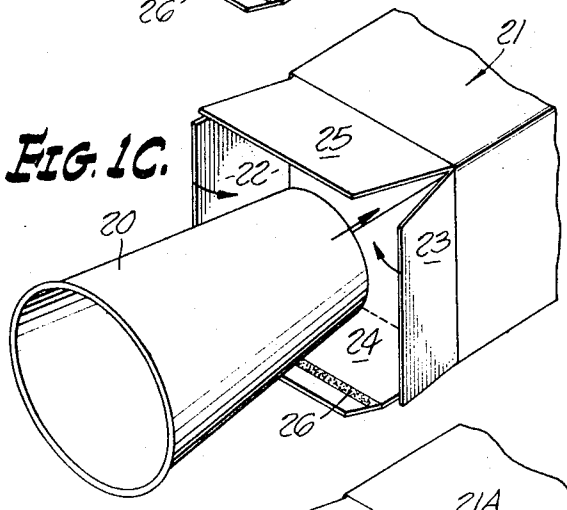


FIG. 1e.

FIG. 1c.



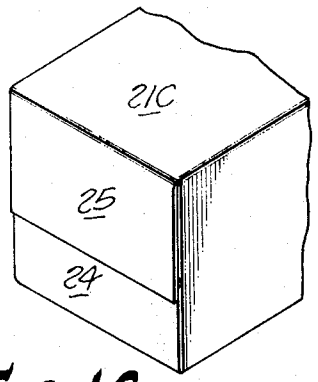
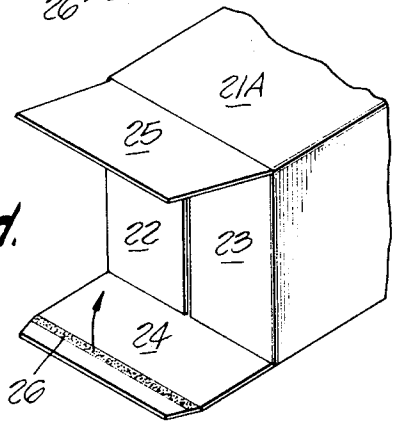


FIG. 1f.

FIG. 1d.



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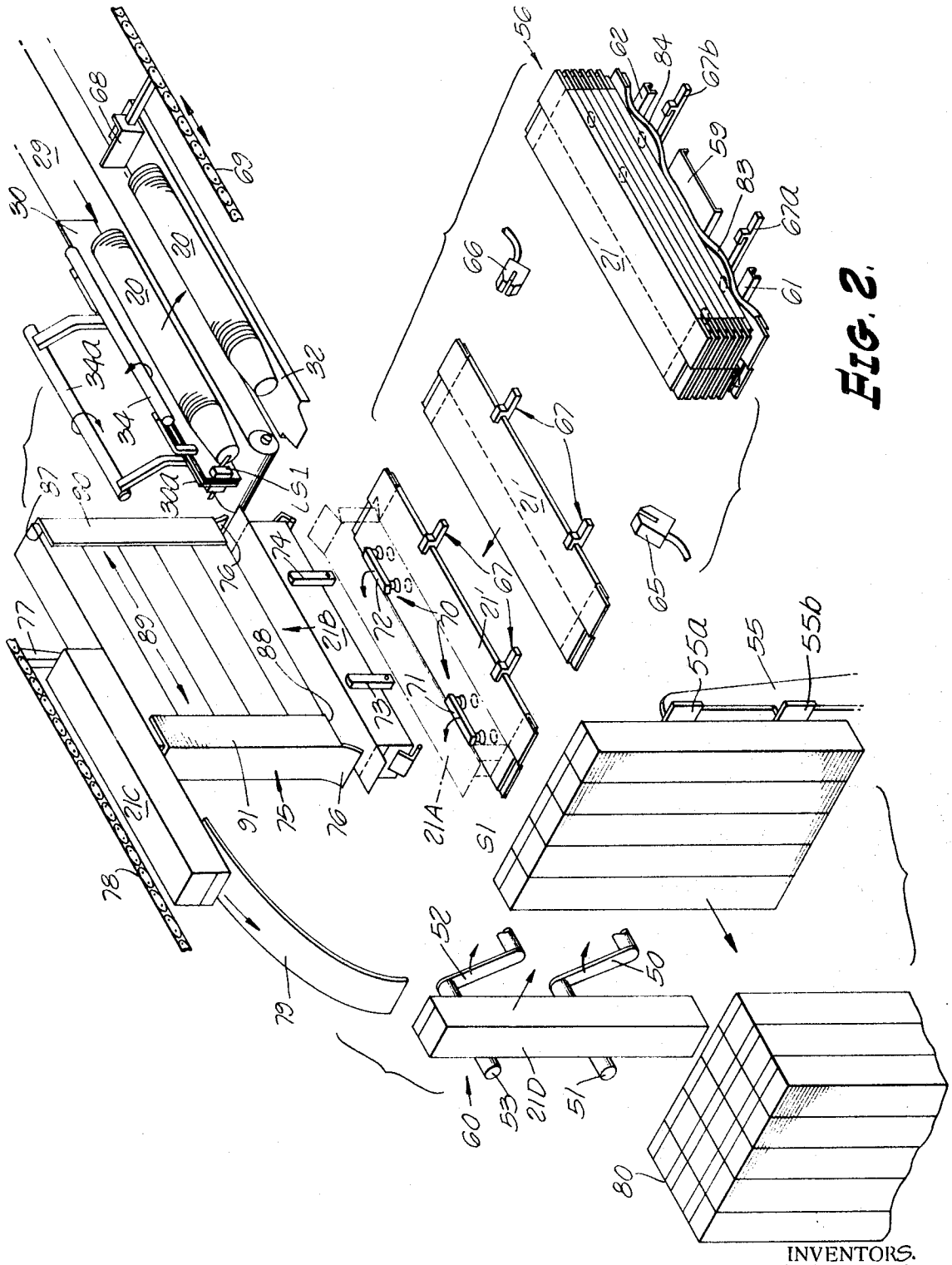


FIG. 2.

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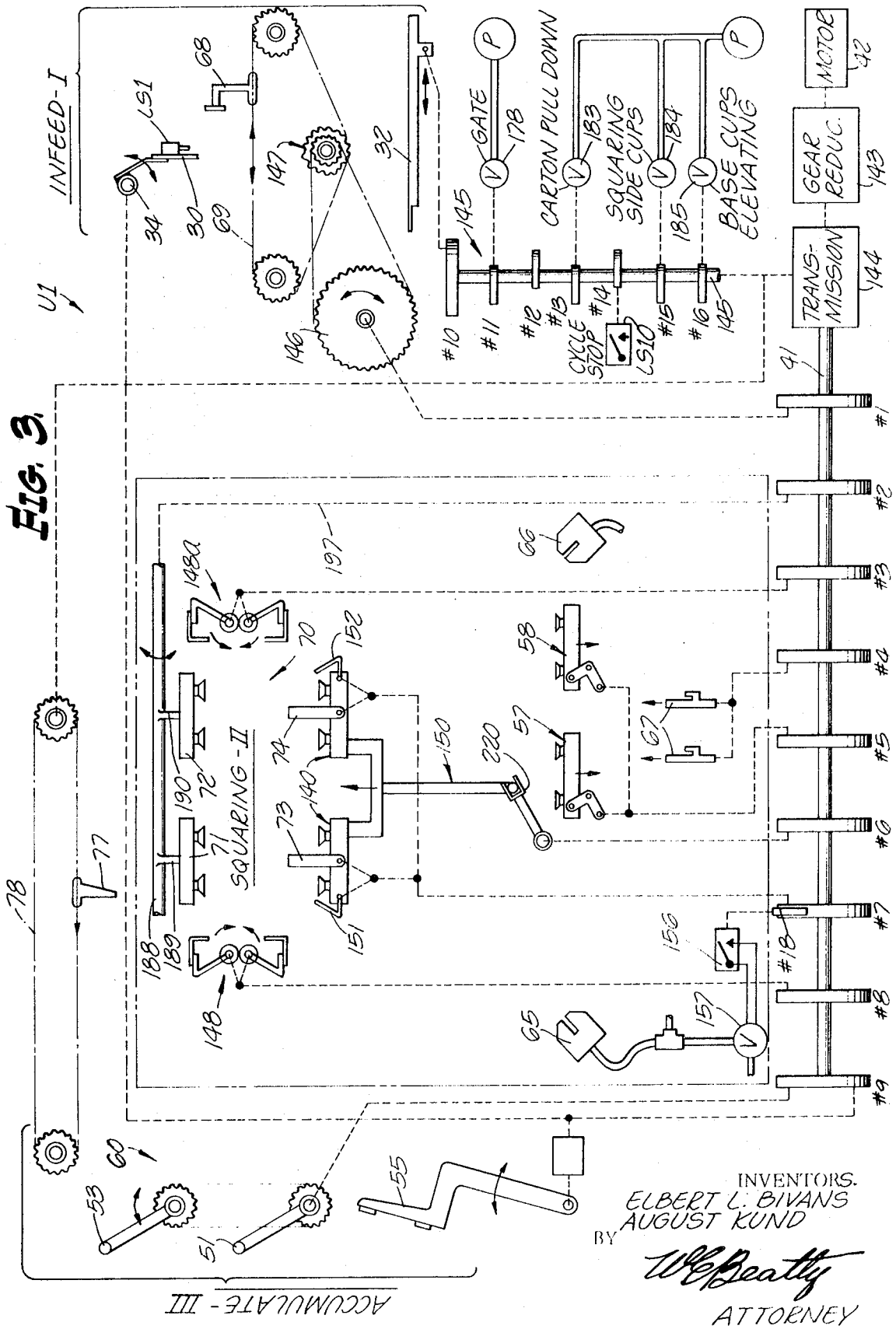


Fig. 3.

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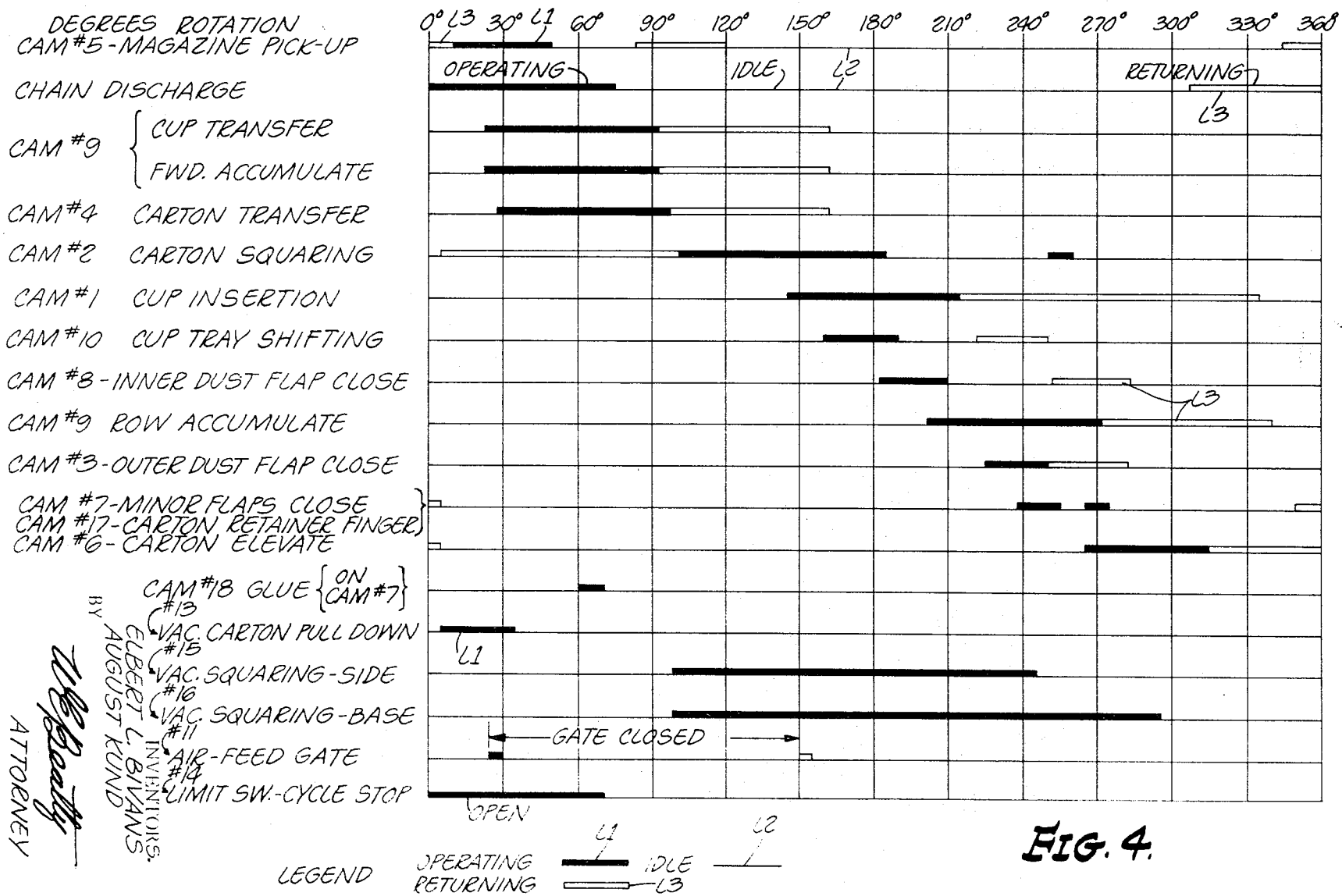


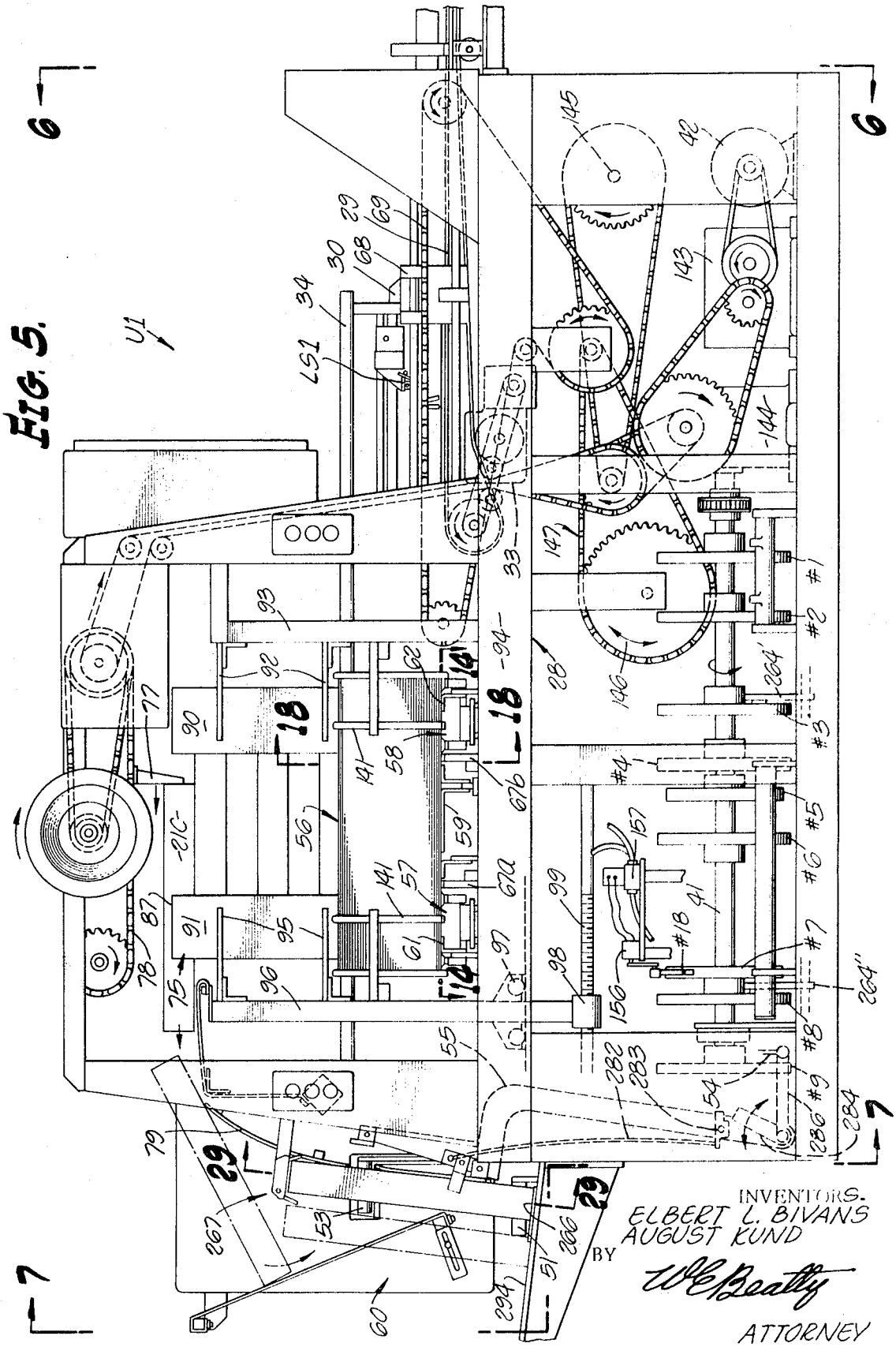
FIG. 4.

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FIG. 5.



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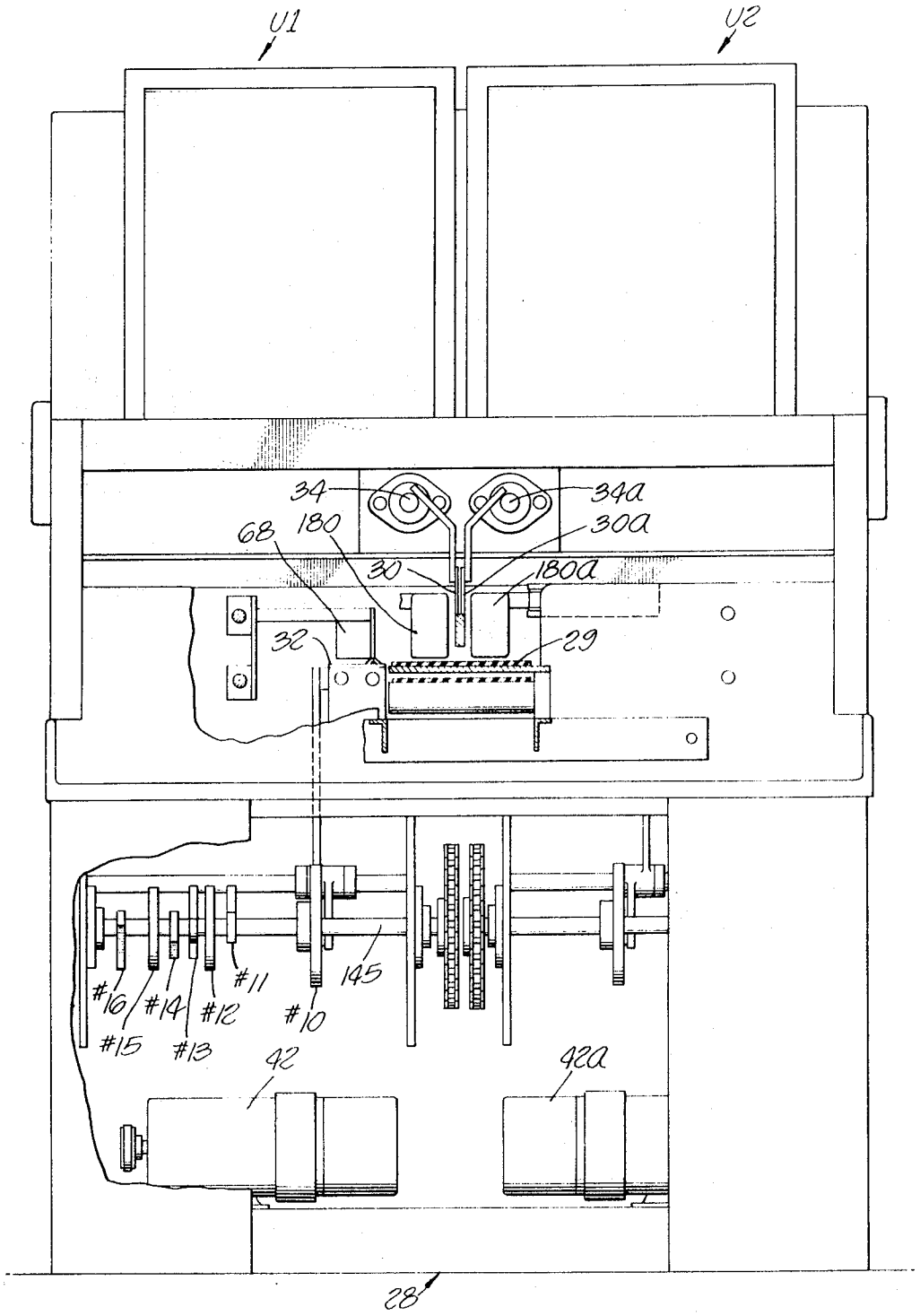


FIG. 6.

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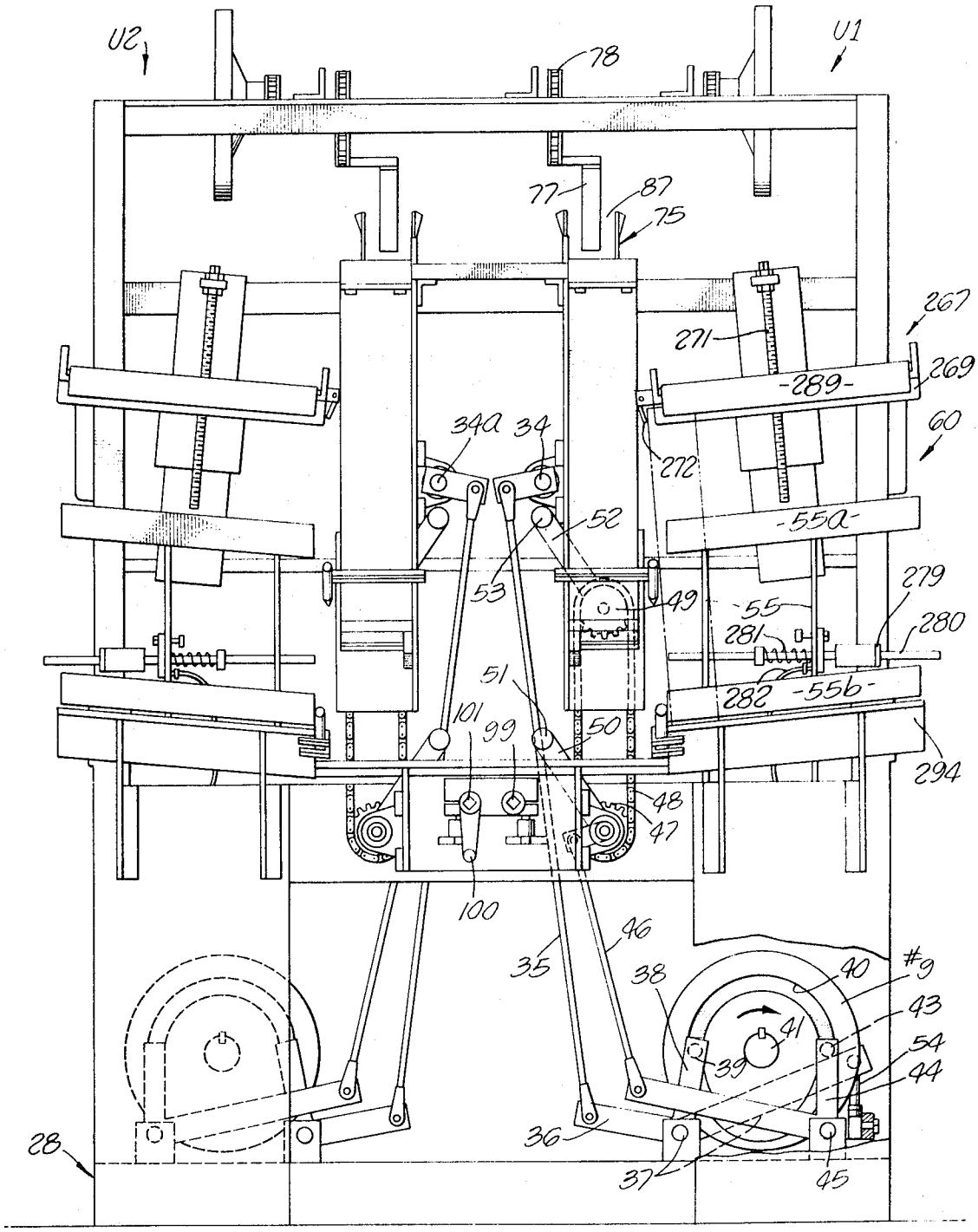


FIG. 7.

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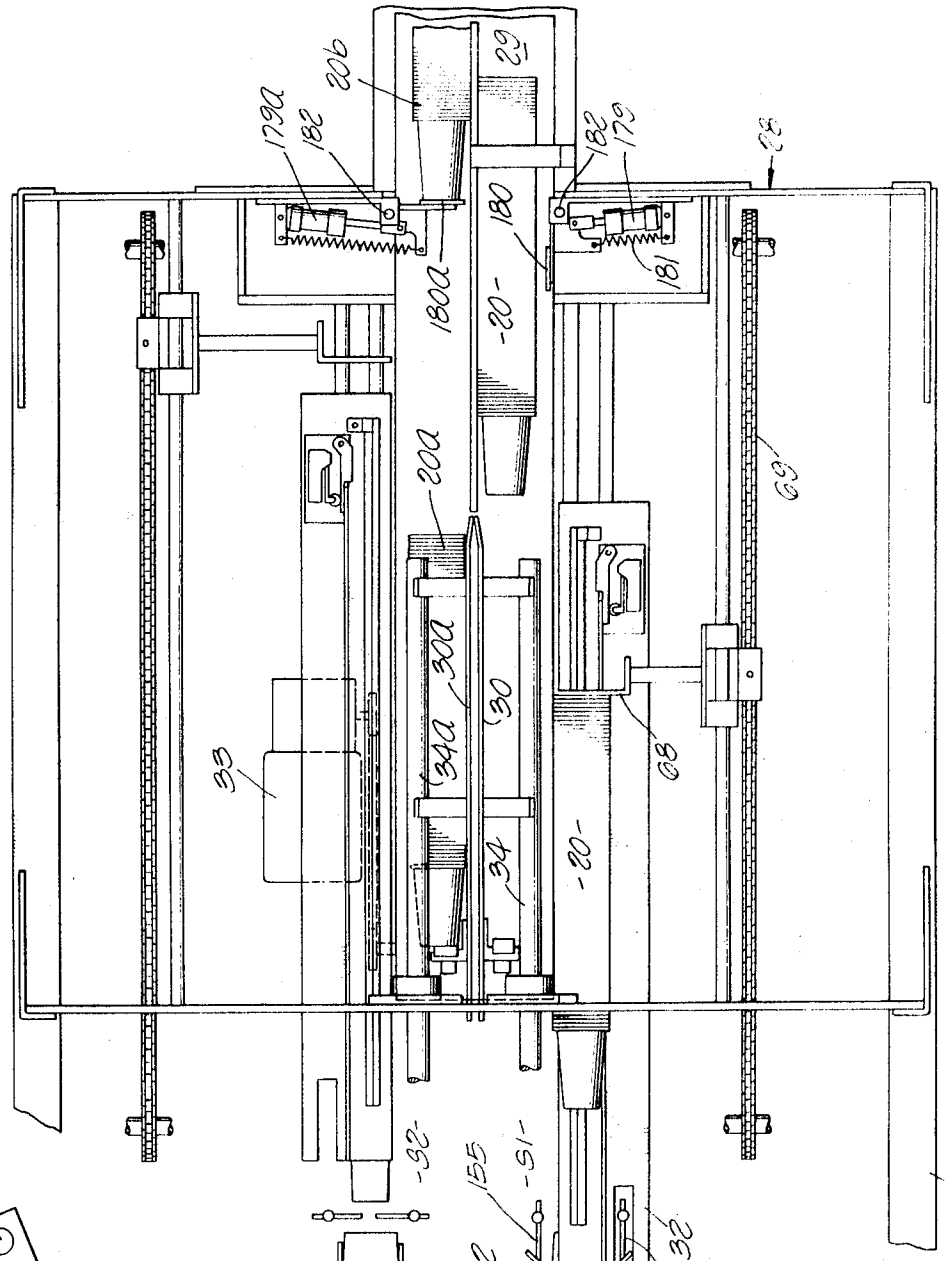


FIG. 8.

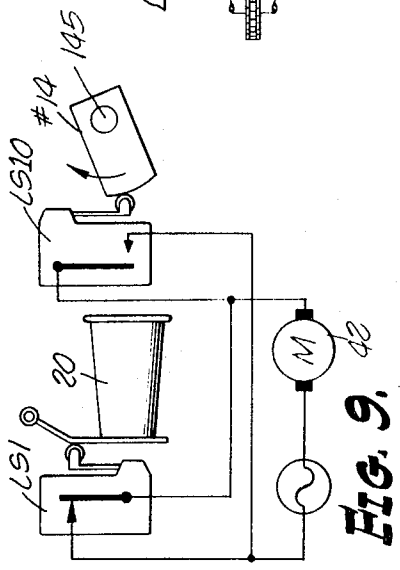


FIG. 9.

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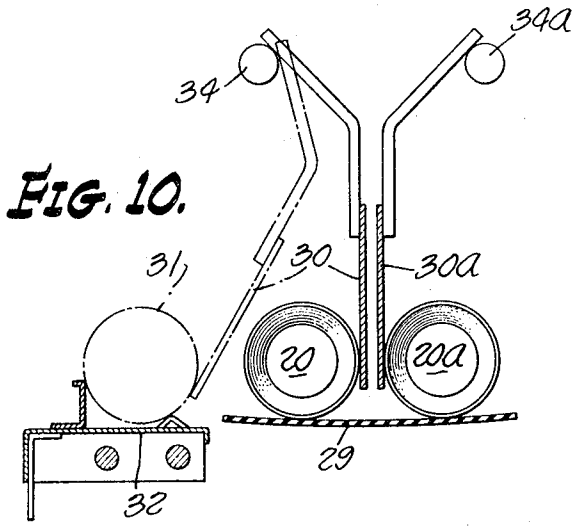


FIG. 10.

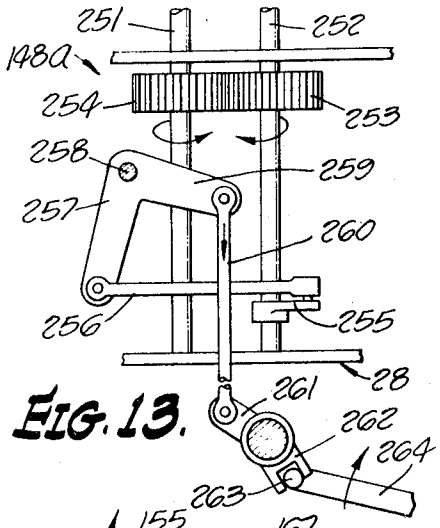


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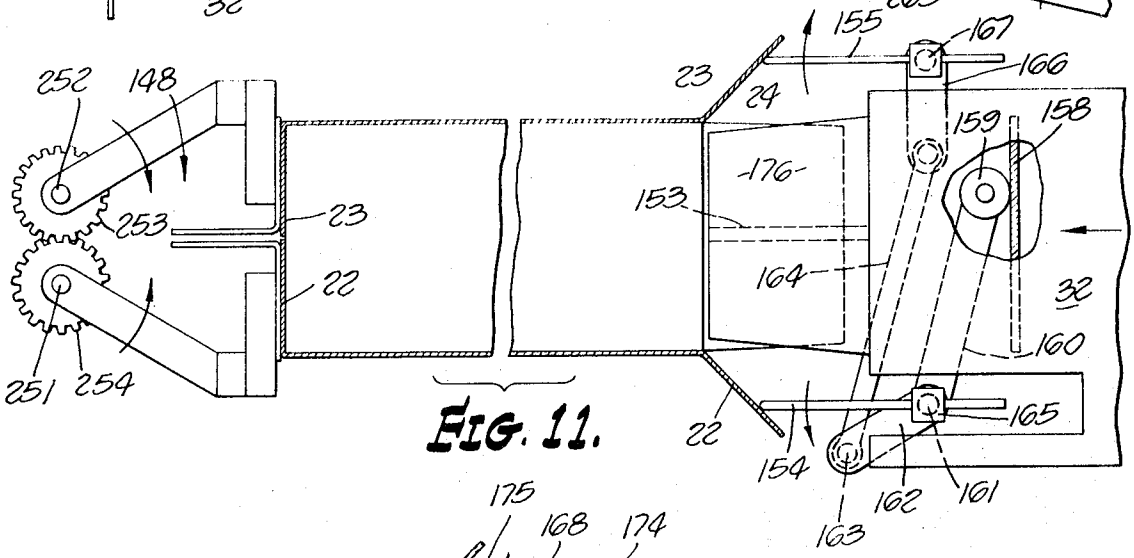


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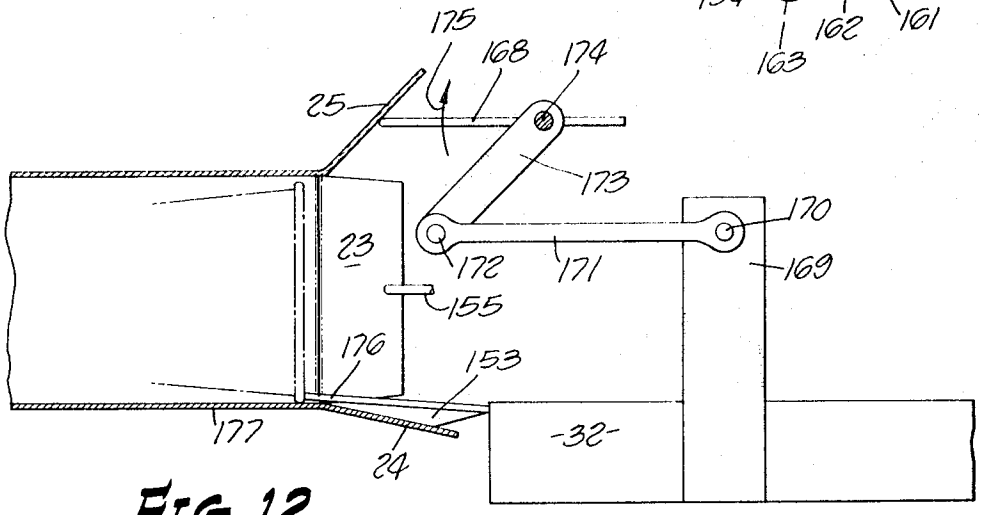


FIG. 12.

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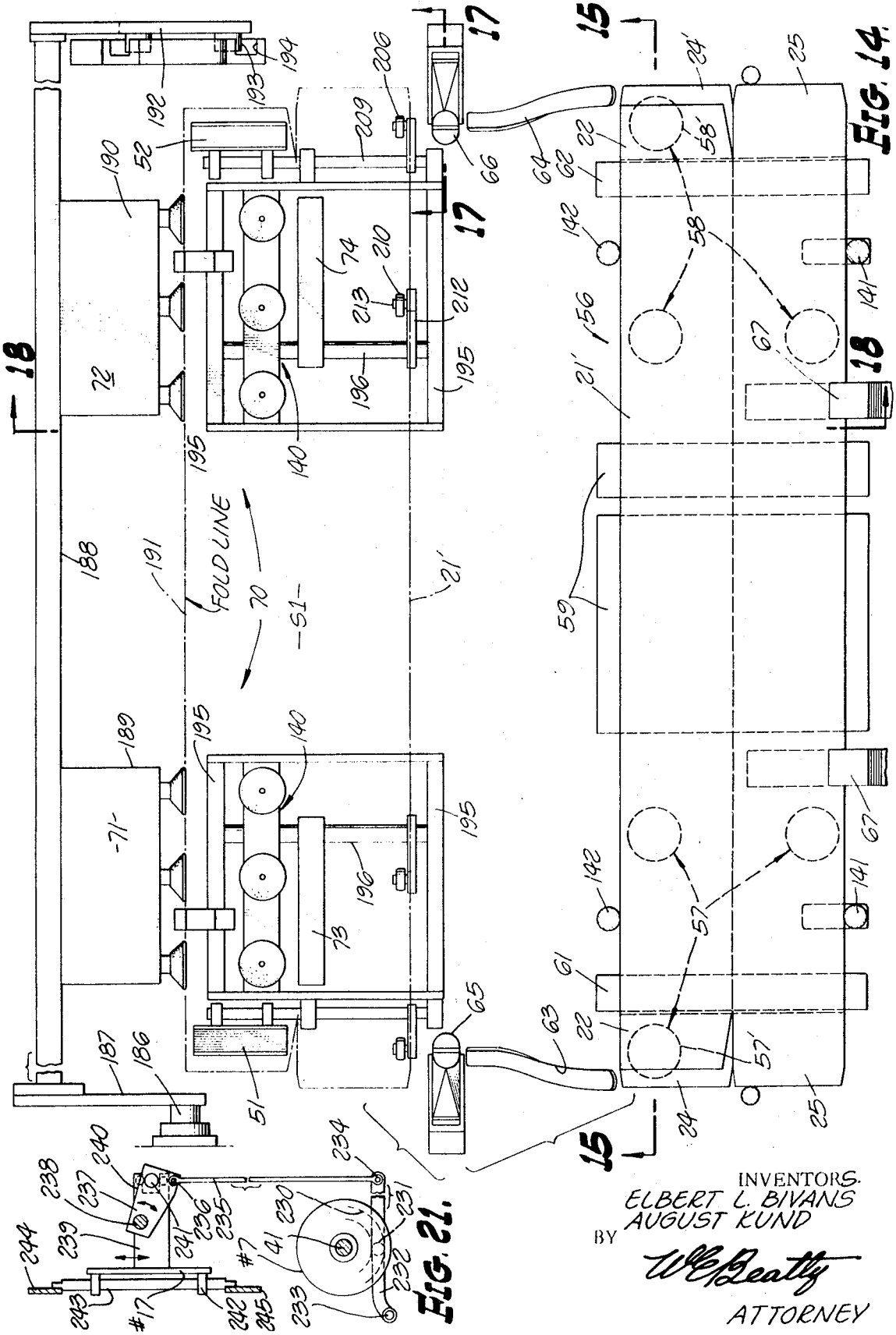


Fig. 14.

Fig. 21.

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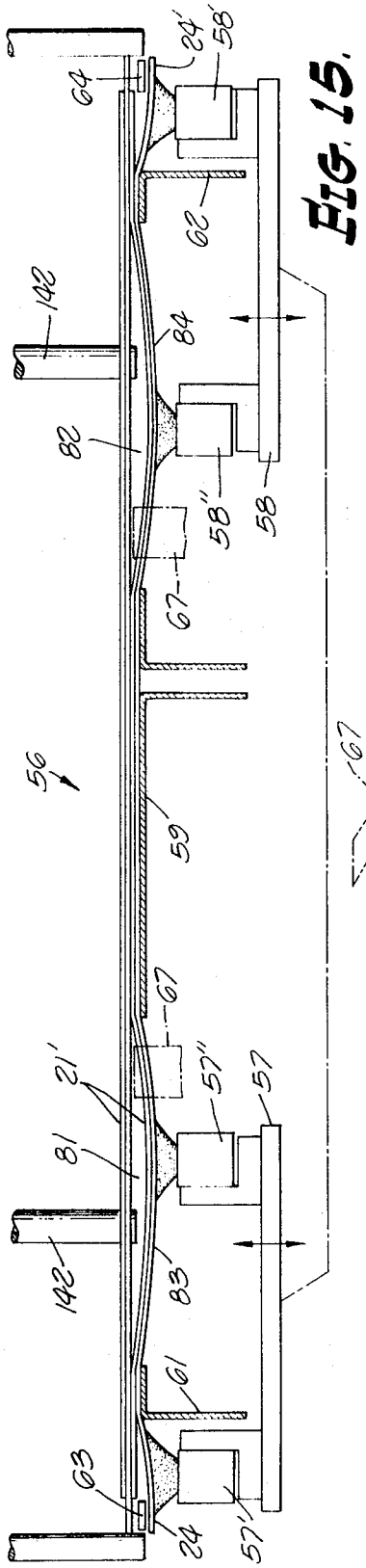


Fig. 15.

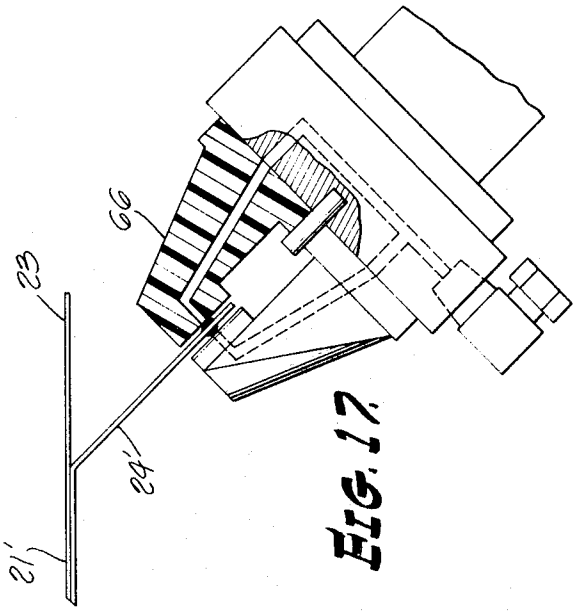


Fig. 17.

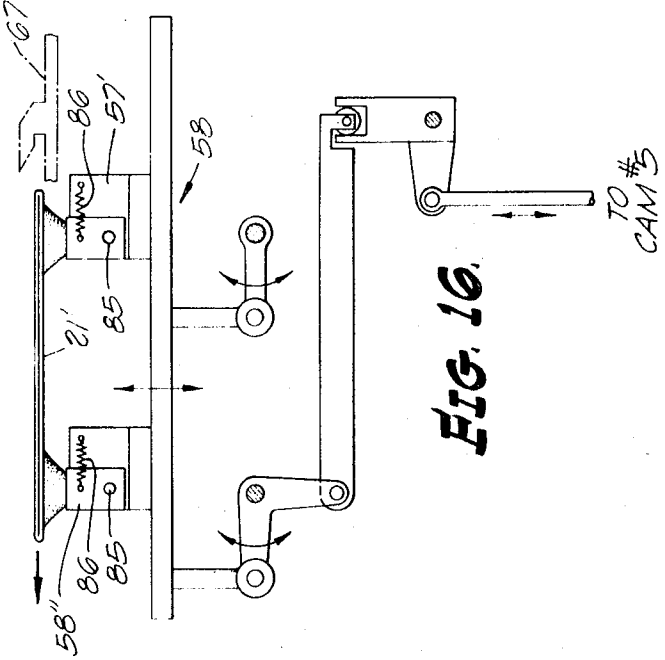


Fig. 16.

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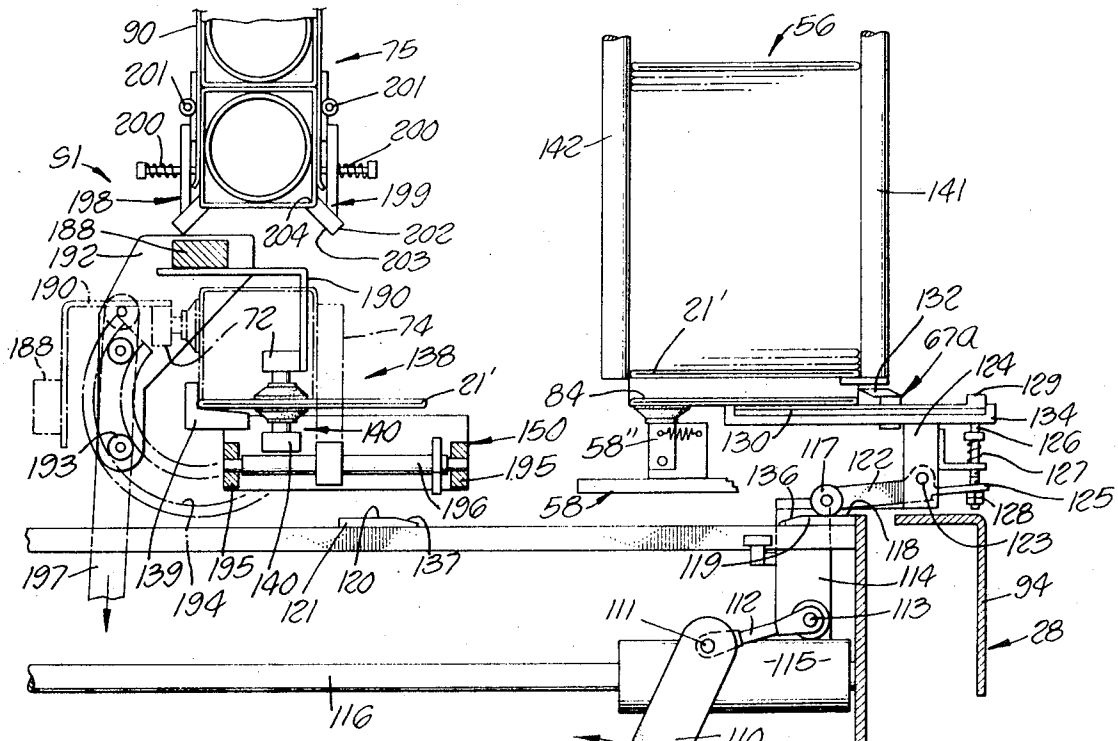
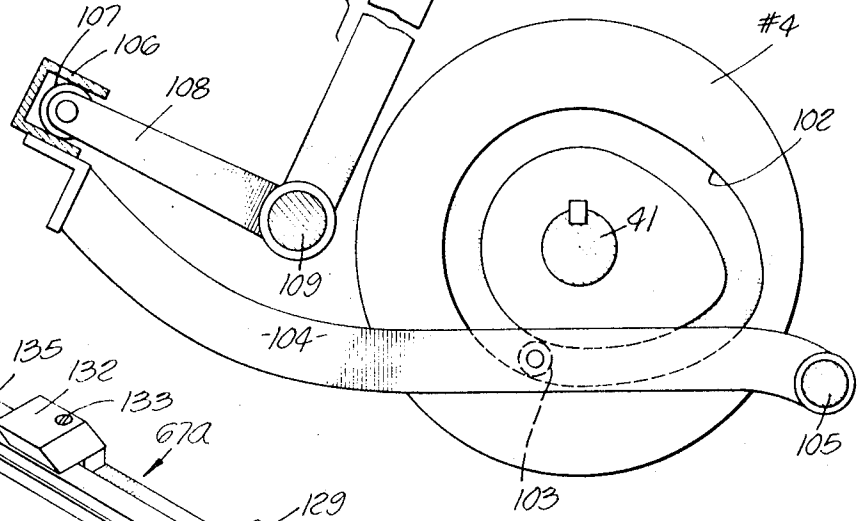


FIG. 18.



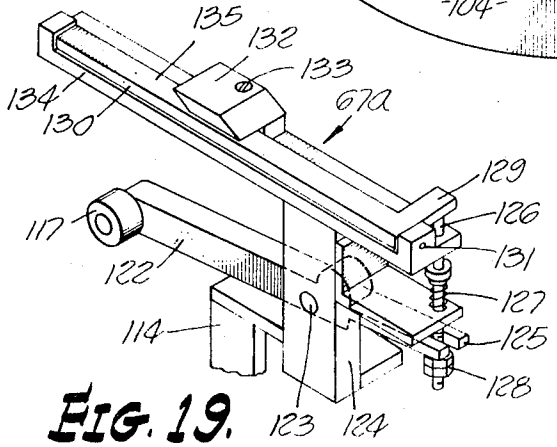


FIG. 19.

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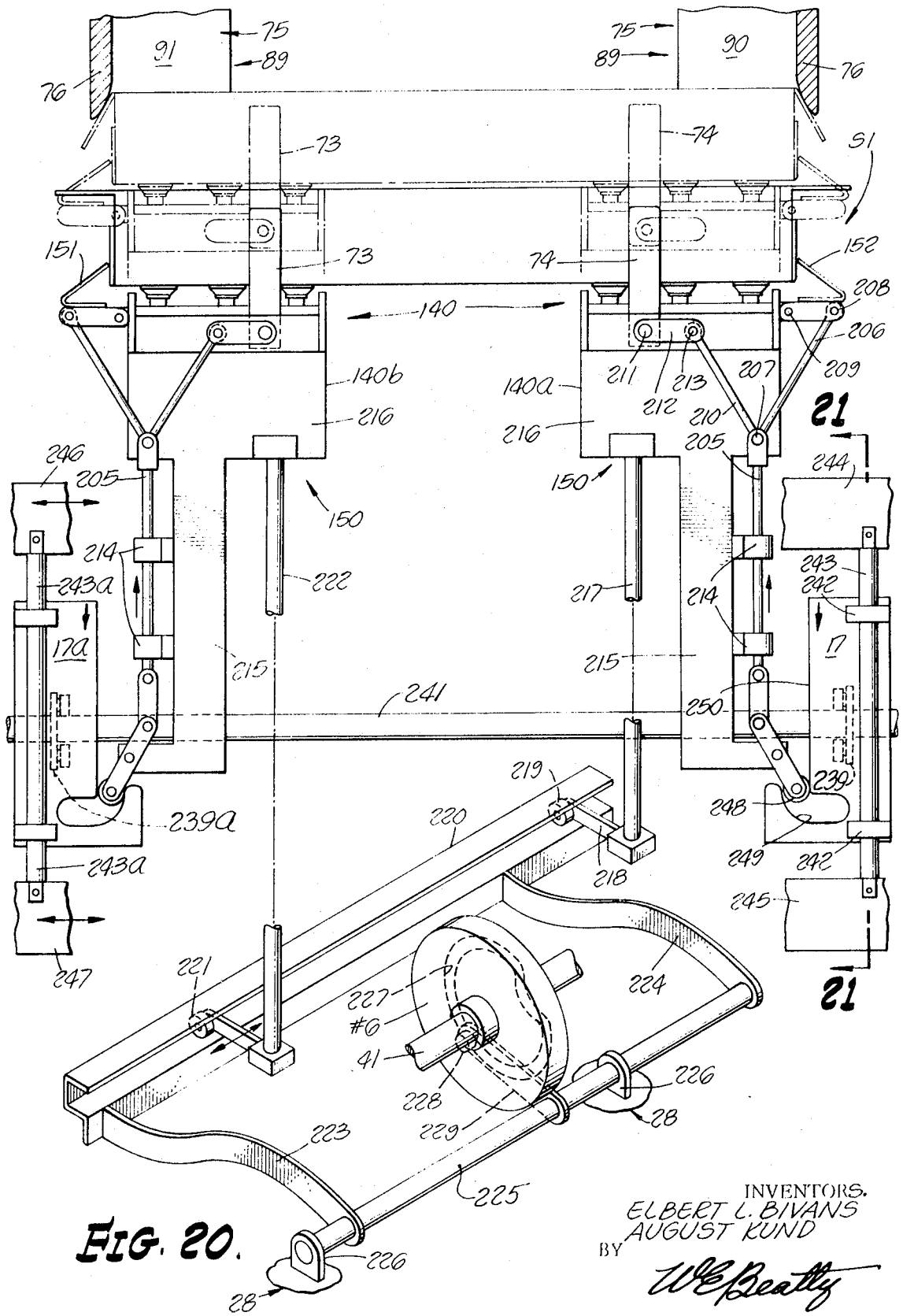


FIG. 20.

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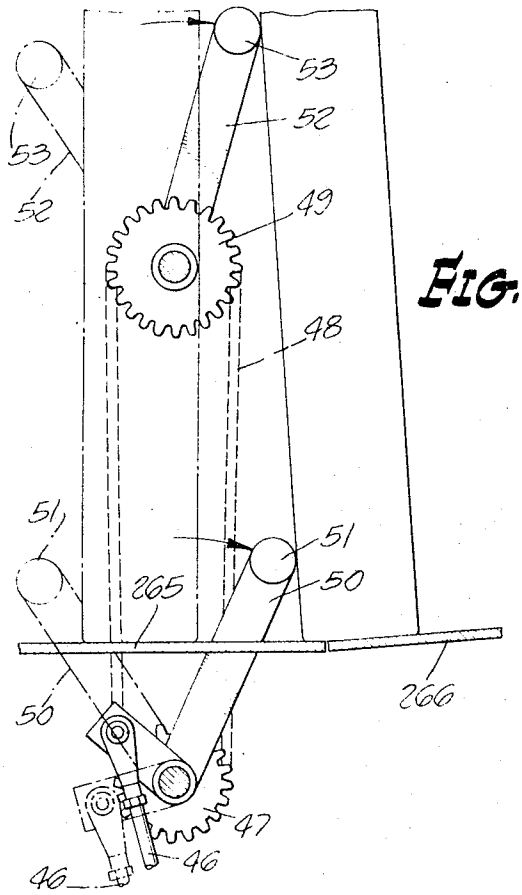


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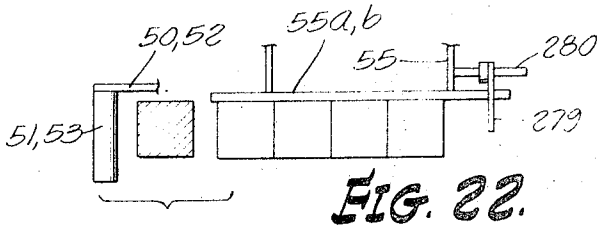


FIG. 22.

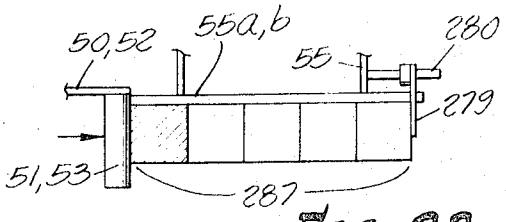


FIG. 23.

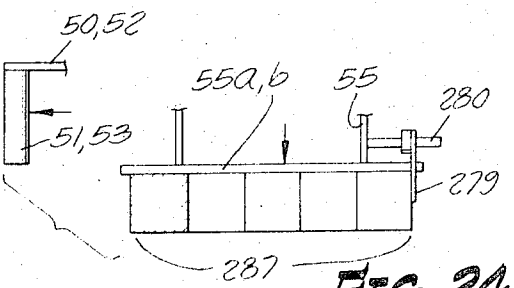
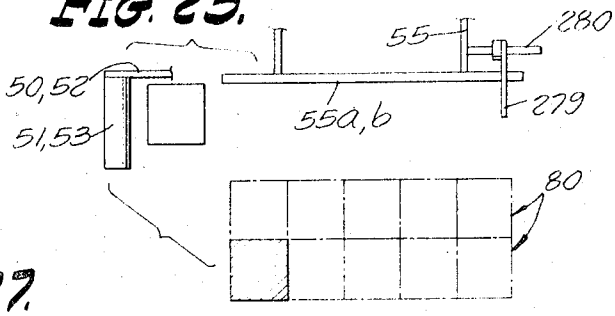


FIG. 24.

FIG. 25.



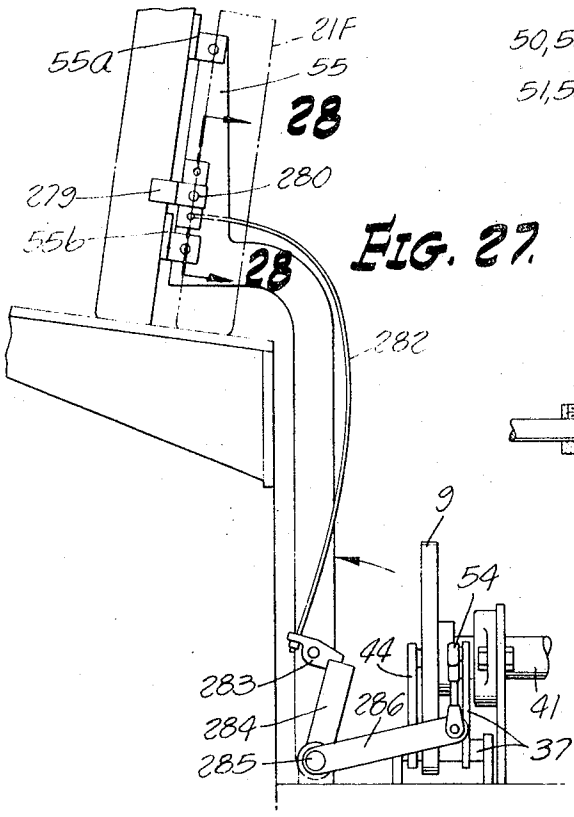


FIG. 27.

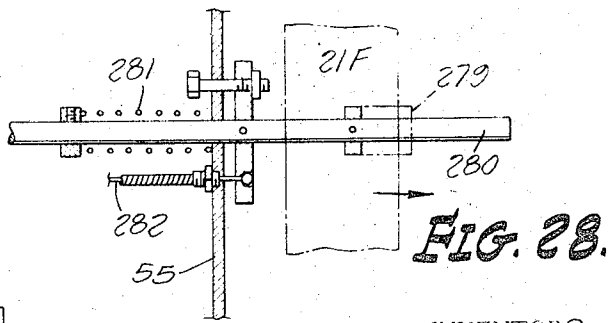
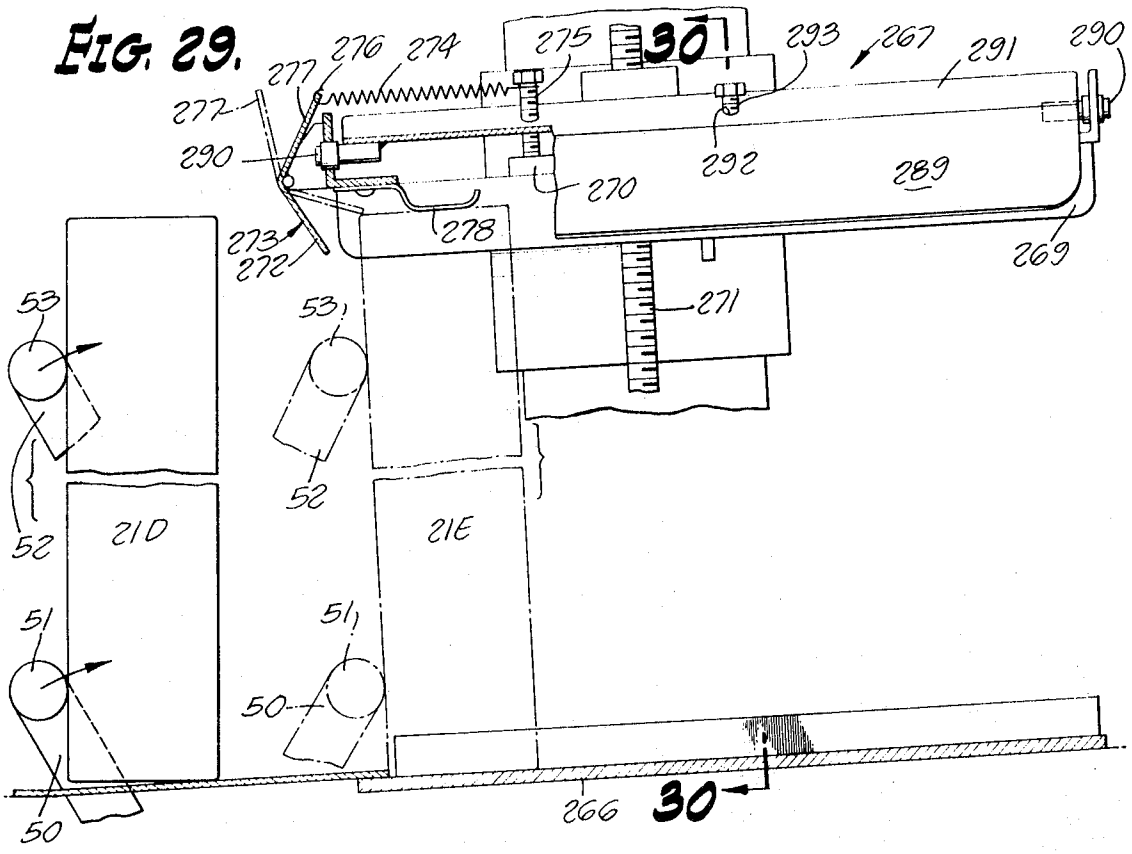


FIG. 28.

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FIG. 29.



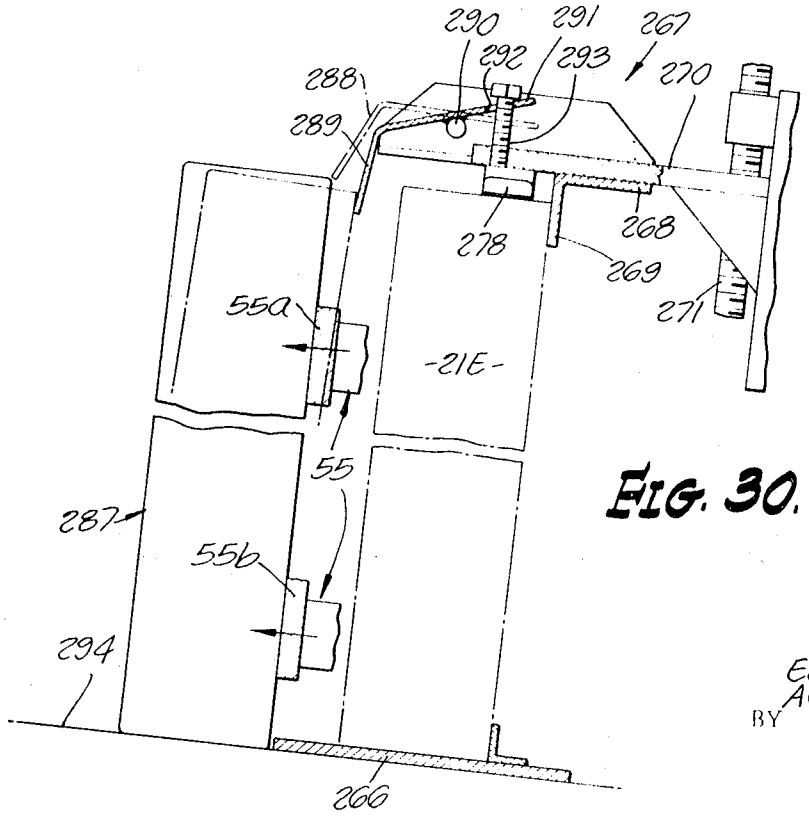


FIG. 30.

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AUTOMATIC CARTONING MACHINE FOR GLUE END CARTON

CROSS REFERENCE TO RELATED APPLICATION

The present case claims the accumulator in combination with the cartoning operation. The accumulator separate from that combination is described and claimed in copending application Ser. No. 9,724, filed Feb. 9, 1970, now U.S. Pat. No. 3,620,386, by applicants for ACCUMULATOR FOR CARTONING MACHINE.

BACKGROUND OF THE INVENTION

1. Field of the Invention

Automatic cartoning machine for cartons having flaps at both ends sealed by glue. The machine includes twin units having a conveyer common thereto for supplying articles to be loaded into cartons opened up, squared and sealed by each unit.

2. Description of the Prior Art

The prior art includes a number of U.S. patents owned by the assignee hereof as well as patents to others, disclosing cartoning machines, e.g., KUCKLINSKY ET AL U.S. Pat. No. 2,916,974, Dec. 15, 1959; JONES U.S. Pat. No. 2,133,248, Oct. 11, 1938; BIVANS U.S. Pat. No. 3,432,984, Mar. 18, 1969; BIVANS U.S. Pat. No. 3,373,665, Mar. 19, 1968; BIVANS U.S. Pat. No. 2,682,209, June 29, 1954; ENGLESON ET AL U.S. Pat. No. 3,074,326, Jan. 22, 1963. So far as known, none of the prior patents disclose the following features listed under the next heading.

SUMMARY OF THE INVENTION

The invention includes twin cartoning units having a common conveyer and a number of features peculiar to each unit such as an improved shuttle for transferring the collapsed carton from a magazine to a squaring-up station, gluing the minor flaps before the carton is squared up, squaring up and loading or packing an article into the carton and partially closing the flaps at the same station having an elevator, completing closing and sealing the flaps by operating the elevator to raise the loaded cartons into and through a compression chute, both the shuttle and the elevator having a pair of members for longitudinal adjustment to suit cartons of different lengths, with a sliding pivotal connection for driving both members of the shuttle by one cam drive, a similar sliding pivotal connection being provided for one cam drive for both members of the elevator. An accumulator is provided for accumulating the loaded and sealed cartons in upright position in rows and columns in timed relation with the transfer of the stack of cups or similar article from the conveyer to a loading tray for the cups. A loading tray holds the flaps open at the adjacent end of the carton and serves as a stop to prevent the inserted cup stack from bouncing out from the open end of the carton. The operation of the cartoning mechanisms is controlled by means of a series of cams making one revolution for one cycle of operation, the cycle being started by a switch actuated by the cup stack arriving at a station where the cup stack is transferred from the conveyer to a cup loading tray. The cycle is stopped by a switch operated after the cams have made one complete revolution. A gate halts arrival of the cup stack on the conveyer until the preceding cup stack has been processed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1*a* is a perspective view of an article consisting of an elongated stack of paper cups to be loaded into a carton, this figure showing the carton in collapsed form.

FIGS. 1*b* to 1*f* are perspective views of one end of the carton showing the flaps in various positions.

FIG. 2 is a schematic perspective view with parts broken away showing one unit of a twin unit cartoning machine for loading the cups in the cartons with an accumulator for the filled and sealed cartons.

FIG. 3 is a schematic view showing the motor drive for the cam shafts having a total of 17 cams, this figure indicating the element controlled by each cam. This figure consists of three main sections, INFEED — I, SQUARING — II, ACCUMULATE — III.

FIG. 4 is a timing chart for the various cams.

FIG. 5 is a side view in elevation of the left-hand one of two cartoning units, considering that the right-hand side of FIG. 1 is the inlet, the cups or similar article being supplied at the front of the machine as also appears in FIG. 2. This view shows cams No.1 to No.9 as indicated on FIG. 2, but does not show the cam followers or driven mechanical connections for these cams.

FIG. 6 is a front elevation looking in the direction of the arrows on line 6—6 in FIG. 5. The cams shown here correspond to the cams No.10 to No.16 in FIG. 3. In the drawings, the unit on the left side is shown in detail, the unit on the right side being exactly the same except for cam No.4 and its operated drive which is different because of the different traverse of the shuttle which picks up the flat carton.

FIG. 7 is a rear view in elevation, the left unit being shown on the right-hand side of the figure, looking in the direction of the arrows on line 7—7 in FIG. 5.

FIG. 8 is a plan view of the inlet end of both units showing one conveyer which serves both units.

FIG. 9 is a schematic circuit showing the article control for starting the motor at the start of a cycle. This cycle corresponds to one rotation of the cam shaft which has a cam for stopping the motor at the end of the cycle.

FIG. 10 is an enlarged view in vertical section showing cross transfer arms for transferring the stack of cups from a conveyer to one unit indicated or to the twin unit not indicated.

FIG. 11 is a schematic view showing the dust or side flap closures in position to act as a stop at the time that the loading tray is advanced to hold the flaps open at the other end of the carton to facilitate entry of the cups.

FIG. 12 is a vertical sectional view with parts broken away showing the cup tray in position at the outer end of the carton.

FIG. 13 is a detail of the mechanism for operating the dust flap closures, this apparatus being the same for both ends of the carton but being operated at different times by different cams.

FIG. 14 is a plan view on line 14—14 of FIG. 5 looking in the direction of the arrows and showing a collapsed carton in a magazine ready to be transferred to a squaring-up station.

FIG. 15 is a sectional view on line 15—15 of FIG. 14 showing the carton and lowermost flap pulled down.

FIG. 16 is a schematic side view in elevation showing the collapsed carton pulled down from the magazine in position for engagement by a shuttle.

FIG. 17 is an enlarged view on line 17—17 of FIG. 14, partly in section, showing the minor flap at one end of the carton in position to pass through a glue applicator for applying glue to opposite sides thereof, a similar applicator indicated in FIG. 14 being provided for the minor flap at the other end of the carton.

FIG. 18 is an enlarged vertical sectional view on line 18—18 of FIGS. 5 and 14 showing cam No.4 and mechanism operated thereby for operating one of the two shuttle members, the other one being similar, adjustable lengthwise to suit cartons of different lengths by reason of a sliding pivotal connection, and both members being driven by the same cam No.4 which is rotated about a vertical axis 90 degrees from its true plane shown in FIG. 3. This figure also illustrates a chute for receiving the loaded cartons.

FIG. 19 is a perspective view showing a detail of the shuttle.

FIG. 20 is a side view in elevation with parts broken away showing the two elevator members which feed the filled carton into the lower end of a compression chute leading to the accumulator, with their common adjustable elevator cam drive and also the sliding cam for driving the minor flap tucker at the inner end of the carton and support arms, cam No.6 being rotated 90 degrees out of its true plane, the sliding

pivotal connection permitting longitudinal adjustment of the two elevator members to suit cartons of different lengths.

FIG. 21 is a sectional view on line 21—21 of FIG. 20 showing a rotary cam for operating the above-mentioned reciprocating cam.

FIGS. 22, 23 and 24 are schematic plan views which illustrate the accumulation of the upright filled cartons in a row, and FIG. 25 is a schematic plan view which illustrates the step-by-step advance of the filled rows to form a bundle.

FIG. 26 is a vertical sectional view showing cross transfer arms wherein the lower one has a greater range of movement than the upper one to shift the upright carton from a vertical position on a horizontal platform to a tilted position upright with respect to a tilted extension of the platform.

FIG. 27 is a side view in elevation showing the accumulator mechanism for advancing a row of filled cartons.

FIG. 28 is an enlarged sectional view on line 28—28 of FIG. 27 showing the trigger finger operated by the leading carton when a row is filled to advance the row.

FIG. 29 is a view in elevation, partly in section, on line 29—29 of FIG. 5 of the carton retainer which admits the individual cartons to form a row, preventing them from receding.

FIG. 30 is a view in elevation, partly in section, of the carton row retainer for permitting ejection of the whole row and preventing it from receding, taken on the line 30—30 of FIG. 29.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings, FIG. 1a shows a stack of paper cups indicated at 20, typical of a desired article to be inserted into the carton. The stack 20, in fact, may be from 50 to 100 cups, and this stack is the preferred type of article to be loaded or packed into a carton indicated at 21′ in collapsed form. The carton is identified by reference number 21 in FIGS. 1*b* and 1*c* with its flaps 22 to 25 open. When the cup stack 20 is being inserted in the outer end of the carton as shown in FIG. 1*c*, the dust flaps like 22 and 23 are closed at the opposite end, this condition of the carton being indicated by reference number 21A, see FIG. 1*d*. When the minor flap like 24 is closed at both ends of the carton, this condition is indicated by reference number 21B, see FIG. 1e. When all the flaps at both ends are closed with the contents 20 in the carton, this condition is indicated by reference number 21C as shown in FIG. 1f. For example, the carton may be from 17 inches to 27 inches long and from 1 ¾ inches square to 4 inches square. The cartoning machines disclosed herein are adjustable to accommodate these dimensions.

The carton 21 is a standard four-flap glue-up carton and has four panels mutually at right angles when the carton is open or squared up as shown in FIG. 1*b*. The carton 21 has side or dust flaps indicated at 22 and 23, a lower or minor flap 24 and a major flap 25, these flaps being provided at opposite ends of the carton. Glue is applied to the lines or strips indicated at 26 on the inside of minor flap 24 and on the directly opposite line 27 on the outside of flap 24 whereby on first closing the dust flaps like 22 and 23 to abut, as shown in FIG. 1*d*, later closing of minor flap like 24, as shown in FIG. 1e, adheres it to the dust flaps, and final closing of the overlapping major flap like 25, as shown in FIG. 1*f*, seals it to flap 24. When the carton is collapsed as shown at 21′, the end of minor flap 24 extends beyond the outer end of dust flap 22 as indicated at 24*a*, and the glue strips 26 and 27 are applied to this extension in position so that strip 26 will not be contacted by the lug 153 on the loading tray 32 in FIG. 12 or by the side flap openers 154 and 155, FIG. 11, and the strip 27 will not be contacted by the flap closures at either end of the carton.

FIG. 1*c* illustrates that the carton 21 is in horizontal position at the time that the stack 20 is inserted lengthwise into the carton.

The article to be inserted in the carton may be of some other nature than a stack of paper cups.

The invention provides a twin automatic cartoning machine having a common framework indicated at 28 in FIGS. 5, 6 and 7, the unit on the left U1 appearing in side elevation in FIG. 5 and a rear elevation in FIG. 7 showing the unit U1 on the right-hand side and the similar unit U2 on the left-hand side. Each unit is complete with its motor, cam drive and cartoning mechanism all as shown schematically in FIG. 3 which details the unit U1. FIG. 6 is a front view of the twin machine, the view being taken in the direction of the arrows on line 6—6 of FIG. 5, the unit U1 appearing on the left and the similar unit U2 appearing on the right. These two units U1 and U2 have a combined operation in that their inlets or loading stations S1 and S2 as shown in FIG. 8, where the cup stacks 20 and 20a respectively are loaded into their respective cartons, are arranged adjacent to each other and the cup stacks 20 and 20*a* are conveyed by one continuously operating conveyer belt 29 as shown in FIG. 10. Conveyer belt 29 is suitably driven by motor 33, FIG. 8. Each of the units U1 and U2 has a cross transfer arm, arm 30 being provided for transferring the stack 20 laterally in one direction to the position shown at 31 to be received by a loading tray 32, the similar arm 30a for the other unit being actuated in the opposite direction to laterally transfer the stack 20*a* from the conveyer 29 to a tray like 32 not shown for the companion unit. Arm 30 is mounted on an oscillating shaft 34, and arm 30*a* is mounted on shaft 34*a*. These shafts are shown in FIG. 7. Shaft 34 is oscillated by a link connection 35 to a crank 36 having a pivotal support at 37 in the form of a rock shaft and an arm 38 having a cam follower 39 in the cam groove 40 of cam No.9 mounted on the main camshaft 41 driven by motor 42, FIGS. 3 and 5. The cam groove 40 of cam No.9 also has a cam follower 43 which operates a crank 44 having a pivotal support 45, the crank operating link 46 to oscillate sprocket 47 to reciprocate chain 48 and oscillate idle sprocket 49. Sprocket 47 carries an arm 50 having a cross transfer arm 51 of the accumulator 60, and sprocket 49 has an arm 52 having a companion arm 53. Sprocket 47 is smaller than sprocket 49 for a reason explained later. Rock shaft 37 also at the rear of cam No.9, as seen in FIG. 7, rocks lever arm 54 to provide power for actuating the row pusher 55 having cross arms 55*a* and 55*b* of the accumulator 60, see FIG. 3, when a row of filled cartons has been accumulated.

Referring to FIG. 2, the collapsed cartons 21′ are stacked in horizontal position in a suitable magazine 56, see FIGS. 14, 15 and 16, which permits their withdrawal one at a time by a suction head device 57 at one end of the carton and a similar device 58 at the other end of the carton as shown in FIG. 15. In being thus pulled down, the collapsed carton 21′ is lowered to rest on a support 59. The outer end member 61 of support 59 is spaced from the similar member 62 at the other end of the carton by a length corresponding to the length of a carton panel so that the minor flap 24 projects outwardly beyond the support member 61 at one end and the minor flap 24′ projects outwardly beyond support member 62 at the other end. The reason for this is that suction head member 57′ pulls flap 24 down below a track 63, see also FIG. 14, the outer end of minor flap 24′ in being pulled down by suction head member 58′ is similarly pulled down below track 64, the tracks 63 and 64 guiding their respective minor flaps 24 and 24′ through glue applicators 65 and 66 for applying glue as indicated at 26 and 27 in FIGS. 1*b* and 1*e* to the opposite sides of the respective minor flaps in the course of travel of the collapsed carton 21′ from its position below magazine 56 to the combined squaring-up and loading station S1 shown also in FIG. 8.

The carton support 59 also has a gap 81 above the suction head member 57″ and a similar gap 82 above the suction head member 58″ so that these suction heads will buckle the portion of the carton indicated at 83 and 84 between their respective supports to facilitate entry of the members of shuttle 67, as shown in FIGS. 2 and 15.

Details of the shuttle 67 are shown in FIG. 18. See also FIG. 2, wherein the shuttle 67 is in the form of two similar members 67*a* and 67*b*, the former engaging the bulge 83 and 67*b* engag-

ing the bulge 84, these bulges being portions of the collapsed carton 21' bulged by the suction heads 57'' and 58'' as shown in FIG. 15. One of the shuttle members such as 67*a* is shown in detail in FIGS. 18 and 19 wherein the shuttle is reciprocated between the magazine 56 and the combined squaring-up and loading station S1, by means of cam No.4. Cam No.4 has a groove 102 for a cam follower 103 which operates a lever 104 having a pivotal support at 105, the outer end of the lever having a U channel 106 forming a slidable pivotal connection with a roller 107 at the outer end of a crank lever 108 pivotally connected at 111 to a link 112 pivotally connected at 113 to a shuttle carriage 114. The carriage 114 includes a hollow cylindrical slide bearing 115 which slides on the fixed shaft 116. The shuttle member 67*a* has a cam roller 117 which holds the shuttle open in the position shown in FIG. 18 when the cam roller 117 is on the land 118 of a stationary cam 119, in position to engage the edge of the flat carton 21', and also open when cam roller 117 is on the land or raised portion 120 of a reverse cam 121 when the carton has been deposited at the combined loading and squaring-up station S1. The cam roller 117 is mounted on the outer end of a lever 122 pivoted at 123 to a post 124 on the shuttle carriage 114. The opposite end of lever 122 has a fork 125 engaging a plunger 126 urged upwardly by a spring 127. The lower end of plunger 126 has a stop member 128 and its upper end engages the outer end 129 of a clamp member 130 pivoted at 131. The member 130 forms the lower jaw of a clamp having an upper jaw member 132 slidably adjustable in position by means of screw 133 on the base member 134 to accommodate cartons of different widths.

When the cam roller 117 is elevated on land 118 or 120, the jaw or clamp member 130 operates by gravity to open position with respect to the under surface 135 of the upper jaw member 132, the outer end 129 falling by gravity onto the upper end of the retracted plunger 126. When cam roller 117 rides on the incline 136 of cam 119 or on incline 137 of cam 121, the spring 127 operates to clamp the edge of the carton between the clamp member 130 and the inner corner of surface 135 at certain times, and the spring action is removed to release the clamping action at other times, namely the clamp 130–132 is open to pick up a carton from the bottom of magazine 56, the cam roller 117 riding down incline 136 to clamp the carton and hold it clamped until the cam roller arrives at incline 137 to release the clamping action and deposit the carton in the position shown at 138 in FIG. 18 wherein the inner edge or fold line of the carton is in position against the angle block 139 in position to be engaged and held by the lower suction head device 140, the latter being actuated by cam No.5 as shown in FIG. 3. On the return trip to the right, the shuttle members 130–132 are opened by arrival at cam 119 to be in position to engage and clamp the right-hand edge of the carton to hold it thus clamped for transfer to the station S1.

To accommodate cartons of different widths, the posts like 141 in FIG. 18 of the magazine 56 are adjustable, the posts like 142 on the other side of the magazine being relatively fixed.

The shuttle 67 reciprocates between a position below the magazine 56 and the station S1 to transfer the collapsed cartons 21', one at a time, from the bottom of the stack in the magazine, with the minor flaps 24 and 24' of a carton passing through the glue applicators 65 and 66, to the destination at station S1 where the carton is squared up and loaded or packed with the cup stack 20. The carton is squared up by a special device described later and is indicated generally by the reference number 70 in FIGS. 2 and 14. The dust flaps 22 and 23 are moved to closed position shown in FIG. 2 prior to the time that stack 20 reaches that end of the carton. Prior to loading the cup stack 20 into the open carton 21A in FIG. 2, the loading tray 32 with the stack 20 thereon is advanced to the open end of the carton to spread open all of its flaps to facilitate entry of the cup stack which is urged off from tray 32 by a traveling finger 68 carried by chain 69. After the cup stack has entered carton 21A in FIG. 2, the dust flaps at the outer end, where the stack 20 entered, are closed and then the minor flaps are closed, on removing the upper suction heads 71 and 72 forming a part of squaring-up device 70, the arms 73 and 74 are moved to upright position at the side of the carton to support it, the major flaps like 25 extending outwardly somewhat, the carton indicated at 21B in FIG. 2 is elevated into an upright compression chute 75, FIGS. 2 and 5, open at top 87 and bottom 88 and each side as indicated at 89. The chute 75 is adjustable lengthwise to accommodate cartons of different lengths. The chute at opposite sides has an upwardly and inwardly tapered shoe like 76 to close the flaps like 25 at each end as the carton is elevated. The effective width of the chute 75 in a horizontal direction is such that the cartons make a sliding fit in passing upwardly through it, to more effectively seal all of the flaps together at each end of the carton. The elevator is reciprocated so that each lowermost carton of the vertical stack in the chute forces all of the other cartons in the chute upwardly, the topmost carton indicated at 21C being removed by a finger 77 on a chain 78 which operates through one cycle with one revolution of the cam shaft 41.

The chute 75, see FIGS. 2 and 5, is in the form of two upright U channels 90 and 91 each receiving one end of the cartons, but being spaced apart as indicated at 89 to receive the arms 73 and 74 when the filled and sealed container is elevated by cam No.6 into the chute 75. The lower end of each of the side pieces or U channels 90 and 91 of chute 75, as shown in FIG. 18 in respect of the member 90, has mounted on the front and rear walls thereof a pivoted catch 198 and 199 urged to the position shown by springs like 200, each catch having a pivotal support like 201 and at its lower end having a head 202, the inner surface of which has a tapered surface 203 and a shoulder 204. When the upper suction head like 71 has been moved to the broken-line position shown in FIG. 18, and the carton squared up and sealed, the elevator 150, see FIG. 20, elevates the filled carton into the chute 75, acting on the tapered surfaces like 203 of the catches 198 and 199 to spread them apart against the action of the springs like 200, the elevator urging the filled carton upwardly in the chute above these catches which act as a guide for the carton. The catches return to position shown in FIG. 18 under action of spring 200 with shoulders like 204 underlying the carton to prevent it from dropping out of the chute by gravity and supporting it in position to be engaged by and urged upwardly by the next filled carton raised by the elevator.

The U channel or end support 90 is carried by suitable brackets like 92 mounted on an upright support 93 carried by the crosspiece 94 of the framework 28. The channel or end support 91 is carried by a suitable bracket 95 on a post 96 having a roller bearing 97 on crosspiece 94 and arising from a traveling nut 98 mating with the screw shaft 99 which can be operated by a handle like 100, see FIG. 7, which is shown on the similar shaft 101 for the companion cartoning unit U2. By operating the shaft 99 or 101 the separation of the U channels 90 and 91 and associated elements including one end of the magazine, one of the transfer members and one of the squaring-up members can be adjusted to suit cartons of different lengths. Also the chute, magazine, the shuttle, the pulldown suction cups and the elevator and squaring-up mechanisms are adjustable to accommodate cartons having different sizes of cross section.

As indicated in FIG. 2, the horizontal sealed and filled carton 21C is delivered in horizontal position to a slide 79 which guides it to fall by gravity to a vertical position to the accumulator 60 where it is stacked to form a compact bundle consisting of a number of rows with the same number of cartons in each row as indicated at 80.

As shown in FIG. 16, the suction heads like 57' are preferably pivoted as indicated at 85 to permit the suction heads to swing in the direction of motion of the carton 21' while the suction is applied so as to insure that the minor flaps 24 and 24' will be pulled down below their respective tracks 63 and 64, leading to the glue applicators. A spring like 86 urges the suction heads to face upwardly as shown in FIG. 16.

Power Drive

Referring to FIGS. 3 and 5, the motor 42 operates a gear reduction 143 which drives a transmission 144 which drives cam shaft 41 and cam shaft 145 at the same speed. Shaft 41 has fixed thereto the rotary cams No.1 to No.9, and cam No.7 includes cam No.18. Shaft 145 carries the rotatable cams No.10 to No.16 inclusive.

The reciprocating cam No.17 is shown in FIG. 20, the remainder of the group No.1 to No.18 being shown in FIG. 3. The broken lines from each of the cams in FIG. 3 represent a suitable driving connection to the element driven thereby as indicated in that figure.

Cams No.1 to No.9 and No.18

Cam No.1 oscillates sprocket 146 which has a chain and sprocket connection 147 to reciprocate finger 68 which moves to the left to advance the cup stack into the open carton and then retreats to idle position ready to act on the next cup stack or similar article.

Cam No.2 oscillates the upper suction heads 71 and 72 at station S1, to unfold or square up the carton.

Cam No.3 operates the side flap tuckers 148*a* at the outer end of the open carton, which receives the cup stack, this mechanism being similar to that shown at 148 at the inner end of the carton, FIG. 13 showing further details of the drive for operating the side flap tuckers.

Cam No.4 operates the shuttle 67 as shown and described in connection with FIGS. 18 and 19.

Cam No.5 reciprocates the upwardly facing suction heads 57 and 58 which operate to pull down a carton from the bottom of the magazine 56.

Cam No.6 raises and lowers the elevator 150 and associated parts as indicated in FIGS. 3 and 20.

Cam No.7 operates the bottom or minor flap tuckers 151 and 152 at opposite ends of the carton as well as the support arms 73 and 74. Cam No.7 has a cam No.18 which operates a switch 156 to control valve 157 controlling a suitable source of pressure to operate the glue applicators 65 and 66.

Cam No.8 operates the side flap tuckers 148.

Cam No.9 operates three elements in timed relation with each other as indicated in FIG. 3, these devices being the row pusher 55 of the accumulator 60, the carton transfer arms 51 and 53 of the accumulator 60 and transfer arm 30.

Cams No.10 to No.16

Referring to FIG. 3, cam No.10 reciprocates loading tray 32 shown in further detail in FIGS. 11 and 12 wherein the following appear. The bottom of tray 32 has a flange 158 which operates as the tray is advanced to engage a roller 159 on the outer end of a lever 160 which swings the side flap opener 154 about pivot 161, where the lever 165 is also pivoted, lever 165 having a bell crank extension 162 to the outer end of which is pivotally connected at 163 a link 164 which operates the lever 166 having a pivot 167 on which the flap opener 155 is also pivoted. As the tray advances to engage roller 159, the side flap openers 154 and 155 swing outwardly in opposite directions to urge the side flaps 22 and 23 to open position as indicated in FIG. 11, to facilitate entry of the cup stack 20. As the cup tray 32 advances, having a travel of about 3 inches, the tray also operates the top flap opener 168 to urge the top of major flap 25 to open position as shown in FIG. 12. For this purpose, tray 32 has a post 169 having pivoted thereto at 170 a crank arm 171 pivotally connected at 172 to lever 173 having a pivot 174 on the frame not shown. Lever 173 has fixed thereto, at an angle, the top flap opener 168 which oscillates about pivot 174, being retracted when tray 32 is withdrawn, and moved clockwise as shown by arrow 175 as the tray 32 advances to the open end of the carton. As tray 32 advances, also the lug 153 urges the minor flap 24 downwardly as shown in FIG. 12, without contacting the glue strip 26 shown in FIG. 1*b*. The tray 32 at its outer end has a raised portion 176 extending above the bottom panel indicated at 177, in position to act as a stop and prevent the cup stack from bouncing back out of the carton following its insertion into the carton by the finger 68.

Cam No.11 operates a valve 178 to control fluid pressure indicated at P to operate a cylinder 179, see FIG. 8, to control a gate 180. When the gate is open as shown at 180, this allows the cup stack 20 on the conveyer to advance to its transfer arm 30, whereas while a given stack such as 20*a* is being processed, the gate as shown at 180*a* is swung into the path of the oncoming cup stack indicated at 20*b* to retard its advance by the continuously operating conveyer 29 until the previous cup stack has been processed. These gates are also shown in FIG. 6. When the pressure is released from cylinder 179 or corresponding 179*a*, the gate is retracted by a spring like 181, the gate having a pivotal mount like 182 in FIG. 8. The gate 180 is shown in FIG. 8 as open to admit a cup stack 20. This gate is closed as shown for the twin unit 180*a* in FIG. 8 by cam No.11 at the same time as the collapsed carton is transferred by cam No.4 and the cup stack is transferred to the tray by cam No.9 and the forward accumulator is operated by cam No.9 to feed an upright filled carton into the row former.

Cam No.12 is not shown as connected to anything, schematically representing a cam which may be used for safety purposes, for example, to stop the motor 42 if undesirable things happen such as failure of the vacuum, these safety features forming no part of the present invention.

Cam No.13 operates valve 183 to control the supply of vacuum to the suction heads 57 and 58 which pull down a collapsed carton from the magazine, in timed relation with the operation of cam No.5 which reciprocates these suction heads. Referring to the timing chart FIG. 4, the heavy black line L1 in each case represents the operating condition, the straight line such as L2 represents idle condition, and the open heavy line like L3 represents returning from operating condition. For example, as applied to cam No.5 for magazine pick-up and cam No.13 for the application of vacuum to the suction heads for the carton pulldown, cam No.5 is elevating the pulldown from 0° to 10° and lowering the pulldown from 10° to 50°. From 85° to 120° the pulldown is returning up, and at 350° to 360° and continuing from 0° to 10° the pulldown is being elevated an additional amount to insure firm contact with the bottom carton in the magazine. Vacuum is applied to the suction heads of the pulldown during the interval indicated on FIG. 4 and is idle the remainder of the cycle.

Cam No.14 controls limit switch LS10 to open the circuit of motor 42 and stop the cycle, as shown in FIGS. 3 and 9. FIG. 9 also shows the limit switch LS1 operated by arrival of the cup stack 20 to close the circuit of motor 42 and start the cycle. The two switches LS1 and LS10 are in a parallel circuit in series with the motor. Switch LS10 is normally closed, but is held open by cam No.14 from 0° to 70° as shown by the timing chart FIG. 4 so that when the cup stack 20 arrives and closes switch LS1, this completes the motor circuit to start the cycle. Switch LS1 is normally open, being closed by the advancing cups. LS1 is mounted on transfer arm 30 and moves with it and is adjustable lengthwise to accommodate cup stacks of different lengths. LS1 stays closed until 90° as shown, FIG. 4, by cup transfer of cam No.9, which overlaps the normal closed condition of LS10 controlled by cam No.14, to keep the motor running until opened at 0 degrees by cam No.14. LS1 returns to open position when it is released by transfer of the cup stack 20 from conveyer 29 to tray 32.

Cam No.15 controls valve 184 controlling vacuum supply for suction heads 71 and 72 which are the movable suction heads for squaring up the carton.

Cam No.16 controls valve 185 for controlling vacuum supply for the lower suction heads 140 which are mounted on the elevator 150 and cooperate with the suction heads 71 and 72 for squaring up the carton.

Squaring Up

The squaring-up station in FIG. 3 shows an oscillating shaft 186 which operates the upper suction heads 71 and 72. Further details of the squaring-up feature are disclosed in FIGS. 14 and 18. In FIG. 14, the shaft 186 is indicated and this carries a crank arm 187 which appears in side view in that figure. Shaft 186 has a suitable bearing not shown on the main

frame of the machine. The outer end of crank **187** carries an elongated bar **188** which in turn has an arm **189** for the suction head **71** shown as having three suction cups, and a similar arm **190** for the suction head **72** also having three suction cups. The outer end of bar **188** is supported for rotation about the axis of shaft **186** which corresponds to the fold line **191** of the carton by means of a support arm **192**, the edge of this arm appearing in FIG. **14** and an elevation of it appearing in FIG. **18**. Arm **192** has a bearing support in the form of a roller **193** rotatably carried by the arm **192** and riding in an arcuate track **194** which is concentric with the axis of shaft **186** and the fold line **191**, this fold line being determined by the apex of the angle formed by the angle block **139** as shown in FIG. **18**. When the shaft **186** is in one angular position, the parts are as shown in FIG. **18** with suction head **71** in position to engage the side panel of the carton at a point directly above the lower suction head **140** which engages and holds the bottom panel during the squaring-up operation. As shaft **186** rotates through 90°, it elevates the suction head **71** to square up the carton, suction head **71** and associated parts moving to the broken-line position shown in FIG. **18**. A portion of the elevator **150** is shown in FIG. **18**, the crosshatched portion **195** representing a bearing support for the shaft **196** which carries one of the support arms indicated at **73**, a similar support being provided for the other support arm **74**. Preferably the upper suction heads **71** and **72** move in circular tracks like **194** in the same direction in both of the cartoning units U1 and U2.

By arranging for the suction heads **71** and **72** to be supported as described, with the crank **187** at the inner end of the carton, this frees the space around the fold line **191** at the opposite end of the carton which space is available for the side tuckers and other elements not shown in this figure, and it is this feature which makes it possible to perform both the squaring up and the loading of the article into the carton at the same station S1 instead of squaring up at one station and then conveying the squared-up carton to another station where the article is inserted. The same advantage applies in regard to flap closing as the closure of the flaps at both ends of the carton is substantially completed at station S1 instead of conveying the loaded carton to a further station to effect sealing the flaps. Shaft **186** is oscillated by cam No.**2**, see FIG. **3**, by a suitable drive indicated by the broken line **197**.

Side Flap Tucker

As indicated in FIG. **3**, side flap tucker **148a** is operated by cam No.**3** and side flap tucker **148** is operated by cam No.**8**. The mechanism for accomplishing this is shown in FIGS. **11** and **13**. FIG. **11** shows the side flap tucker **148** in closed position, the tuckers being mounted on shafts **251** and **252** connected for rotation in opposite directions by the meshing pinion **253** and gear **254**. The pinion **253** drives gear **254**, shaft **252** having a crank arm **255** operated by a connecting rod **256** pivotally connected to a bell crank lever **257** having a pivotal support at **258** and an arm **259** pivotally connected to a link **260** for operating the oscillating lever **261** having an arm **262** having a pivotal connection **263** to a rocker arm **264**. The arm **264** is indicated in FIG. **5** adjacent cam No.**3** at **264'** and is indicated at **264''** for cam No.**8**, the side flap tucker mechanism of FIG. **13** being the same for cam No.**3** as for cam No.**8**, but operating at different times as previously described. The shafts for **148***a* are mounted on a frame which is stationary with respect to the main frame of the machine, while the tucker **148** is carried by the adjustable frame including post **96** so that it will be shifted with related elements to suit cartons of different lengths.

Elevator

Prior to operating the elevator **150**, the side flap tucker **148***a* operates under control of cam No.**3** to close the side flaps at the outer end of the carton, the completion of closing the side flaps at the inner end of the carton by side flap tucker **148** under control of cam No.**8** having been previously obtained prior to complete insertion of the cup stack in the carton.

With the carton loaded and with the side flaps at both ends thereof closed, the carton is now in condition for closing the minor or bottom flaps at both ends of the carton prior to elevating the carton into the chute **75**. As shown schematically in FIG. **3** and in further detail in FIG. **20**, the minor flap tuckers **151** and **152** are operated in conjunction with the support arms **73** and **74** by cam No.**7**, as follows. As the operation is similar for both of the suction head members **140***a* and **140***b*, only one of them will be described in detail. In the position shown in FIG. **20**, the reciprocating rod **205** in its upper position shown has operated tucker **152** to position closing the minor flap against the dust flaps through link **206** pivotally connected at **207** to the upper end of rod **205** and pivotally connected at **208** to the tucker **152** having a pivot **209** on the suction head member **140***a*. Also in the position shown, the link **210** has operated the support arm **74** to upright position at the side of the filled carton to support it, the upper suction head having been removed. The arm **74** has a pivotal support **211** on the suction head member **140***a*, and the arm **74** has a crank arm **212** having a pivotal support **213** with the upper end of link **210**. Connecting rod **205** has suitable bearings like **214** on an extension **215** of the base **216** on which the three suction heads are mounted. Base **216** has a connecting rod **217** connected at its lower end to an arm **218** having a roller **219** which slidingly and rotatably fits in the elongated U channel member **220**. This channel also contains a similar roller **221** for the rod **222**, like rod **217**, for the other suction head member **140***b*. The U channel member **220** is carried by a pair of arms **223** and **224** fixed to an oscillating shaft **225** having suitable bearings like **226**. Shaft **225** is oscillated under control of cam No.**6** which has a cam groove **227** for a cam follower **228** on the outer end of arm **229** fixed to shaft **225**. The suction head members **140***a* and **140***b* are thus raised and lowered under control of cam No.**6**.

The operation of the arm **74** and minor flap tucker **152** is under control of cam No.**17** which is reciprocated by the cam No.**7**, see FIG. **21**. Cam No.**7** has a cam groove **230** for a cam follower **231** on oscillating arm **232** having a pivotal support **233** at one side of the cam, the arm **232** having a pivotal connection **234** at the other side of the cam with a link **235** having a pivotal connection **236** with a crank **237** having a fixed pivot **238**. FIG. **20** shows the front of cam No.**17** while the side view in FIG. **21** shows the elements **236** to **238** at the rear of cam No.**17**. Projecting from the rear of cam No.**17** is an arm **239** which carries a fork **240**, and the crank **237** carries a shaft **241** which rides in the fork **240** to form a sliding pivotal connection which permits the cam No.**17** to assume different adjusted positions when members **140***a* and **140***b* are adjusted lengthwise to suit cartons of different lengths. The upper suction heads **71** and **72** are similarly adjustable lengthwise on their support. As shown in FIG. **20**, cam No.**17** has a slide bearing support like **242** on a shaft **243**. The shaft **243** is supported by frame members **244** and **245** which are fixed with respect to the frame of the machine as the right-hand side of this cartoning unit is relatively fixed, the left side being adjustable. Hence, the supports **246** and **247** in FIG. **20**, for the support rod **243***a*, are carried by an adjustable frame member or post **96**, see FIG. **5**, which carries the left-hand chute member **91** and the left-hand bars of the magazine **56** and associated elements, post **96** being longitudinally adjustable by means of the nut and screw device **98**, **99** as previously described. When cam No.**17** reciprocates, it controls the cam roller **248** which rides in a groove **249** to pull down the rod **205**, or the roller rides on the surface **250** to urge rod **205** to the position shown. When rod **205** is in its alternate position with roller **248** in groove **249**, the arm **74** is retracted to horizontal position and the tucker **152** is withdrawn to a position under the carton.

Accumulator

As previously described in connection with FIG. **7**, one of the three functions performed by cam No.**9** is to rock lever arm **54** to provide power for actuating row pusher **55** of the accumulator **60**, see FIGS. **2** and **3**, also FIGS. **22** to **25** and

27, when a row of filled cartons has been accumulated. A row is accumulated or formed as shown in FIGS. 22 to 25, with the aid of the row former 267 shown in FIGS. 29 and 30. As shown in FIG. 2, the completed carton at the top of chute 75 is removed in horizontal position by means of the traveling finger 77, being guided to a downwardly extending slide 79 which guides the carton to fall in upright position shown at 21D in FIG. 2, in front of the spaced arms 51 and 53. The carton 21D falls on a platform 265 which leads to a platform extension 266 which slopes upwardly in an outward direction to cause the successive cartons to lean against each other in compact form. The sprocket 47 which drives arm 51 is smaller than the idle sprocket 49 whereby arm 51 travels a greater distance than arm 53 to urge carton 21D to upright position shown at 21E with respect to the platform extension 266 as shown in FIG. 29 while urging the carton to enter the row former 267. Row former 267 is in the form of an inverted U channel 268, one side 269 of which is carried by a bracket 270 supported in adjustable vertical position by means of screw 271 to adjust the height of the row former above the platform extension or base 266 to accommodate cartons of different heights. In entering the U channel, the top of carton 21E contacts the lower arm 272 of a pivoted door 273 urged to closed position shown in FIG. 29 by spring 274, one end of the spring being fixed to a post 275 and the other end being fixed at 276 to the outer end of the upper arm 277 of the door. As the door 273 springs back to the position shown after the carton has entered the former 267, the arm 272 of the door acts as a stop to prevent the carton from sliding back out of the former 267 after the arms 51 and 53 have been withdrawn. The initial carton such as 21E, to enter the former 267, is held in the position shown under the action of a leaf spring 278, the top of the carton being held in the former 267 under the action of this spring while the base of the carton rests on the platform extension 266. Successive filled cartons are fed to one end of the former, each new one urging the previous ones, if any, in the former to advance in compact form as indicated in FIGS. 22 to 24 until the desired number of cartons has entered the row former 267. When the first carton which entered the former as indicated at 21F in FIGS. 27 and 28 contacts a trigger finger 279, it slides rod 280 against the action of spring 281 to operate cable 282 which swings the pawl 283 in FIG. 27 into position shown wherein the lever arm 284 is rocked about pivot 285 by means of a driving connection 286 with the lever arm 54 operated by cam No.9, see also FIG. 7, whereby the lever arm 284 is operative to advance the row pusher 55 which has a pivotal connection at 285. When the pawl 283 is in an alternate idle position shown in FIG. 5, the lever arm 284 oscillates idly and the row pusher 55 drops by gravity to an idle position as shown in FIG. 5 in broken lines. The row pusher 55 is operative to push the entire row of cartons indicated at 287, and shown as having five cartons in a row, laterally out of the row former, against the action of a pivoted door shown at 288 in open position in FIG. 30 to permit ejection of the row of cartons. The door is shown at 289 in closed position to prevent the ejected row 287 from re-entering the row former, to make room for accumulation of the next series of cartons to form a row. The door 288 is pivoted at 290 and it has a rear extension 291 having an aperture 292 to receive a suitable screw 293 having a head acting as a stop. The rows like 287 as formed are ejected on a base 294 which slopes upwardly in an outward direction for a reason explained in connection with the platform extension or base 266, namely to cause the weight of successive rows to be urged against the later rows to form a compact bundle, two rows of such a bundle being illustrated at 80 in FIG. 25. After the bundle has reached a desired size, the bundle is removed manually or otherwise as desired.

The door 273 acts as a catch to prevent the cartons from falling backwards out of the inlet or open end of the row former 267 when the oscillating arms 51 and 53 withdraw on the return stroke. The door 288 acts as a catch to prevent the row of cartons from re-entering the row former 267 when the row pusher 55 withdraws due to release of the trigger 279 when the leading carton no longer engages it due to ejection of the row by the row pusher.

To summarize the operation of the accumulator, a row of upright cartons is formed by adding the next carton at one end of the desired row and employing it to push the carton or cartons ahead of it longitudinally along a linear support provided by a row former and base. When the row is full, the leading carton operates a trigger which activates a device ejecting the row laterally from the row former to empty it for the next row. The cartons are moved uphill longitudinally to form a row and moved uphill laterally to form successive rows to form a compact bundle of upright cartons.

The previous reference to bundle of cartons is to be construed as applying to a group of rows which may or may not be tied together to form a bundle, as desired.

Referring to FIG. 21, shaft 241 is fixed at its ends in the two cranks like 237 of the two spaced cams No.17 and No.17*a*. Shaft 241 extends from one of the cams, No.17, to the companion cam No.17*a* as shown in FIG. 20 in order to operate both of these cams at the same time by cam No.7, FIG. 21. The fixed pivot 238 is suitably fixed to the main frame. Shaft 241 as shown in FIG. 20 is longer than the lateral separation of cams No.17 and No.17*a* for maximum desired lateral adjustment of cam No.17*a*, the fork 240 and associated parts being slidable with respect to shaft 241.

We claim:

1. Automatic cartoning machine comprising a unit having
a. a magazine for collapsed glue end cartons having panels mutually at right angles when the cartons are squared up, the cartons having end flaps,
b. means for removing the collapsed cartons from said magazine,
c. means for squaring up the removed collapsed cartons one at a time,
d. a loading station for the squared-up cartons,
e. means for inserting an article into the open carton at the loading station,
f. means for sealing the flaps of the loaded cartons, and
g. means for ejecting the loaded and sealed cartons,
the improvement wherein two of said units are provided, namely, right and left-hand units when viewed from the front of the machine looking toward their loading stations, the loading station for the right-hand unit being at the left side thereof and the loading station for the left-hand unit being at the right side thereof, with their loading stations adjacent each other,
a conveyer for conveying articles for both of said loading stations,
an article carrier for each loading station, and
means for transferring articles at a transfer station from said conveyer to each of said carriers.

2. Automatic cartoning machine comprising a unit having
a. a magazine for collapsed glue end cartons having panels mutually at right angles when the cartons are squared up, the cartons having end flaps,
b. means for removing the collapsed cartons from said magazine,
c. means for squaring up the removed collapsed cartons one at a time,
d. a loading station for the squared-up cartons,
e. means for inserting an article into the open carton at the loading station,
f. means for sealing the flaps of the loaded cartons, and
g. means for ejecting the loaded and sealed cartons,
the improvement wherein two of said units are provided, namely, right and left-hand units when viewed from the front of the machine looking toward their loading stations, the loading station for the right-hand unit being at the left side thereof and the loading station for the left-hand unit being at the right side thereof, with their loading stations adjacent each other,
a conveyer for conveying articles for both of said loading stations,
an article carrier for each loading station,

means for transferring articles at a transfer station from said conveyer to each of said carriers, and

means supporting said carriers on opposite sides of said conveyer, said transferring means being individual to each loading station and comprising separate means for laterally transferring articles on one side of said conveyer to one of said carriers and for laterally transferring articles on the other side of said conveyer to the other of said carriers, said conveyer conveying parallel lines of the articles on opposite sides thereof.

3. Machine according to claim 1, including a framework common to both of said units.

4. Automatic cartoning machine having glue applying means for the minor flap at each end of a carton and comprising a suction head device at a station for holding the lowermost panel of the carton in fixed horizontal position during operation of the following elements of said machine: (a) means for squaring up the carton to open it, (b) means for closing dust flaps at the inner end of the carton, (c) means for filling the carton with contents, (d) means for closing dust flaps at the outer end of the carton, and (e) means for closing a minor flap having glue thereon to dust flaps at each end of the carton to thereby seal the minor flap to dust flaps at each end of the carton.

5. Automatic cartoning machine having glue applying means for the minor flap at each end of a carton and comprising a suction head device at a station for holding the lowermost panel of the carton in horizontal position during operation of the following items: (a) means for squaring up the carton to open it, (b) means for closing dust flaps at the inner end of the carton, (c) means for filling the carton with contents, (d) means for closing dust flaps at the outer end of the carton, and (e) means for closing a minor flap having glue thereon to dust flaps at each end of the carton to thereby seal the minor flap to dust flaps at each end of the carton, an upright compression chute open at the top forming an outlet and having an open bottom forming an inlet above said station, means for elevating the cartons thus filled and sealed into said inlet step-by-step, each lower carton in the chute acting to advance the ones above it, said chute forming a sliding fit lengthwise with the cartons to compress the cartons lengthwise while passing through said chute to press the flaps at each end of the carton, said inlet being tapered to urge the major flaps to sealed position against the minor flaps.

6. Machine according to claim 5, and a traveling finger device for removing the cartons as they arrive at said outlet.

7. Automatic cartoning machine comprising a magazine for a stack of collapsed cartons in horizontal position, each carton having an end having major, minor and dust flaps extending from panels, the cartons being arranged in the magazine with the minor flaps and their panels lowermost, a shuttle for transferring the cartons one at a time in a path from the bottom of said magazine to a squaring-up device, means adjacent said path for deflecting each minor flap downwardly, and a glue applicator for applying glue to opposite sides of said minor flap while the carton is moving in said path, and means for guiding the deflected minor flap to said glue applicator.

8. Machine according to claim 7, said guiding means being in the form of a track and a suction head below said magazine for pulling down the minor flap to a position below said track, said track guiding the deflected minor flap to said glue applicator while the collapsed carton is transferred by said shuttle to said squaring-up device.

9. Machine according to claim 7, each of said cartons having major, minor and dust flaps at each end of the carton, said deflecting means, guiding means and glue applicator being provided for each end of the carton.

10. Automatic cartoning machine having a supply of collapsed cartons and a supply of articles to be loaded into said cartons, said machine including a plurality of means for squaring up, loading, sealing the flaps and ejecting the loaded and sealed cartons, a conveyer for supplying an input of the articles, said conveyer advancing the articles along a line laterally displaced from the longitudinal axis of the open carton, a loading tray in alignment with the squared-up carton, means for laterally transferring the articles in succession from the conveyer to the loading tray, a plurality of means for accumulating the loaded and sealed cartons in upright position in rows and columns to form a group of rows, and cam means controlling the operation of said transferring means in timed relation with the operation of said accumulating means.

11. Automatic cartoning machine comprising a loading station for an open horizontal carton, an endless conveyer for conveying a series of articles each to be loaded into the horizontal carton at said station, a loading tray located beyond said conveyer at one side thereof, means for horizontally transferring the article from said conveyer to said tray, means for advancing the tray to the open carton, and a finger for sliding the article from the tray into the carton.

12. Automatic cartoning machine comprising a magazine for collapsed glue end cartons having panels mutually at right angles when the cartons are squared up, the cartons having end flaps, means for supplying the collapsed cartons to a squaring-up station having a support for the carton in horizontal position, means at said station for squaring up the cartons comprising a lower suction head device for holding the lowermost panel of the carton at said station, said lowermost panel having a fold line connection with an upper panel, another suction head device for said upper panel, means for operating said other suction head for erecting said upper panel, a vacuum supply for said suction heads, an elevator for elevating said lower suction head device and the carton held thereby after removal of said other suction head device, said elevator having support arms movable into position to support the side of the carton when said other suction head device is removed, and means for operating said support arms.

13. Machine according to claim 12, said elevator having end flap closures for both ends of the carton, and separate cam means for operating both said support arms and said end flap closures.

14. Machine according to claim 12, said lower and other suction head devices being adjustable for different sizes of cartons.

15. Automatic cartoning machine for cartons having flaps, said machine comprising a motor driven cam shaft having thereon a plurality of cams, at least a separate one of said cams and separate means controlled by each cam being provided for performing each of the following operations during one revolution of said shaft,

a. removing a collapsed carton from a magazine,

b. opening the removed collapsed carton,

c. inserting an article into the open carton,

d. sealing the flaps, and

e. ejecting the sealed carton,

a conveyer supplying a series of said articles, means for starting operation of said motor by arrival of an article on said conveyer, means for stopping said motor when said cam shaft has made one revolution, the carton having inner and outer dust flaps and having a major flap and a minor flap at each end of the carton, and further including means controlled by a first one of said cams for applying glue to opposite sides of the minor flaps while the collapsed carton is moving from said magazine, means controlled by a second one of said cams for closing the inner dust flaps, means controlled by a third one of said cams for closing the outer dust flaps, means controlled by a fourth one of said cams for closing the minor flaps, and means controlled by a fifth one of said cams for elevating the filled carton with certain flaps thus closed into a chute to thereby effect closing of the major flaps.

16. Automatic cartoning machine for a carton having dust flaps, also major and minor flaps, means supporting an open horizontal carton, a loading tray for an article to be loaded into the carton, means for advancing the tray in a path to the open carton, a finger for sliding the article from the tray into the carton, a dust-flap-opening member at each side of the path of the tray in position to engage and swing the dust flaps

open, means pivotally supporting each of said dust-flap-opening members, an operating member having a driving connection with said dust-flap-opening members, and an abutment on the tray in position to engage said operating member as the tray advances and operate said dust-flap-opening members.

17. Machine according to claim 16, said tray adjacent the bottom thereof having a lug to urge the minor flap open downwardly, a major-flap-opening member in position to engage and swing the major flap open, means pivotally supporting said major-flap-opening member, and a driving connection between said tray and said major-flap-opening member.

18. Machine according to claim 16, said tray at its outer end above said lug having a raised portion extending above the bottom panel of the carton in position to act as a stop and prevent the article from bouncing back out of the carton following its insertion into the carton by said finger.

19. Automatic cartoning machine for an elongated carton having flaps at both ends thereof, longitudinally spaced suction head devices having upwardly facing suction heads for engaging the bottom of the carton, each suction head device having a connecting rod terminating in a roller, and a rotary-cam-operated, longitudinally extending U channel in which said rollers are mounted, one of said rollers being slidable in said U channel to accommodate cartons of different lengths, said rotary cam being operative to reciprocate said U channel and thereby elevate or lower said suction head devices.

20. Automatic cartoning machine for an elongated carton having flaps at both ends thereof, longitudinally spaced suction head devices having upwardly facing suction heads for engaging the bottom of the carton, each suction head device having means for closing the bottom flap at one end of the carton, each suction head device also having means supporting a mechanical movement means terminating in a cam follower having a pivoted link having a roller for operating the associated flap-closing means, each suction head device having a reciprocating upright cam having a cam groove in which its respective said roller slidingly fits, rotary cam means for operating each of said reciprocating upright cams, one of said suction head devices being laterally adjustable to accommodate cartons of different lengths, and cooperating means supporting the corresponding said reciprocating upright cam for slidable movement to a new position when said laterally adjustable suction head device is moved.

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