May 13, 1958 J. L. FERGUSON ET AL 2,834,264

CARTON SET-UP MACHINE

Filed Nov. 10, 1953 7 Sheets-Sheet 1

Fig. 1A.

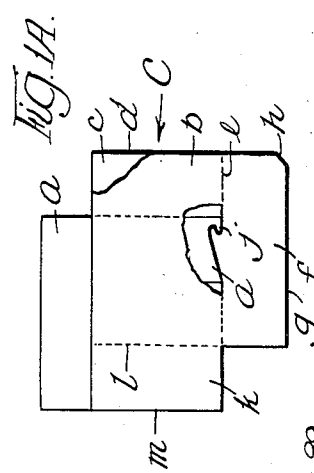


Fig. 1.

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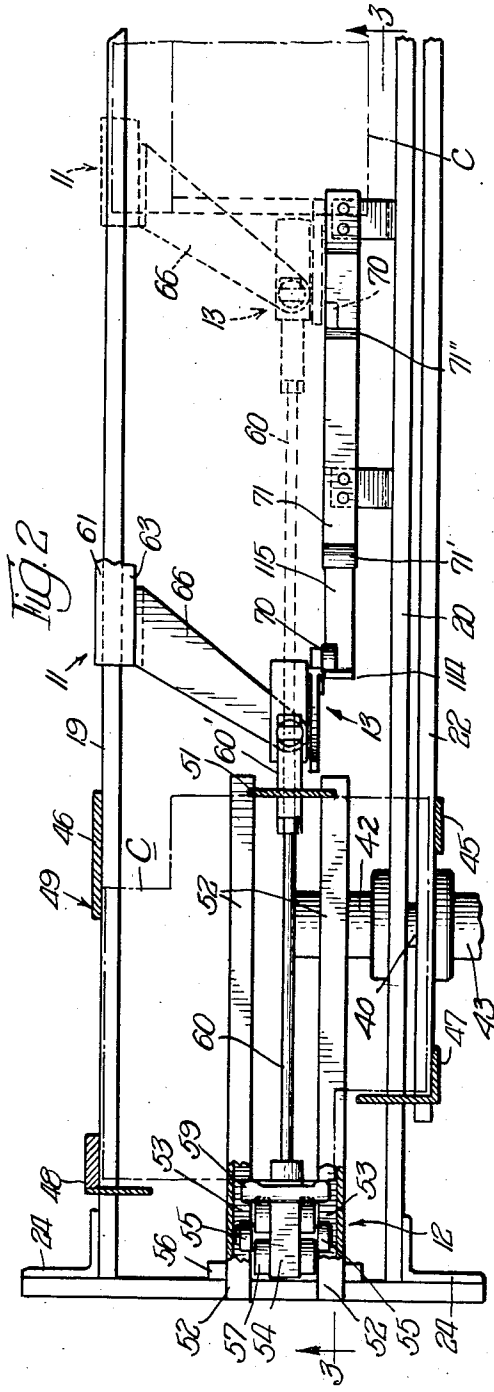


Fig. 2

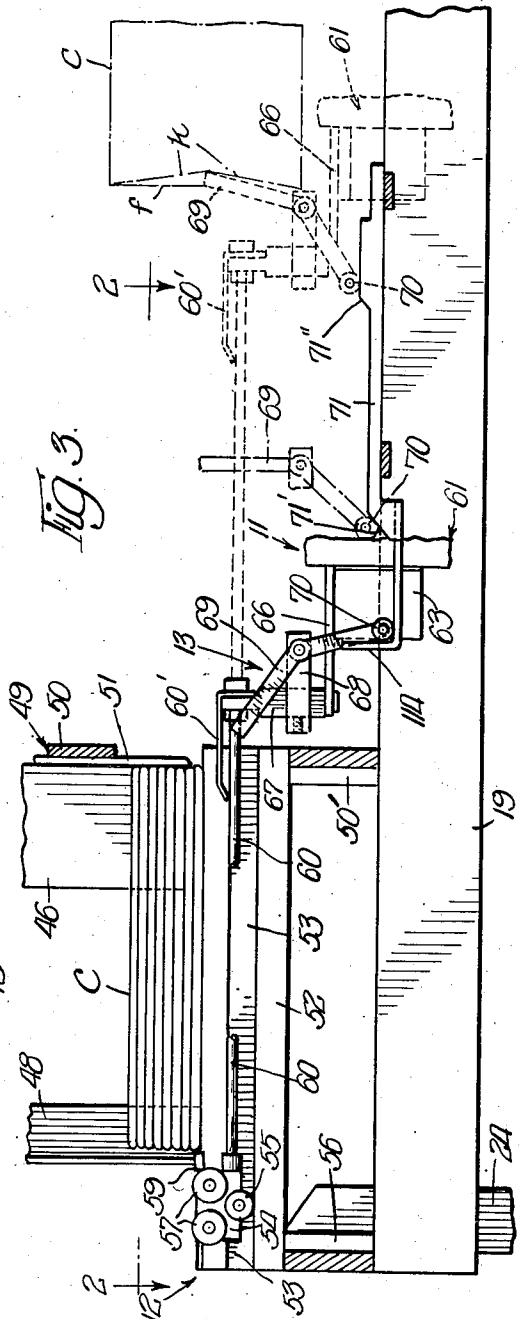


Fig. 3

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CARTON SET-UP MACHINE

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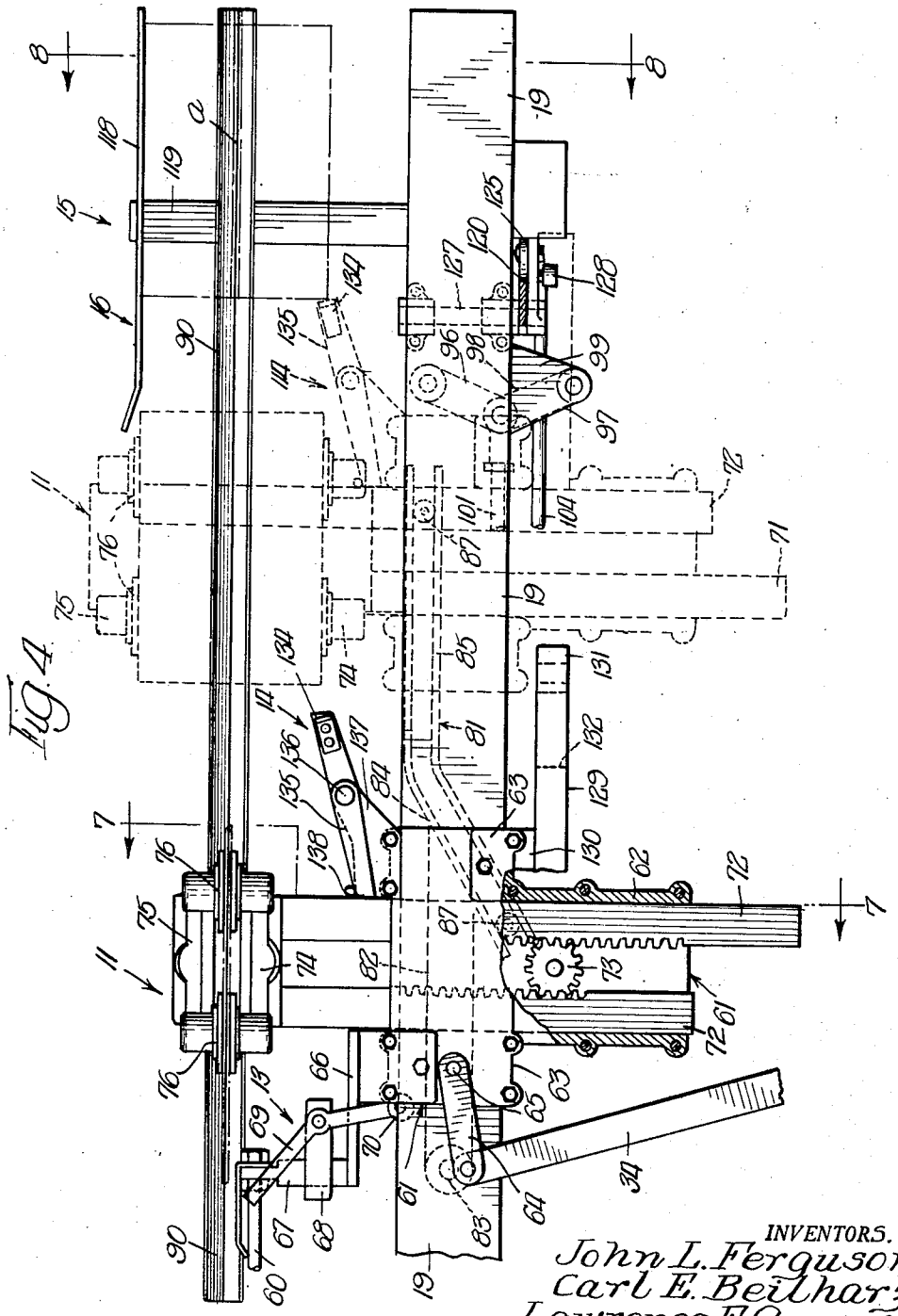


Fig. 4

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CARTON SET-UP MACHINE

Filed Nov. 10, 1953

7 Sheets-Sheet 4

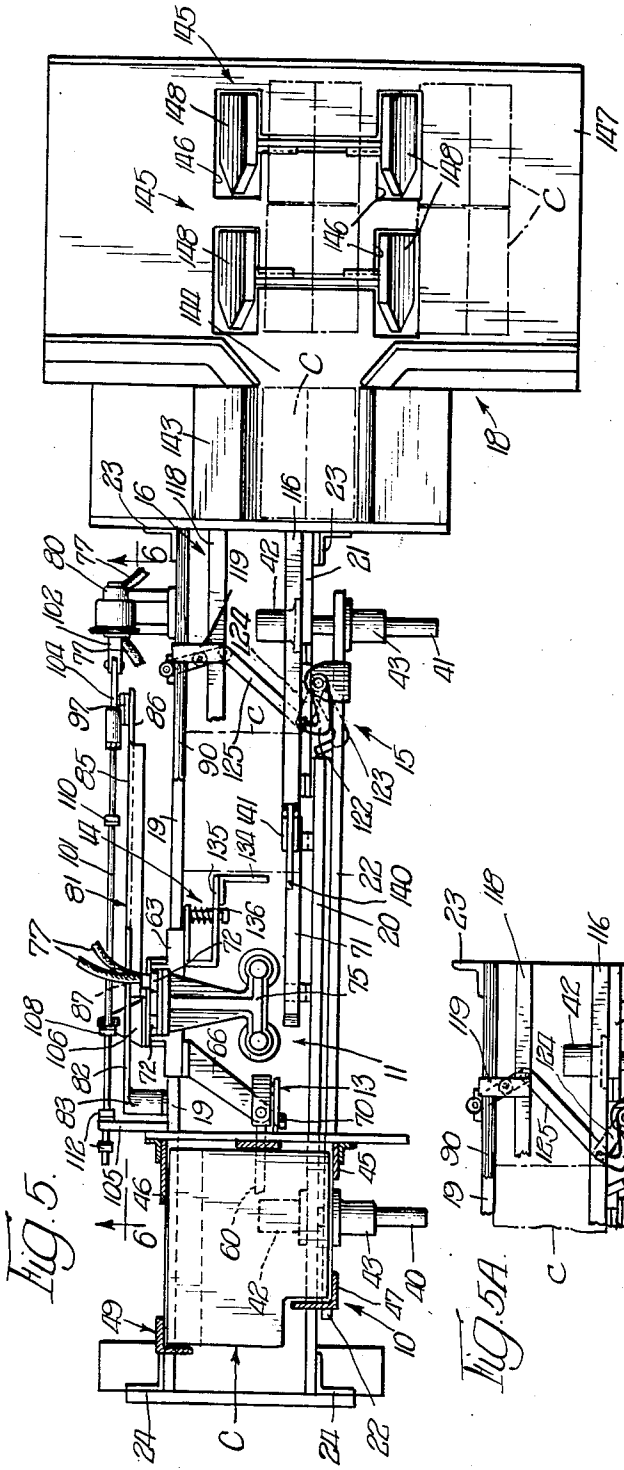


Fig. 5.

Fig. 5A.

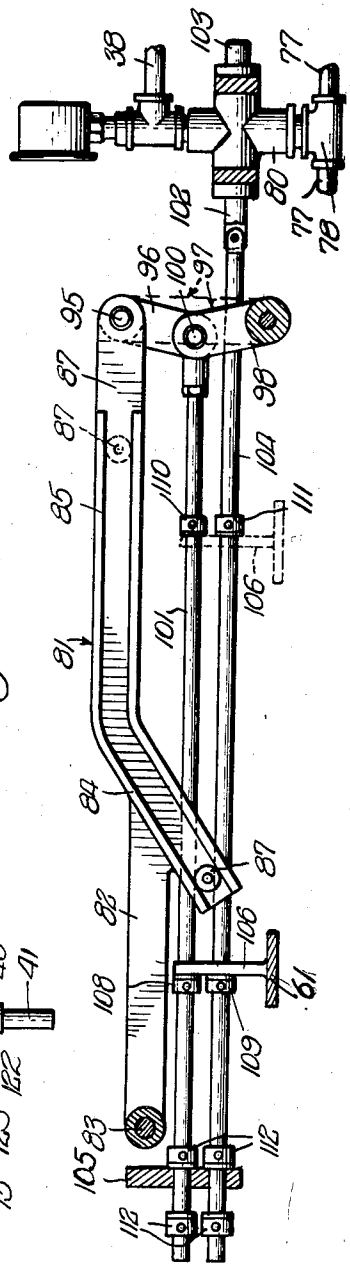


Fig. 6.

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CARTON SET-UP MACHINE

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Fig. 8

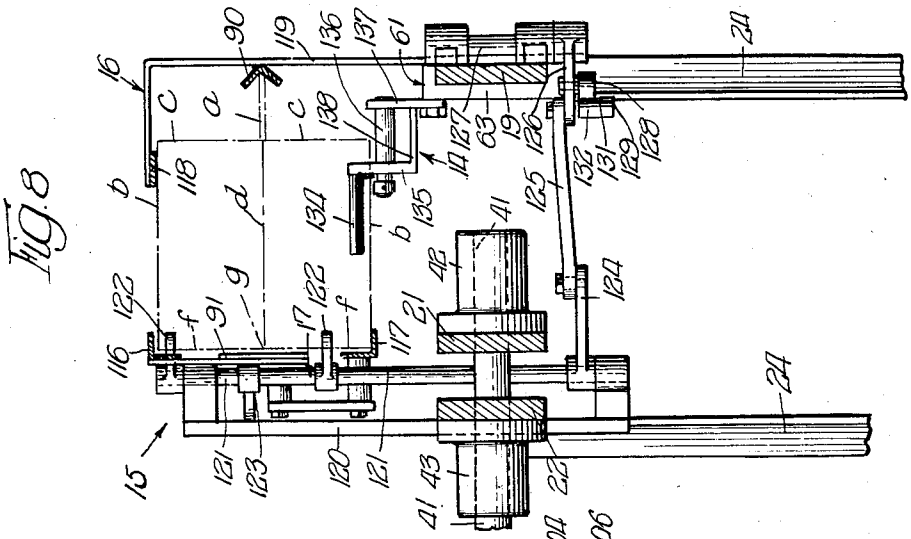
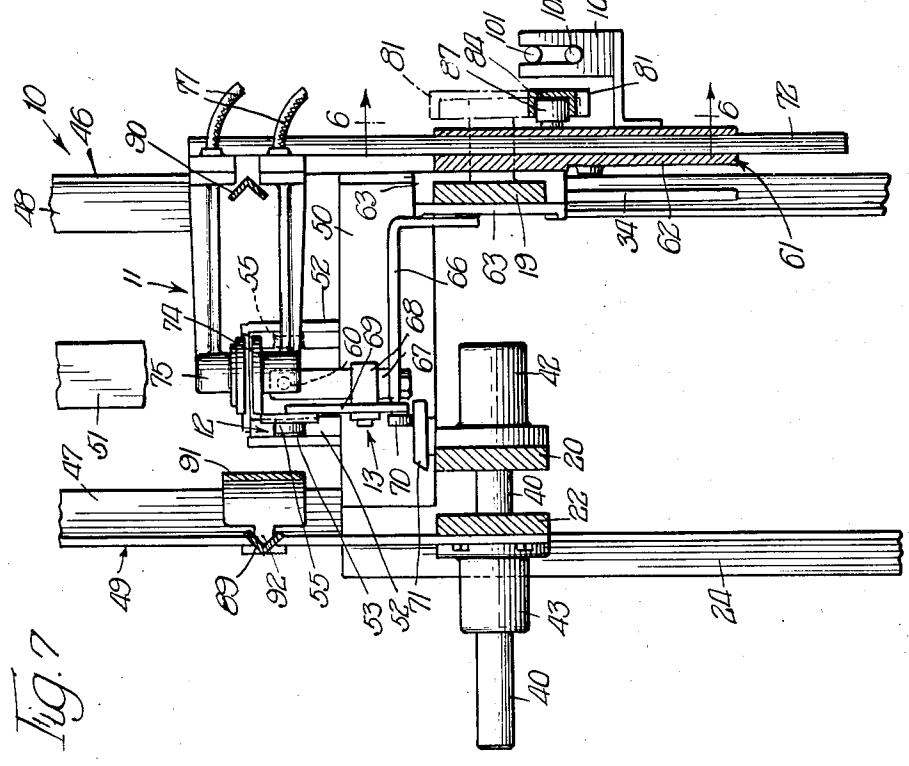


Fig. 7



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CARTON SET-UP MACHINE

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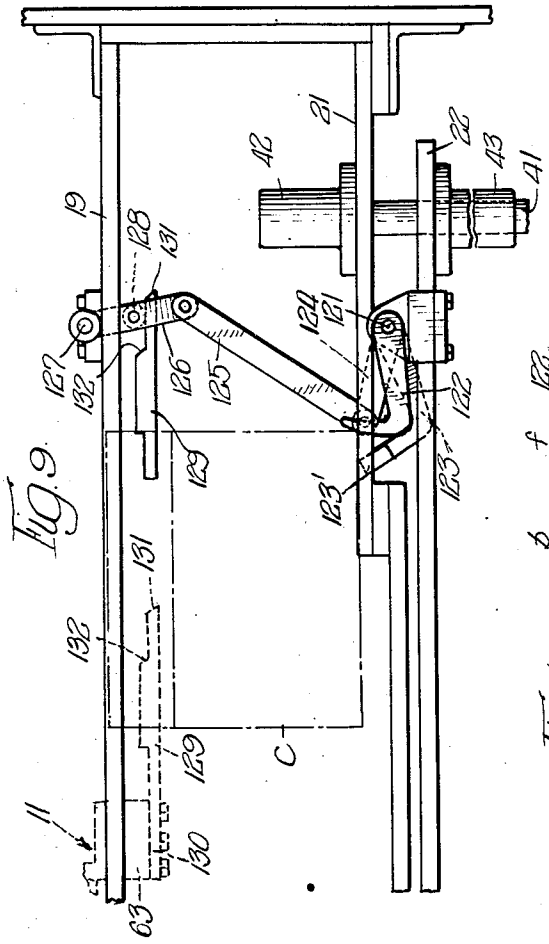


Fig. 9.

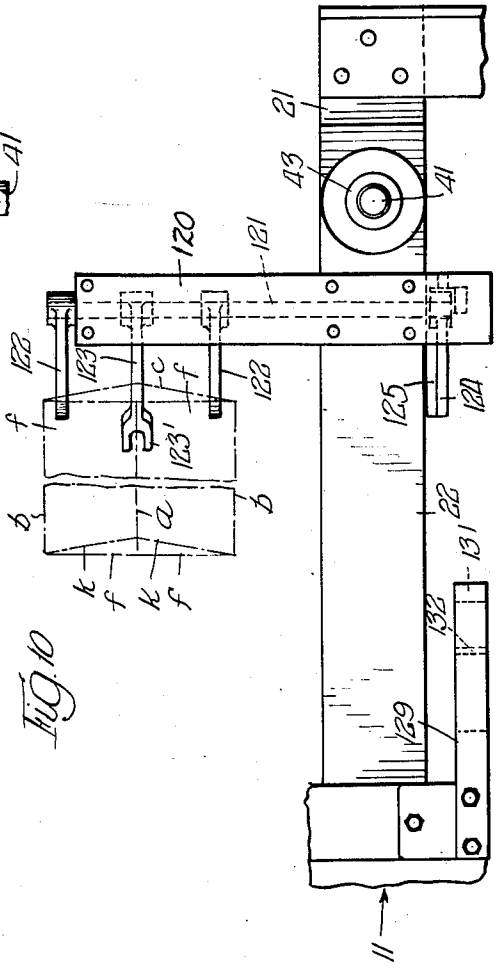


Fig. 10.

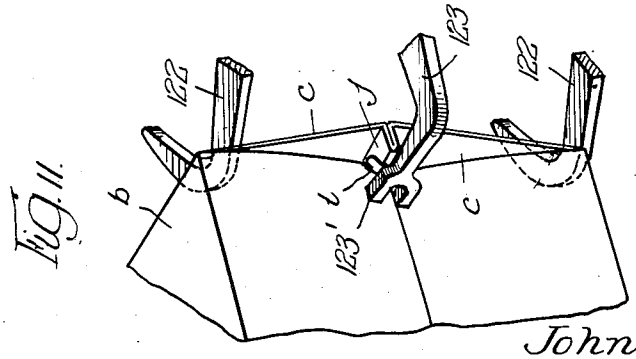


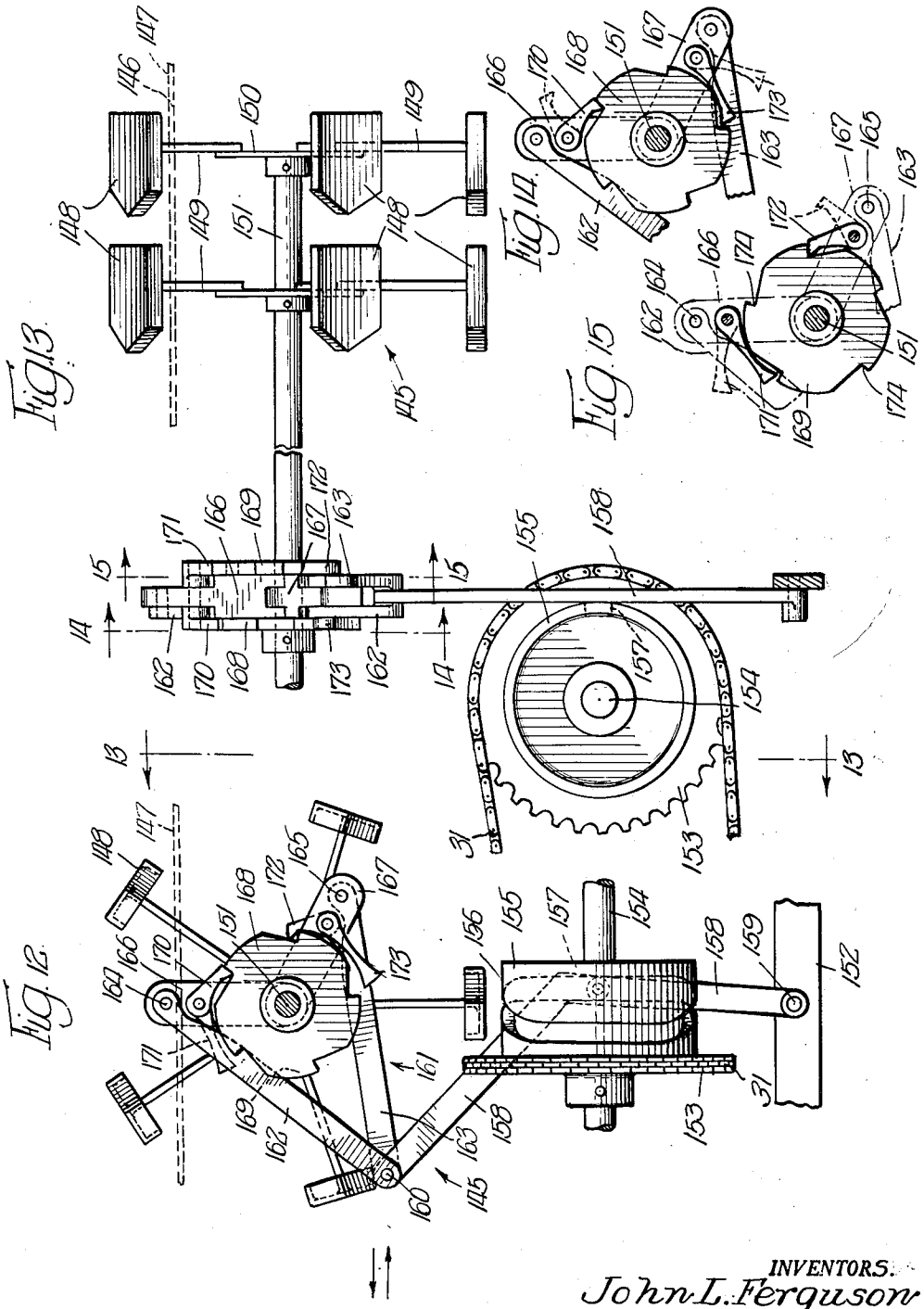
Fig. 11.

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CARTON SET-UP MACHINE

Filed Nov. 10, 1953 7 Sheets-Sheet 7



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United States Patent Office 2,834,264 Patented May 13, 1958

2,834,264

CARTON SET-UP MACHINE

John L. Ferguson and Carl E. Beilharz, Joliet, and Lawrence E. Arneson, Morris, Ill., assignors, by mesne assignments, to Federal Paper Board Company, Inc., Bogota, N. J., a corporation of New York

Application November 10, 1953, Serial No. 391,172

12 Claims. (Cl. 93—53)

The present invention relates to an improved machine for setting up for use a particular type of paperboard container which is ordinarily furnished in flat knocked-down condition by its manufacturer. More specifically, the machine operates on a container, such as a paperboard carrier for bottles, which is characterized by a central, longitudinally extending partition panel paralleling opposed side walls and hingedly connected to opposed end walls. A well known carrier of this general description has a hook formed at one end of the bottom edge of its longitudinal partition which, upon erection of the carrier walls to a rectangular cross sectional outline, is latched with an adjacent end margin of a bottom forming panel spanning the side walls; this sustains the carrier in rectangular outline for gravity loading with bottles or the like. The present machine is for the special purpose of setting up and latching such a carrier in erected condition.

In general, the improved machine acts to feed flat carriers from a gravity hopper, withdrawing the bottom-most carrier by means of an improved, anti-friction carriage of its reciprocable article feed out mechanism, which operates in timed relation to other instrumentalities functioning to spread and latch the carrier. This feed out carriage is mechanically linked to a driven pneumatic spreader assembly which intermittently engages and separates the opposed side walls of the carrier while further advancing the same forwardly beyond the point at which it receives them from the feed out mechanism. The spreader assembly draws the carrier walls to a rectangular, box-like outline, in which a bottom panel is disposed at a right angle to the sets of spread side and end walls.

In this condition of the carrier parts, a rear end wall is mechanically engaged by a deflecting unit associated with the horizontally movable spreader head. The unit forces the rear wall inwardly, correspondingly thrusting the partition panel and forward end wall outwardly in relation to the bottom. This affords end clearance for a subsequent transverse deflection of the bottom into position for interlocked engagement with the described latching hook on the longitudinal partition.

A bottom deflecting and latching unit now comes into operation while the carrier is held stationary in a holding frame of that unit, to which the spreader assembly delivers the squared carrier. This second unit displaces the carrier bottom inwardly, whereupon the rear wall deflecting unit is retracted by withdrawal of the spreader assembly, allowing the carrier to spring into a locked relationship of its bottom with the latching hook. This sustains the carrier in an erected condition in which it is discharged by a later erected carrier to a special divider turret assembly controlling the final disposition of the carrier.

Coincident with the wall and bottom deflecting and latching operations performed by the two described units, the suction spreader heads of the spreader assembly are mechanically disengaged by a cam actuated linkage from the spread side walls and suction is simultaneously cut

off at the heads. The heads and coupled feed out carriage then move rearwardly for subsequent engagement with the next carrier to be processed. The set up and latch cycle is repeated, during which repeat cycle a third unit, i. e., a pusher unit mounted at the front of the spreader assembly, acts to discharge the previously erected carrier toward a delivery station and toward the final divider turret assembly of the machine.

In respect to the last named assembly, the invention embodies an intermittently acting, rotative divider turret which is adapted to discharge the erected carriers optionally in either of two directions at a right angle to the line of carrier travel through the spreading and latching devices, or to discharge alternately in both of those directions. This selective operation is controlled by an improved mechanical motion and linkage involving sets of rotary ratchets, driving links and selectively adjustable driving pawls.

It is a general object of the invention to provide a carrier set-up machine of the foregoing description which is simple and inexpensively constructed as regards the component parts thereof and their assembly; which operates reliably and amply rapidly to supply the requirements of one or more bottle or article loading machines associated with the set-up machine; which is flexible as to adjustability of its parts so that various sizes and types of latched paperboard article carriers may be speedily set up and loaded in cases at a bottle manufacturing or bottling establishment, operating in conjunction with conventional case loading apparatus; and which is relatively compact in size, occupying a minimum of floor space and being overseen only occasionally by an operator whose main duties are the replenishing of flat carriers in the machine hopper, and whatever adjustment work is involved in a change over to another carton style.

A more specific object of the invention is to provide an improved reciprocable article feed out device for a gravity hopper-fed machine, which is characterized by an article pusher carriage operating beneath a stack of flat articles, is borne by anti-friction side rollers guided in parallel horizontal ways and has a plurality of further anti-friction rollers exposed above its top, thus to insure a frictionless return stroke beneath the article stack for re-engagement with the bottom article thereof.

Yet another object of the invention is to provide a horizontally reciprocable pneumatic wall spreader assembly for intermittently advancing containers, which employs a set of pneumatic suction heads engaged with opposite side walls of a flat container to spread the same as the container is mechanically forwarded by the heads, the spreader assembly also having rear wall deflecting and container pusher units mounted respectively behind and in front of the head, which units are mechanically coupled to the spreader assembly and are controlled in their operation by its reciprocable stroke.

A still further object is to provide a horizontally reciprocable suction spreader assembly characterized by opposed, vertically acting suction heads; these heads are appropriately valve-controlled in their connection to a source of vacuum to cause them to take engagement with opposite side walls of a collapsed paperboard container, to grip those walls under suction as the heads are vertically separated, to interrupt suction at the completion of a forward stroke of the assembly, simultaneous with their mechanical separation from the spread walls, to return rearwardly to a position from which the foregoing steps are repeated, while the heads re-approach one another, and to resume suction as the heads arrive at the last named position.

A further object is to provide a wall spreader assembly of the sort described in the preceding paragraph, in which approaching and separating movement of the

suction heads is controlled by vertically guided toothed racks and an interconnecting meshing pinion, one of the racks having a cam follower roller which travels in an inclined fixed track, and this track being pivoted at one end. A toggle linkage controlled by the movement of the assembly is connected to a free end of the pivoted cam track, in such way that straightening of its toggle by the assembly has the effect of further separating the heads at the end of the forward stroke of the suction heads, thus to disengage the heads from the carrier. The heads are simultaneously disconnected from their vacuum source by a valve similarly actuated by the stroke of the spreader assembly.

Yet another specific object of the invention is to provide an improved container holding and latching unit to which spread carriers are delivered by the assembly described above, at which a trailing end wall of the carrier is deflected inwardly, by a unit traveling with the assembly, in the embodiment shown. In the holding and latching unit, the bottom of the spread carrier is similarly deflected inwardly, as the carrier is held open, by a tucker arm actuated by the traveling spreader assembly. The unit in question also includes stop arms automatically positioned to hold the carrier stationary as the rear wall deflecting operation is performed, and the stop arms, like the tucker arm of the latching unit, are actuated in synchronism with movement of the suction spreader assembly, as by cam and follower provisions associated with said unit and assembly.

A still further specific object is to provide a divider turret assembly, here shown as positioned at the discharge end of a carton erecting mechanism of the sort described above, featuring a novel pawl and dual ratchet unit, together with an actuating linkage therefor, preferably cam-actuated, this unit driving an intermittently rotative or oscillatory divider turret. The unit is so composed that it may be optionally adjusted to forward erected and latched containers or other articles in a given transverse direction, in the opposite transverse direction alone, or alternately in both transverse directions, a simple manipulation of the pawls of the unit being all that is required to effect change over.

Another specific object is to provide an improved mechanical movement or linkage involving plural ratchet disks attached to a common driving shaft, driving arms freely journalled on the shaft and adjustable ratchet engaging pawls on the arms, which movement is well adapted for use in a divider turret assembly such as is described in the preceding paragraph, or in other settings, the movement also comprising a pair of actuating links each pivoted at one end to the pawl driving arms and pivoted at its other end to a common point on a reciprocatory actuator.

The foregoing statements are indicative in a general way of the nature of the invention. Other and more specific objects will be apparent to those skilled in the art upon a full understanding of the construction and operation of the device.

A single embodiment of the invention is presented herein for purpose of illustration. It will be appreciated that the invention may be incorporated in other modified forms coming equally within the scope of the appended claims.

In the drawings:

Fig. 1 is an over-all view in side elevation, partially broken away, of the improved machine, this view showing the parts in initial position at the commencement of operating cycle;

Fig. 1A is a top plan view of a paperboard article carrier illustrative of the type of container operated on by the machine, being partially broken away to show structural features;

Fig. 2 is a view in horizontal section along a line corresponding to line **2—2** of Fig. 1, particularly showing structural details of an improved gravity hopper feed out device of the machine, as well as certain other operating instrumentalities of the machine, other instrumentalities having been omitted for clarity of illustration;

Fig. 3 is a view in vertical longitudinal section in a line generally corresponding to line **3—3** of Fig. 2, being partially broken away and sectioned and further illustrating details of the feed out device;

Fig. 4 is a fragmentary elevational view in somewhat larger scale, also partially broken away and in section, illustrating structural features of a horizontally reciprocable wall spreader assembly and associated deflector unit of the machine, this view showing the assembly and unit in solid lines in the position occupied at the time a flat container is delivered to the assembly and, in dotted line, a forward position in which a container is spread preliminary to inward deflection of its rear wall;

Fig. 5 is a top plan view of the machine, particularly illustrating the relationship of parts of its spreader and wall deflector instrumentalities to one another and to a terminal turret assembly, with the wall deflector unit in a withdrawn position;

Fig. 5A is a fragmentary plan view showing the wall deflector parts in an intermediate position, to which they move from the position shown in Fig. 5;

Fig. 6 is a fragmentary view in longitudinal vertical section along a line corresponding to line **6—6** of Fig. 5, showing details of an actuating cam and toggle linkage for shifting the suction heads of the spreader assembly, as well as an automatic pneumatic valve actuating linkage also operated in synchronism with the assembly;

Fig. 7 is a view in transverse vertical section on a line corresponding to line **7—7** of Fig. 4, further illustrating details and relationships of the spreader assembly and associated instrumentalities;

Fig. 8 is a view in transverse vertical section along line **8—8** of Fig. 4, showing details and relationships of a container holding and latching unit of the machine;

Fig. 9 is a fragmentary top plan view, more or less diagrammatic in character, illustrating the operation of the container holding and latching unit, with its moving parts shown in an intermediate position, two positions of the cam which operates the parts being indicated in solid and dotted lines;

Fig. 10 is a fragmentary view in side elevation, also schematic in character, further illustrating the operation of the container holding and bottom deflecting tucker arms of the unit of Figs. 8 and 9;

Fig. 11 is a fragmentary perspective view in enlarged scale further depicting the operations performed by the unit of Figs. 8, 9 and 10, its parts being shown in a third, final position;

Fig. 12 is a view in transverse section through the machine at the improved divider turret assembly thereof, being on a line corresponding to line **12—12** of Fig. 1;

Fig. 13 is a side elevational view of the divider assembly, viewed from the right of Fig. 12; and

Figs. 14 and 15 are, respectively, views in vertical section along lines **14—14** and **15—15** of Fig. 13.

In order to best understand the operation of the machine, it is necessary to understand the structured composition of a representative paperboard container, illustrated in flat, knocked, down condition in Fig. 1A and generally designated C, on which it operates. This figure should be considered in conjunction with Fig. 11.

The container C is a partitioned type internally subdivided by a longitudinal central, multiple ply partition *a*, which also affords a top handle, and usually a plurality of transverse partitions (not shown) which extend from partition *a* to each of a pair of side wall panels *b* paralleling and spaced from the same when the carrier is in set-up condition. Since the present machine will set up a carrier lacking such cross partitions, they are not shown in order to simplify the drawings. Each of the side wall panels *b* is hinged to an end wall forming panel *c* by a vertical crease *d* at the right hand end of

the collapsed carrier, as viewed in Fig. 1A, and the end walls *c* are in turn flexibly connected to the right hand end of longitudinal partition and handle panel *a*, being in face to face engagement with one another in the collapsed condition.

Side wall panels *b* are flexibly connected by bottom margin forming crease *e* to like bottom forming panels *f*, which are integrally hinged to one another by a longitudinal crease *g*. An arcuate end notch *h* is cut in panels *f* at the right hand end of crease *g*. These cuts result in the formation of a semi-circular latching recess *i* at the center and one end of the carrier bottom (Fig. 11) when the bottom panels *f*, *f* are straightened to coplanar relation.

Multi-ply longitudinal partition and handle *a* is formed on its right hand bottom edge to provide an inwardly facing hook *j*; it is one of the main functions of the machine to engage hook *j* with latching recess *i* when the carrier is spread to rectangular shape, as in Fig. 11.

Each side wall panel *b* has a second end wall forming panel *k* integrally articulated to the left end thereof by a crease *l* and the end walls *k*, *k* are flexibly connected to the left hand extremity of partition *a* along the crease *m*, i. e., at the vertical midpoint of the erected carrier.

As a general outline of the operation of the improved machine, the opposed side walls *b*, *b*, are subjected to action, vertically, of oppositely acting, horizontally travelling suction heads which draw these walls away from one another while causing the end walls *c*, *c* to move to coplanar positions, respectively, normal to the side walls. With carrier C in this general condition, the front end wall *c*—*c* is further forced forwardly, by pressure applied to opposite end wall *k*—*k*, causing the hook *j* to advance forwardly of front bottom recess *i* as illustrated in Fig. 11. The forward end wall construction *c*—*c* is bulged substantially forwardly of the adjacent edge of the bottom *f*—*f*, as illustrated in Fig. 11.

Now the bottom *f*—*f* is mechanically engaged from the adjacent side of the machine and forced inwardly past the mouth of hook *j*, whereupon the carrier end walls are released upon retraction of the mechanical element which initially caused the deflection of the hook. The inherent return spring of the carrier parts at their creases results in the interengagement of hook *j* in the latching recess *i*, and this holds carrier C in erected condition.

Now, with most ready reference to Figs. 1 and 5 for a general layout of the machine, it has four major constituent assemblies. These are, progressing from left to right in the figures mentioned, a rear gravity supply hopper and feed out assembly **10**; a container wall spreader assembly **11** acting on carriers fed by assembly **10**, which reciprocates horizontally and is mechanically coupled to a feed out carriage unit **12** of assembly **10** (Figs. 3 and 4), as well as to a rear wall deflecting unit **13** and a container pusher unit **14**; a carrier holding and latching assembly **15**, including a carrier holding frame **16** and associated bottom deflecting and latching device **17**; and an adjustable divider turret assembly **18** at the forward end of the machine, by which the erected cartons are optionally disposed of for loading.

These instrumentalities are supported on a basic framework consisting of a far horizontal side bar **19**, which is smoothly machined and of considerable rigidity since it also serves as a guide slide for spreader assembly **11** and its associated devices; a near side bar unit which parallels and is spaced laterally from side bar **19**, being made up of rigidly associated bars **20** and **21**; and a further, laterally adjustable side bar **22** which is disposed outwardly of and parallels side bar unit **20**—**21**. Side bars **19** and **20**—**21** are rigidly supported adjacent a forward delivery zone by angle iron uprights **23**, just to the rear of divider turret assembly **18**. Similar angle iron uprights **24** sustain these side bars at the rear of the machine, adjacent hopper and feed out assembly **10**. Uprights **23**, **24** are connected beneath the horizontal side bars by longitudinal angle irons **25** as part of a sub-frame on which various driving agencies of the machine are supported.

These include a drive motor **26** operating a belt pulley **27** to drive a pulley **28**, preferably through a slip clutch, on the shaft of a speed reduction unit **29**. One end of the output shaft of the speed reducer carries a small sprocket **30** driving an endless chain or link belt **31** by which the divider turret assembly **18** is actuated; the other end has an eccentric disk **32** (shown in Fig. 1) secured thereon. An eccentrically mounted pin **33** of disk **32** is received in an elongated slot of an upwardly extending pitman lever **34**, which is pivoted at **35** at its lower end to a horizontal frame angle iron **25**, or suitable other fulcrum associated therewith.

A separate motor-driven vacuum pump **36** is also mounted on the machine frame along with the driving units just described. It is a self-contained unit having an electric motor supplied by a suitable cable **37**. Its function is to create a vacuum in the suction heads of spreader assembly **11**, under the control of a suitable automatically actuated valve, as will be described. The vacuum is communicated through a conduit **38** from the vacuum pump **36** to the valve.

As illustrated in Figs. 1, 2 and 5, the adjustable near side bar **22** of the machine frame serves as a support for parts of hopper feed out assembly **10** and carrier holding and latching assembly **15** which must be adjusted laterally, in reference to other fixedly mounted or guided parts, when carriers operated upon in different runs vary in their shape or transverse dimensions. Other longitudinal adjustments, if necessary, are made at the individual parts.

To this end, a pair of relatively heavy stud shafts **40**, **41** are rotatively journalled in the composite frame side bar **20**, **21**, as by relatively heavy bearings **42**. One of these is located on bar **20** directly beneath hopper and feed out assembly **10** and the other is on bar **21** just to the rear of divider turret assembly **18** and beneath carrier holding and latching assembly **15**. Shafts **40**, **41**, have threaded internal engagement with internally threaded collars **43** fixedly associated with adjustable side bar **22**; accordingly rotative adjustment of the shafts **40**, **41** results in lateral shifting of bar **22** and parts associated therewith, thus to accommodate the machine to handle carriers of different sizes.

With the above outline of the basic operating instrumentalities of the machine, their intended function in the erection and latching of carriers C, and the main adjusting and driving means therefor, a more detailed description thereof can be undertaken. For this purpose reference should first be made to Figs. 1, 2, 3 and 5, dealing with the construction and operation of supply hopper and carrier feed out assembly **10** at which the operations on a carrier C are initiated.

Assembly **10** comprises a gravity hopper made up of forward, vertically extending straps **45**, **46** riveted or otherwise fixedly secured, respectively, one in upstanding relation to adjustable frame side bar **22** and the other to the fixed, transversely spaced, far side bar **19**. These straps coact with upright rear angle irons **47**, **48** secured to side bars **22**, **19**, respectively, in defining an open sided gravity hopper **49**. A forward hopper cross bar **50** secured between uprights **45**, **46**, adjustably at the former, supports a rigid, vertically extending escapement or gauge strap **51**; the lower extremity of this strap is spaced just sufficiently above a pair of channeled carriage guide ways **52** upon which a stack of carriers C rests to restrain all but the lowermost carrier from forward sliding movement out of hopper **49**.

The carriage guide ways **52** are parallel and extend horizontally, being supported at their front by cross bar **50**. As best illustrated in Figs. 2 and 3, there are two of these ways; they are internally channeled to provide rela-

tively closely spaced, horizontally extending, side-opening guide tracks 53. The rear ends of ways 52 are supported by a rigid bracket 56 secured to the machine frame.

An article pusher carriage 54 is provided with side anti-friction rollers 55 received in tracks 53 of ways 52. Carriage 54 also has laterally spaced pairs of anti-friction rollers 57 appropriately journalled thereon and disposed between the ways 52. Rollers 57 extend slightly above the tops of the carriage, and of ways 52, as illustrated in Fig. 3, and are located immediately to the rear of a transverse article engaging cleat 59, also located between ways 52.

Accordingly, with carriage 54 retracted behind the lowermost carrier C in hopper 49, the cleat 59 is positioned to engage behind the rear edge of that carrier when the carriage is advanced forwardly, sliding the carrier out of hopper 49 beneath the forward gauge strap 51. In anticipation, as the carriage takes its rearward return stroke, the anti-friction rollers 57 roll beneath the bottom carrier in the hopper without frictional resistance, until the carriage cleat 59 passes the rear edge of that carrier, in position to engage therebehind, again as illustrated in Figs. 2 and 3.

Carriage 54 is driven for its reciprocation by an elongated connecting and actuating rod 60, coupled mechanically to and extending rearwardly from spreader assembly 11, which is the basic moving unit of the container erecting section of the machine. A rearwardly extending spring strip 60' bears on rod 60 at its forward connection to this assembly.

Spreader assembly 11 comprises a generally T-shaped guide casing 61, best illustrated in Figs. 1, 4 and 5. Casing 61 is of flat outline, and is built up of shaped side plates to provide a downwardly opening rack guiding sleeve 62, and a pair of upper, horizontally aligned, oppositely opening guide sleeves 63; these slidably embrace the far machine side bar 19 and guide the assembly 11 in its longitudinal reciprocatory movement on the machine.

As illustrated in Fig. 4, the oscillatory actuating pitman 34 has a thrust link 64 pivoted on its upper end, link 64 being in turn pivoted at 65 to the left hand guide sleeve 63 of guide casing 61. Accordingly, desired reciprocatory movement is imparted to assembly 11 through movement of its casing 61 by pitman 34.

Left hand guide sleeve 63 of casing 61 also serves as the support for the rear wall deflecting unit 13 on assembly 11, mentioned above and hereinafter further described, and also mechanically connects the spreader assembly to the actuating thrust rod 60 of feed out carriage 54; thus assembly 11 mechanically reciprocates the carriage in synchronism with its reciprocation by pitman 34. For this purpose, a suitable rigid bracket 66 is bolted to guide sleeve 63, this bracket carrying an upstanding post 67 through which the rod 60 extends and is secured as illustrated in Fig. 4.

Rear wall deflecting unit 13 comprises a supporting block 68 fixed on post 67 intermediate the height of the latter, and an angled L-shaped deflecting arm 69 pivoted adjacent its midpoint on block 68. The upper portion of arm 69, in the retracted, inoperative position thereof illustrated in solid line in Figs. 1, 3 and 4, extends to the rear and lies beneath the plane of exit of the lowermost carton C from hopper 49; and the lower, tail portion of arm 69 has a cam follower roller 70 journalled thereon.

Follower 70 coacts with a fixed horizontal plate cam 71 appropriately supported on angled brackets secured to fixed frame side bar 20, as illustrated in Figs. 2 and 3, and it is evident that as spreader assembly 11 travels forwardly, the follower roller 70 on arm 69 of deflecting unit 13, which moves with the assembly, will engage and be controlled by cam 71. Travelling up its first rise 71' at an intermediate point in the forward stroke of unit 13, as illustrated in dot-dash lines in Fig. 3, the follower swings deflecting arm 69 in clockwise direction to prepare the arm for its final intended action. Then as, the assembly 11 and attached unit 13 reach the forward limit of their stroke, follower roller 70 rides up a secondary rise 71'' of cam strap 71, as illustrated in dotted lines in Fig. 3, swinging the arm 69 further clockwise and inwardly into engagement with the rear wall *k*—*k* of spread carton carton C. This has by now been spread by further instrumentalities of the unit 11, to be described, and arm 69 deflects wall *k*—*k* inwardly as indicated in Fig. 3.

Detailed structural features of carrier wall spreader assembly 11 are shown in Figs. 4 and 7, to which reference should be made. A pair of elongated vertical racks 72 are slidably guided in the upright stem portion 62 of the sleeve-like T-shaped guide casing 61. The gear teeth of the racks face one another and are in meshing engagement with a pinion 73 journalled in the casing. The left hand rack 72 is connected at its upper extremity to a lower suction head 74, while right hand rack 72 is similarly connected to an upper suction head 75.

Each of the heads 74, 75 is equipped with a pair of suction cups 76, and vacuum is created at the cups through the interior of the heads 74, 75 by flexible conduits 77. These are united by a T 78 with a common two-way valve 80, whose function is alternately to communicate heads 74, 75 with vacuum pump evacuation line 38 (Fig. 1) or with atmosphere. Operation of valve 80 is controlled by the movement of spreader assembly 11 and will be further described.

The device for actuating suctions heads 74, 75 through racks 71, 72 and pinion 73 is illustrated best in Figs. 4, 5, 6 and 7. A shaped horizontally extending cam track 81 is pivotally mounted on the far machine frame side guide bar 19, on which assembly 11 reciprocates, by means of a rear extension arm 82 of the cam track which swings on a pin 83 on the side bar. The cam track is capable of a slight vertical pivoting shift at the end of the forward stroke of assembly 11, and the purpose of this is to withdraw suction cups 74, 75 from the spread carrier.

Cam track 81 is of angled outline, including an upwardly and forwardly inclined rear portion 84 and a horizontal forward portion 85. Portion 85 terminates at a connecting strap 86. The cam portions 84, 85 are of channeled sectional outline and a cam follower roller 87, which is journalled on right hand spreader head rack 72, is received in the cam channel. The outer plate of vertical guide casing sleeve 62 is appropriately slotted to accommodate vertical movement of cam follower 87.

As the guide casing 61 of spreader assembly 11 is horizontally reciprocated by pitman 34 the follower 87 will travel in cam track 81 to cause suction head actuating, right hand rack 72 to rise and fall, with attendant vertical movement of left hand rack 72 in an opposite sense through connecting pinion 73. The carrier spreader heads 74, 75 are correspondingly separated from one another and brought together, departing from the position illustrated in solid lines in Fig. 4 to an ultimate fully separated position, illustrated in dotted lines in that figure, at the extreme forward travel of the spreader assembly 11.

As the flat collapsed carrier C is advanced by carriage 54 forwardly out of hopper 49 and into position for gripping by the suction heads, it is guided at its opposite sides, i. e., along the outer side margin of partition and handle *a* and along the medial bottom crease *g*, by longitudinally extending angled, near and far guideways 89, 90. These ways are appropriately secured at their rear extremities to portions of the hopper 49 which are supported fixedly and for transverse adjustment. The far, fixedly supported way 90 extends a considerable distance forwardly to the divider turret assembly 18, where it is appropriately secured toone of the frame uprights 23 or like equivalent support.

The near, transversely adjustable, angled way 89 extends only part of this distance, as illustrated in Fig. 1 terminating at a point where its function is continued by

a flat guide strap 91, a component of the carrier holding and latching assembly 15. A welded connection 92 supports the forward end of angled way 89 in fixed relation to this strap, which is itself appropriately supported on the unit 17 of assembly 15. Unit 17 is mounted on the near adjustable frame side bar 22; the same is true of the hopper upright 45 on which the rear end of guide 89 is anchored.

It is seen from the above that as the carrier side walls *b*, *b* are spread apart by the oppositely moving suction heads 74, 75, the bottom *f*—*f* in approaching planar condition leaves the side guide way 89 and, as the carrier walls are fully spread, enters within the part of holding frame 16 defined by side guide strap 91, partition and handle panel *a* remaining guided by the other angled guide 90. Thus the elected carrier C is side-restrained against return spring to flat condition when not held by heads 74, 75.

It is important at the extreme forward limit of the stroke of spreader assembly 11, feeding a spread carrier C into the holding and latching assembly 15, that suction be cut off in the heads 74, 75 and that the same be spread slightly further to separate the heads from engagement with the carrier walls, so that a rearward return stroke can be made without interference with the carrier. This operation is performed by the instrumentalities best illustrated in Figs. 5, 6 and 7 of the drawings.

The forward connecting strap 86 of cam track 81, which as stated above is capable of a slight vertical movement about its pivot 83, is pivoted at 95 on the outer end of one link 96 of a toggle 97 whose other link 98 is appropriately pivoted on the machine frame, as by a depending bracket 99 on far side bar 19 (Fig. 4). The inner ends of links 96, 98 are pivoted in common on a pin 100 at the forward extremity of a toggle actuating rod 101, whereby forward shifting movement of the rod 101 will straighten toggle 97, elevate cam track 81 a slight distance about pivot 83, and so further separate suction heads 74, 75 beyond the distance they were previously separated by cam actuated movement of the heads. Toggle 97 is restored to its broken condition of Fig. 6 upon the return stroke of spreader assembly 11, in a way which will be described.

Control of toggle 97 is coordinated with control of the vacuum valve 80. This valve is a well known plunger type, featuring a valve plunger 102 slidable in a valve body. The plunger is operable, in two different positions, to communicate flexible suction head conduits 77 with vacuum pump 36 through conduit 38, or with atmosphere through an open side fitting 103. Internal details of the valve do not require illustration, since it is a standard type. Valve plunger 102 is connected to one end of an actuating rod 104 which parallels toggle control rod 101, and these rods are slidably guided at their rear ends in a laterally projecting bracket 105 (Figs. 5 and 6) on the far machine side bar 19.

Control of the reciprocating movement of rods 101, 104 is through the agency of a laterally projecting bracket 106 on the outer side of the horizontally reciprocable guide casing 61, in which the racks 71, 72 of spreader unit 11 are mounted, as shown in Figs. 5, 6 and 7. This bracket has an upstanding vertically slotted guide portion through which the rods 101, 104 extend with slight clearance, and the rods are provided with fixed thrust collars which are engaged by bracket 106 in the horizontal reciprocation of assembly 11. This shifts the rods for the purposes of straightening and breaking toggle 97 and of controlling the operation of valve plunger 102. The operations are best understood by referring to Fig. 6.

Fig. 6 shows the various toggle, valve and control rod parts in the position occupied thereby at the commencement of the forward operational stroke of spreader assembly 11, during which the spreader heads 71, 72 are vertically separated by travel of follower roller 87 in cam track 81. Toggle 97 is broken rearwardly and valve plunger 102 is in a position to communicate suction heads 74, 75 with vacuum pump 36. The bracket 106 on assembly 11 rearwardly engages collars 108, 109 on the respective rods 101, 104, which collars it has returned rearwardly to the position shown upon the immediately preceding retractile stroke of the bracket.

As assembly 11 and its bracket 106 slide forwardly on side frame bar 19, the rods are unaffected during a major interval of the forward travel of cam follower roller 87 in cam track 81, i. e., until the follower reaches the position illustrated in dotted line in Fig. 6. When this point is reached, the bracket 106 engages further collars 110, 111 secured on rods 101, 104, respectively, whereupon slight further forward movement of assembly 11 causes bracket 106 to shift the collars and rods forwardly. Toggle 97 is straightened to separate suction heads 74, 75 still further and to disengage the same from the spread walls *b*, *b* of the carrier C. At the same instant, or even preferably slightly before, plunger 102 of valve 80 is shifted to disconnect head suction conduits 77, 87 from the vacuum source and open the same to atmosphere through the fitting 103. All this conditions the suction heads for a free return stroke.

Upon the return stroke of the spreader unit 11, the toggle 97 remains straight and suction heads 74, 75 remain exposed to atmospheric pressure, until the bracket 106 rearwardly engages the collars 108, 109, whereupon rods 101, 104 are shifted to the rear, toggle 97 is restored to the position of Fig. 6 and valve 80 is again put in communication with vacuum pump 36. Further stop collars 112 fastened on rods 101, 104 at either side of rear guide bracket 105 serve to limit overthrow of the rods in both directions of their longitudinal travel; the primary control of the rods is by engagement of bracket 106 with their collars 108, 109 and 110, 111 at opposite extremities of the stroke of spreader assembly 11.

The final erecting operation on the spread carrier C is performed by the rear deflecting arms 69 on the deflecting unit 13 associated with assembly 11, and in this connection reference should be made to Figs. 2 and 3 in conjunction with Figs. 9 and 10. The unit 13 of course travels with assembly 11 in its forward and rearward stroke and, as illustrated in Fig. 3, as it travels forwardly, its cam follower roller 70 first engages against the first, rearmost rise 71′ of fixed plate cam 71. Arm 69 is preliminarily swung in counterclockwise direction to the approximate position illustrated in dot-dash line, i. e., in position to go into action on the rear wall *k*—*k* of carrier C when the spreader assembly 11 reaches its forwardmost position.

When this extreme forward limit of the stroke is reached, the cam follower 70 rides up the second rise 71″, causing arm 69 to pivot further clockwise and deflect rear wall *k*—*k* forwardly of the bottom *f*—*f*, as illustrated in dotted line in Fig. 3. At this time the bottom deflecting device 17 of latching unit 16 comes into play, and on an immediately ensuing return stroke of the spreader assembly, arm 69 is restored to its rearwardly withdrawn position shown in solid line in Fig. 3. This is done by engagement of follower 70 with an upright extension 114 of a strap 115 fixed on the rear end of plate cam 71.

At the time the deflector arm 69 shifts forwardly in its final increment of movement to perform its intended function, the carrier C is restrained against longitudinal forward movement in holding and latching assembly 15 by the provisions best illustrated in Figs. 1, 8, 9, 10 and 11 of the drawings, and the final bottom latching operation is also being performed by instrumentalities appearing in those figures.

Referring to Figs. 1 and 8, the assembly 15 comprises, in addition to the horizontal, strap-like, near side guide 91 and opposed angled far side guide 90, the laterally adjustable, longitudinally extending, 90° angle iron

guides at top and bottom designated **116, 117**, respectively, and a top guide **118** at the opposite side of the unit. Guide **118** is fixedly supported on an upper extension **119** of a frame upright, to which the angled guide **90** may also be intermediately secured. The guides **91, 116, 117** are fixedly but adjustably supported by an auxiliary upright frame **120** secured to the adjustable side bar **22** of the machine frame.

An upright shaft **121** by which the carrier stop and latching instrumentalities (to be described) are actuated is appropriately journalled at the top and bottom of auxiliary frame **120**. A pair of curved stop fingers **122** are secured on shaft **121**, in vertically spaced relation to one another, and a bottom tucker arm **123** is also secured to shaft **121** between the fingers **122**. Arm **123** is provided with a forked end **123'** to engage the bottom *f—f* of the carrier, straddling its medial center crease *g*.

The above linkage may be urged toward a retracted position, i. e., with a counter-clockwise force on shaft **121**, as viewed in Fig. 9, by suitable spring means (not shown) and stop bumper provisions to limit this movement (also not shown).

Shaft **121** is oscillated about its axis, in timed relation to the movement of spreader assembly **11**, by a linkage as follows: An actuating arm **124** is secured on shaft **121** adjacent the lower end thereof, extending inwardly of the fixed machine frame bar **21**, and the free end of the arm has a thrust link **125** pivoted thereon and extending across beneath the far side bar **19**. Link **125** is pivoted at its other end to a cam actuated arm **126**, pivoted by upright shaft **127** on machine side bar **19**. Arm **126** carries a cam follower roller **128** intermediate its ends which is engaged and actuated by a shaped plate cam **129** as shown in Fig. 9. Cam **129** is attached by a bracket **130** to a guide sleeve **63** of guide casing **61** (see Fig. 4), thus reciprocating with assembly **11** between the solid and dotted line positions illustrated in Fig. 9.

Cam **129** is provided with first and second rises **131, 132**, and it is seen that as the cam approaches the solid line position of Fig. 9, its primary rise **131** engages follower roller **128** and shifts the same, causing arm **126** to rotate counterclockwise preliminarily about its pivot to the position of Figs. 5A and 9. Prior to this arm **126**, link **125** and actuating arm **124** are positioned to place fingers **122** and arm **123** in the retracted position of Fig. 5, in which an erected carrier C is permitted to pass the former. Rise **131** shifts the stop fingers **122** sufficiently inwardly to position them in the path of the carrier C being advanced into the unit **15**, thus holding the carrier against further endwise movement when it is first engaged by rear wall deflecting arm **69**. As the assembly **11** advances further, the leading edge of the carrier is approached toward fingers **122**, finally abutting the same, and arm **69** is actuated to deflect rear wall *k—k* of the carrier, in turn bulging forwardly the front wall *c—c*. Tucker or deflector arm **123** is not yet engaged with the carrier in its second or intermediate position of Figs. 5A and 9.

The follower roller **128** next rides up the secondary rise **132** of cam **129**, oscillating the stop fingers **122** and tucker arm **123** further to the position illustrated in Fig. 11, in which tucker arm **123** engages the carrier bottom *f—f* immediately to the rear of the end notch *i* therein (see Fig. 11), deflecting the bottom inwardly in relation to the carrier. The edge of the stop fingers **122** is a radius, so that as they shift further inward with arm **123** the carrier continues to be held against forward movement.

While the parts are in this condition, the assembly **11** commences its rearward retractile stroke. As a first incident of this, deflecting arm **69** of unit **13** is rearwardly withdrawn from the carrier wall *k—k*, so that the forward wall *c—c* and the attached hook *j* spring rearwardly under the inherent resilience of the carrier hinge creases, engaging the hook with the bottom notch *i* and completing the operation necessary to erect and latch the carrier.

All that now remains is to discharge the erected carrier to the divider assembly **18**. This involves the pusher unit **14** associated with reciprocable assembly **11**, the final component of that assembly and one which has not come into play in the carrier erecting cycle as thus far described.

It will be observed by reference to Fig. 1 that as the spreader assembly **11** moves forwardly to deliver an erected carrier into the holding and latching assembly **15**, the pusher unit **14**, being located forwardly of spreader heads **74, 75** thereof, will engage and further forward a previously erected and latched carrier C present in the assembly **15**, engaging the rear margin of the carrier as indicated in dotted line in Fig. 4. The unit **14** is best illustrated in Figs. 4 and 5 of the drawings.

It comprises a laterally extending pusher arm **134** of a lever **135**. The lever is medially pivoted at **136** on a bracket **137** secured to the right hand side guide sleeve **63** of spreader guide casing **61**. The lever **135** has a transverse pin **138** secured thereon to project laterally from its rear tail extremity; and the lever is urged counterclockwise, as viewed in Fig. 4, by means of a coil torsion spring **136** encircling its pivot and engaging the lever and bracket, tending to elevate the pusher **134** to a position determined by the engagement of its stop pin with the bracket **137**.

When the spreader assembly **11** has delivered a spread carrier to holding and latching assembly **15**, the pusher **134** will have advanced a previously latched carrier a further step forward and will be beneath and in front of the carrier so advanced for holding and latching. On the next retractile stroke, pusher lever **135** will yield downwardly in clockwise direction as it wipes rearward beneath this carrier at station **15**, and after passing beneath the same will be spring returned to its operative position, shown in solid line in Fig. 4, for a succeeding pushing stroke on the next cycle.

In order to prevent possible regressive movement of the carrier from unit **15** as this takes place, it is desirable to provide an appropriate detent **140** which may, as illustrated in Fig. 1, be in the form of a latch hook pivotally mounted on the top of the frame **16** of assembly **15** and urged downwardly under mild pressure by a spring **141**. Carriers C advancing into holding and latching assembly **15** will readily pass beneath detent hook **140**, but will be positively restrained against undesired rearward movement under the frictional force of the pusher **134** wiping beneath a carrier in the unit.

After being erected, bottom-latched and released in latched condition, each carrier is advanced by the pusher **134** on the next stroke of the mechanisms which performed these operations, which discharges the carrier out of the holding frame **16** of assembly **15**. In leaving the holding frame, the carrier tumbles downwardly along an upwardly and outwardly inclined ramp surface **143**, by which it is naturally directed to an upstanding position, resting on its bottom *f—f*. It is moved forwardly on a flat receiving table **144** of divider turret assembly **18** by the next following carrier leaving holding frame **16**, and is positioned between the arms of a selectively rotatable or oscillatory divider turret **145**, which acts through a set of H-shaped openings **146** in a laterally enlarged extension **147** of the turret table.

Structural features of the divider turret **145** are illustrated in Figs. 12, 13, 14 and 15 of the drawings, with which Figs. 1 and 5 may also be considered for an understanding of the operation of the turret in relation to the operation of the rest of the machine.

The turret comprises two parallel sets of transversely aligned, radially extending and circumferentially spaced pusher shoes **148**, five per set being shown in the illustrated embodiment, which shoes are fixedly mounted on

radial rods 149 secured to circular mounting plates 150 fixedly mounted on a rotative shaft 151.

As illustrated in Fig. 1, shaft 151 is appropriately journaled in a forward auxiliary frame 152 built onto the main frame of the machine. The auxiliary frame also rotatably supports a sprocket 153 driven by endless chain or link belt 31 and, as shown in Figs. 12 and 13, cam 155 has a spiral cam track 156 formed about its periphery. A cam follower roller 157 on an angled actuating link 158 is received in the cam track. The lower end of link 158 is pivoted at 159 on the framework of the machine, and its upper end is pivoted at 160 to a pawl and ratchet actuating unit, generally designated 161, which controls rotation or oscillation of divider turret 145. Obviously the improved mechanical movement constituted by link 158 and the unit 161 is widely adapted to the driving of any shaft which it is desired to have, optionally, intermittently rotatable unidirectionally in either of two opposite directions or alternately oscillatable in both directions.

Such selectivity of operation is especially advantageous in the present machine in view of the fact that it is desirable that the same be capable of supplying erected and latched carriers to either one of two parallel article loading lines, or to both lines. The present equipment is so devised and arranged that a simple manual adjustment is all that is required to adapt the same machine to deliver in this fashion at turret 145.

To these ends, pawl and ratchet unit 161 comprises a pair of drive links 162, 163, each connected to actuating link 158 at a common terminal pivot 160 on the latter. Links 162, 163 are in V-angled relation to one another, and at their opposite ends are pivoted at 164, 165, respectively, to the outer extremities of radial pawl actuating arms 166, 167, respectively. These arms are freely pivoted at their inner ends on turret shaft 151, being arranged between a pair of ratchet disks 168, 169. The two pawl actuating arms are interfitted with one another at their pivoted engagement with the shaft 151, the arm 166 being bifurcated in this zone and the arm 167 fitting into the bifurcation, as shown in Fig. 13. Ratchets 168, 169 are secured on shaft 151 in a predetermined angular relation to one another shown in Fig. 12, and duplicated in Figs. 14 and 15 with the ratchets separated, in the interest of clarity.

Each of the radial actuating arms 166, 167 has a pair of adjustable pawls pivoted thereon, on opposite sides thereof and outwardly of the peripheral limits of ratchet disks 168, 169. These include a driving pawl 170 on one side of arm 166 which is adjustable to and from ratchet engaging position, as illustrated in solid and dotted lines (Fig. 14), and a driving pawl 171 on the opposite side of arm 166, similarly adjustable in or out of ratchet engaging position. Pawl actuating arm 167 includes a pivoted driving pawl 172 on one side thereof (Fig. 15) and a further driving pawl 173 on the opposite side thereof, both being adjustable between solid and dotted line positions in the fashion of the previously described pawls.

The arrangement of the pawls on the respective pawl driving arms is such that the driving pawl 173 of arm 167 and the pawl 170 of arm 166 are selectively engageable or disengageable with the ratchet 168, while the respective driving pawls 171, 172 on the opposite side surfaces of those arms are selectively engageable with or disengageable from the other ratchet disk 169. Ratchets 168, 169 are machined to provide notches 174 equally spaced about their respective peripheries in the angular orientation shown in Figs. 14 and 15.

In operation, let it be assumed that the pawl and ratchet mechanism 161 as shown in Figs. 12, 14 and 15 is viewed from the rear or hopper end of the machine, looking toward the divider turret mechanism 18. Rotation of the transverse shaft 154 by chain belt drive from speed reducer sprocket 30, results in oscillation of actuation link 158 about its bottom pivot 159. This causes the drive links 162, 163 of mechanism 161 to reciprocate transversely in the direction indicated by arrows in Fig. 12.

If it is desired that turret 145 discharge on table extension 147 in a single transverse direction, for example toward the bottom of the sheet as viewed in Fig. 5, or toward the viewer of Fig. 1, the driving pawl 170 of arm 166 and pawl 173 of arm 167 are swung inwardly for engagement in notches 174 of ratchet 168 and the corresponding driving pawl 172 of arm 167 and pawl 171 of arm 166 are withdrawn to inoperative, dotted line position in reference to disk 168. Upon shifting of driving links 162, 163 to the right as viewed in Fig. 12, the ratchet 168 and shaft 151 will be rotated clockwise by pawl 170 an angular distance equalling the angle between successive notches of the ratchet 168. On the return stroke of the links to the left, the pawl 173 will shift ratchet 168 and the shaft clockwise a similar angle. Accordingly, turret 145 will advance clockwise one step and a pair of erected carriers C preset before their delivery shoes 148 will be forwarded laterally in the desired direction.

The angularity of the spiral of cam track 156 and the speed of rotation of shaft 154 are so related to the rate of discharge of on latched carriers by the preceding mechanism that a pause intervenes between ratchet driving strokes of pawl and ratchet mechanism 161 sufficient to permit a pair of carriers to be placed between the delivery shoes 148 of the turrets.

When it is desired to advance articles in the opposite direction, i. e., toward the top of the sheet as viewed in Fig. 5, or away from the viewer of Fig. 1, the driving pawl 172 on arm 167 is engaged with ratchet disk 169 as shown in solid lines in Fig. 15, and the pawl 171 of the other arm 166 is similarly engaged with disk 169, the pawls associated with disk 168 being withdrawn. Oscillatory operation of the driving links 162, 163 now results in counterclockwise rotation of the shaft 151 through ratchet 169, and the desired delivery of the carriers ensues.

When it is desired to forward the completed carriers alternatively in opposite directions along the table extension 147, the pawls 172, 173 common to radial arm 167 may be engaged with the ratchets 169, 168, respectively, the pawls 170 and 171 of the other arm 166 being disengaged from ratchets 168, 169, respectively, to the dotted line position. With this arrangement shaft 151 will oscillate and discharge cartons in alternate opposite directions as mechanism 161 is driven through actuating arm 158. The same result is had when the pawl setting is reversed.

In the operation of the machine as a whole, with the hopper 49 of assembly 10 filled with flat paperboard carriers C, with the parts in the position illustrated in solid lines in Figs. 1–6, and with vacuum pump 36 electrically energized, energization of main drive motor 26 through a suitable switch unit (not shown) results in the imparting of a clockwise stroke to the pivoted pitman 34 and a forward sliding movement of carrier spreader assembly 11, which correspondingly advances carrier feed out carriage 54 and the rear wall deflecting unit 13 and pusher unit 14, which are mechanically coupled therewith. The push bar 134 of unit 14 now engages and discharges an erected and latched carrier previously operated on in holding and latching unit 15, simultaneously forwarding to divider turret assembly 18 any completed carriers in advance thereof.

As illustrated in Figs. 2 and 3, the pusher lug or dog 59 on feed out carriage 54 engages and forwards the lowermost carrier in hopper 49, and in the meantime, a previously fed out carrier is gripped by the suction heads 74, 75 of assembly 11 in the position thereof illustrated in Figs. 4 and 5. As assembly 11 progresses forwardly, the gripped carrier C is spread to rectangular outlines, the cam follower 87 on one of the spreader head separating racks 72 riding upwardly in the angled portion 84 of cam track 81 and along the horizontal portion 85 thereof.

Rack and pinion action produces the suction spreading of the carrier walls.

The suction heads deliver the spread carrier into frame **16** of holding and latching unit **15**, by which return spring of the carrier to flat condition is prevented when the suction heads disengage from the carrier. This they do when suction heads **74**, **75** are exposed through valve **80** to atmosphere and toggle **97** is straightened at the extreme forward limit of the head stroke. Operation of rods **101**, **104** by the bracket **106** on assembly **11**, produces the necessary straightening of the toggle and operation of control valve **80**.

As this is taking place while the carrier proceeds to the end of its movement by the suction heads, the follower roller **70** on arm **69** of rear wall deflecting unit **13** rides upwardly on fixed plate cam **71** and, engaging the second rise **71''** thereof, springs forwardly to deflect the rear wall of the carrier. Corresponding outward deflection of the forward wall takes place as the carrier is forwardly restrained by the pivoted stop fingers **122**, as shown in Fig. 9, which have been actuated inwardly by traveling side plate cam **129** and its associated linkage. Pivoted tucker arm **123** now engages the bottom *f—f* of the carrier, also under force imparted by cam **129**, which causes the carrier bottom to be deflected inwardly, as shown in Fig. 11. When deflecting arm **69** retreats rearwardly, the inherent resilience of the carrier, supplemented by the rear pressure of stop fingers, causes the latch hook *j* to engage with the notched end *i* of the carrier bottom, completing the latching operation.

The carrier is held by detent latch **140** against rearward movement as pusher arm **134** of unit **14** travels rearwardly therebeneath, and on a next forward stroke of the assembly **11**, the pusher bar engages that carrier and shoves the same forwardly out of holding and latching unit **15**.

Carriers C successively erected and discharged in the foregoing fashion are pushed in series into the divider turret assembly **18**, where they right themselves gravitationally. Turrets **145** discharge the carriers in either of two opposite transverse directions or in alternation, under actuation by the pawl and ratchet mechanism **161** of Figs. 12–15, as to the operation of which further detailed description is unnecessary.

The machine is relatively simple in its parts and reliable in operation. There are relatively few moving parts comprised in the feed out carriage **54**, the suction spreader unit **11** and deflecting and pusher units **13**, **14** associated therewith, the deflecting linkage at carrier holding and latching unit **15**, and the turret mechanism **18** with its improved mechanical movement. These are all simple arrangements not apt to require attention, repair or adjustment once the machine is properly set for desired operation on a predetermined size carrier C. The normal operating speed of the machine is amply high to supply the requirements of at least two bottle loading machines at its delivery end, and it may, if desired, be speeded up further without unduly detracting from its inherent reliability of performance.

We claim:

1. In a container erecting machine, a gravity supply hopper for flat, knocked-down containers comprising fixed and laterally adjustable upright members, a feed out device acting to feed containers forwardly in linear succession from said hopper, a longitudinally reciprocable assembly acting on containers fed by said device to spread opposed side and end walls of the containers to a rectangular sectional outline, a holding and latching unit to which spread containers are delivered by said device, said unit acting to engage a container bottom connected to said side walls with a centrally arranged longitudinal partition in the container and comprising fixed and laterally adjustable container guide members and a unit acting transversely on said bottom to deflect said bottom for latching engagement with said longitudinal partition, means actuable by movement of said spreading assembly to operate said unit in synchronism with the operation of the assembly, and means to support said hopper and said holding and latching unit, comprising a fixed frame member on which the respective fixed hopper and guide members are mounted, an adjustable frame member on which the respective laterally adjustable hopper and guide members are mounted, and means to shift said adjustable frame member to and from said fixed frame member.

2. In a container erecting machine, a gravity supply hopper for flat, knocked-down containers comprising fixed and laterally adjustable upright members, a feed out device acting to feed containers forwardly in linear succession from said hopper, a longitudinally reciprocable assembly acting on containers fed by said device to spread opposed side and end walls of the containers to a rectangular sectional outline, said assembly being mechanically connected to said feed out device to operate the same, a holding and latching unit to which spread containers are delivered by said device, said unit acting to engage a container bottom connected to said side walls with a centrally arranged longitudinal partition in the container and comprising fixed and laterally adjustable container guide members and a unit acting transversely on said bottom to deflect said bottom for latching engagement with said longitudinal partition, means actuable by movement of said spreading assembly to operate said unit in synchronism with the operation of the assembly, and means to support said hopper and said holding and latching unit, comprising a fixed frame member on which the respective fixed hopper and guide members are mounted, an adjustable frame member on which the respective laterally adjustable hopper and guide members are mounted, and means to shift said adjustable frame member to and from said fixed frame member.

3. A container erecting machine comprising a supply means for flat, knocked-down containers, a feed out device acting to feed containers forwardly in linear succession from said supply means, a longitudinally reciprocable suction spreader assembly acting on containers fed by said device to spread opposed side and end walls of the containers to a rectangular sectional outline, said assembly being mechanically connected to said feed out device to operate the same and comprising opposed vertically acting suction heads engageable with side walls of the container, a vertically guided toothed rack on each head, a pinion meshing with said racks, a cam follower in fixed relation to one of the racks and a cam engaged by said follower to cause opposite vertical movements of the racks and associated suction heads, and means to latchingly engage a container bottom connected to said side walls with the leading end wall, and means actuable by movement of said spreader assembly to operate said latching means in synchronism with the operation of said first device.

4. A container erecting machine comprising a supply means for flat, knocked-down containers, a feed out device acting to feed containers forwardly in linear succession from said supply means, a longitudinally reciprocable suction spreader assembly acting on containers fed by said device to spread opposed side and end walls of the containers to a rectangular sectional outline, said assembly being mechanically connected to said feed out device to operate the same and comprising opposed vertically acting suction heads engageable with side walls of the container, a vertically guided toothed rack on each head, a pinion meshing with said racks, a cam follower in fixed relation to one of the racks and a cam engaged by said follower to cause opposite vertical movements of the racks and associated suction heads, and means to latchingly engage a container bottom connected to said side walls with the leading end wall, said last named means comprising a first unit acting on the container to deflect an end wall thereof outwardly of an end margin of said bottom, and a second unit acting transversely on said

bottom to deflect the same inwardly of the spread container for latching engagement with said deflected end wall, and means actuable by movement of said spreader assembly to operate said first and second units in synchronism with the operation of said first device.

5. A container erecting machine comprising a supply means for flat, knocked-down containers, a feed out device acting to feed containers forwardly in linear succession from said supply means, a longitudinally reciprocable suction spreader assembly acting on containers fed by said device to spread opposed side and end walls of the containers to a rectangular sectional outline, said assembly being mechanically connected to said feed out device to operate the same and comprising opposed vertically acting suction heads engageable with side walls of the container, a vertically guided toothed rack on each head, a pinion meshing with said racks, a cam follower in fixed relation to one of the racks and a cam engaged by said follower to cause opposite vertical movements of the racks and associated suction heads, and means to latchingly engage a container bottom connected to said side walls with the leading end wall, said last named means comprising a first unit acting on the container to deflect an end wall thereof outwardly of an end margin of said bottom, and a second unit acting transversely on said bottom to deflect the same inwardly of the spread container for latching engagement with said deflected end wall, said first unit being mechanically coupled with said spreader assembly rearwardly of the latter for simultaneous movement therewith, and means actuable by movement of said spreader assembly to operate said second unit in synchronism with the operation of said first unit.

6. In a machine for erecting paperboard containers, a longitudinally moving suction spreader assembly engageable with opposite side walls of a knocked-down carrier forwardly of its rear edge to spread those walls to a spaced parallel relation, said assembly comprising suction heads vertically engageable with said respective side walls, a vertically guided toothed rack connected to each suction head, a rotatable pinion meshing with said racks, a longitudinally extending cam track, a roller in fixed relation to one of said racks and engaged with said track, and means to reciprocate said assembly longitudinally whereby movement of said roller on said cam track causes reciprocating movement of said suction heads toward and away from one another.

7. An assembly for spreading the side and end walls of a flat, knocked-down container to an erected, rectangular outline, comprising a pair of opposed longitudinally movable heads grippingly engageable with opposed side walls of the container to spread said walls to a spaced parallel relation as the heads move longitudinally and a deflecting unit adapted to act on an end wall of the spread carrier to deflect the same longitudinally in reference to the side walls, said unit comprising a pivoted deflecting arm and means mechanically connecting the same with said heads for simultaneous longitudinal movement therewith, and a cam engageable by said deflecting arm upon movement of said unit to cause the arm to engage said end wall of the container.

8. An assembly for spreading the side and end walls of a flat, knocked-down container to an erected, rectangular outline, comprising a pair of opposed longitudinally movable heads grippingly engageable with opposed side walls of the container to spread said walls to a spaced parallel relation as the heads move longitudinally and a deflecting unit disposed to the rear of said heads, in relation to their longitudinal spreading movement, and adapted to act on an end wall of the spread carrier to deflect the same longitudinally in reference to the side walls, said unit comprising a pivoted deflecting arm and means mechanically connecting the same with said heads for simultaneous longitudinal movement therewith, and a cam engageable by said deflecting arm upon movement of said unit to cause the arm to engage said end wall of the container.

9. An assembly for spreading the side and end walls of a flat, knocked-down container to an erected, rectangular outline, comprising a pair of opposed longitudinally movable heads grippingly engageable with opposed side walls of the container, a pair of slidable racks and a connecting pinion operatively connected with said heads, cam and follower means actuating one of the racks in response to longitudinal movement of said heads to cause opposite movement of said heads in reference to the plane of the flat container and thereby to spread said walls to a spaced parallel relation as the heads move longitudinally and a deflecting unit adapted to act on an end wall of the spread carrier to deflect the same longitudinally in reference to the side walls, said unit comprising a pivoted deflecting arm and means mechanically connecting the same with said heads for simultaneous longitudinal movement therewith, and a cam engageable by said deflecting arm upon movement of said unit to cause the arm to engage said end wall of the container.

10. A machine for erecting and latching containers, comprising a device engageable with opposite side walls of a flat, knocked-down container to spread the same to spaced parallel relation, a container holding frame into which spread containers are advanced from said device, a rear wall deflecting unit engageable with a rear wall of a container in said frame to deflect said rear wall forwardly in relation to the spread side walls, and a latching unit associated with said frame comprising a laterally shiftable stop finger engageable with a container in the frame to sustain the container longitudinally during movement of said deflecting unit, and a tucker arm acting transversely on a spread bottom wall of the container to deflect the same inwardly of said side walls for latching engagement with a centrally arranged longitudinal partition in the container, and means actuating said stop finger and tucker arms in timed relation to one another.

11. A machine for erecting and latching containers, comprising a longitudinally movable device engageable with opposite side walls of a flat, knocked-down container to spread the same to spaced parallel relation while advancing the container in a forward stroke, a container holding frame into which spread containers are advanced by said device, a rear wall deflecting unit mechanically coupled with said device and engageable with a rear wall of a container advanced by the device to said frame to deflect said rear wall forwardly in relation to the spread side walls, and a latching unit associated with said frame comprising a laterally shiftable stop finger engageable with a container in the frame to sustain the container longitudinally during movement of said deflecting unit, and a tucker arm acting transversely on a spread bottom wall of the container to deflect the same inwardly of said side walls for latching engagement with a centrally arranged longitudinal partition in the container, and means actuating said stop finger and tucker arms in timed relation to one another in response to longitudinal movement of said spreading device.

12. A machine for erecting and latching containers, comprising a device engageable with opposite side walls of a flat, knocked-down container to spread the same to spaced parallel relation, a container holding frame into which spread containers are advanced by said device, a rear wall deflecting unit engageable with a rear wall of a container in said frame to deflect said rear wall forwardly in relation to the spread side walls, said frame having means engageable with the spread container to prevent return thereof to flat condition, and a latching unit associated with said frame comprising a laterally shiftable stop finger engageable with a container in the frame to sustain the container longitudinally during movement of said deflecting unit, and a tucker arm acting transversely on a spread bottom wall of the container to deflect the same inwardly of said side walls for latching engage-

ment with a centrally arranged longitudinal partition in the container, and means actuating said stop finger and tucker arms in timed relation to one another.

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