

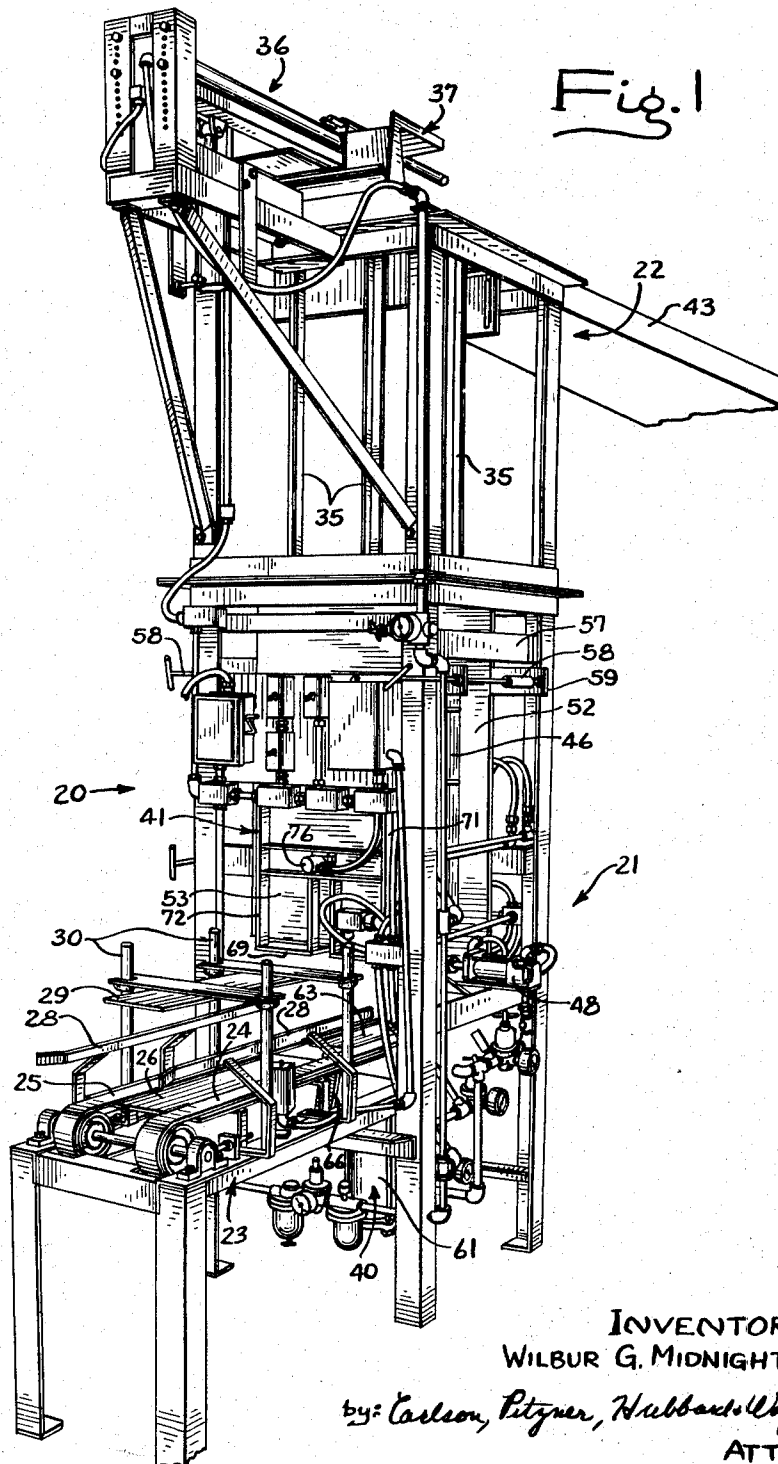
Sept. 22, 1959

W. G. MIDNIGHT
VERTICAL CARTON SEALER

2,904,941

Filed April 15, 1957

6 Sheets-Sheet 1



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6 Sheets-Sheet 2

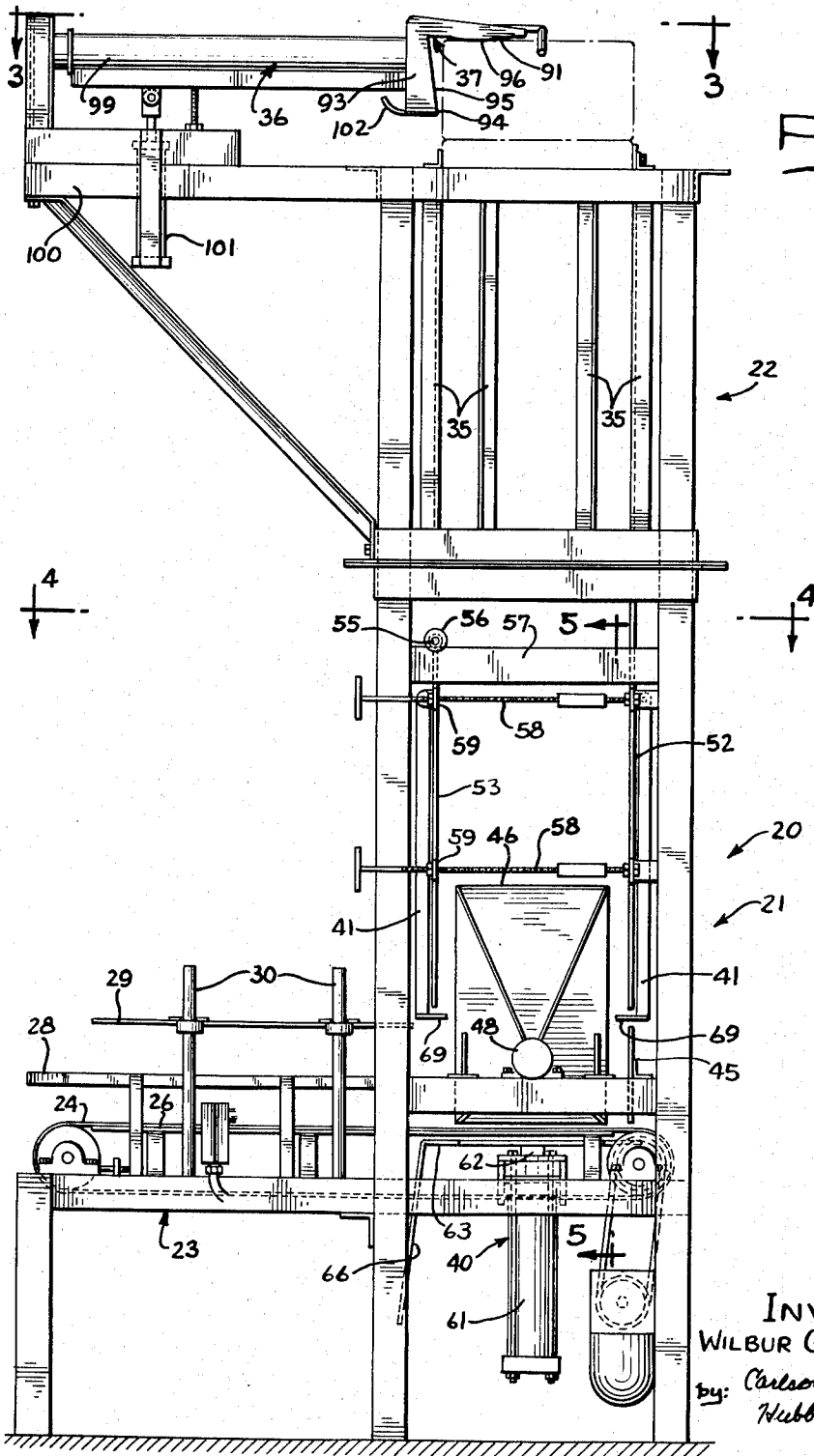


Fig. 2

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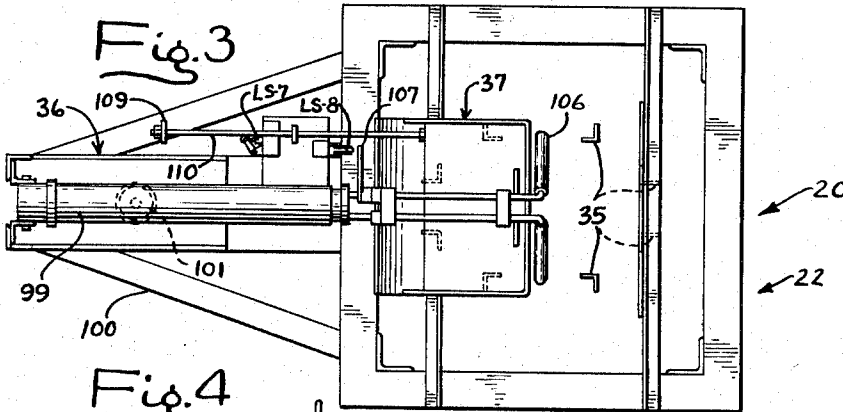
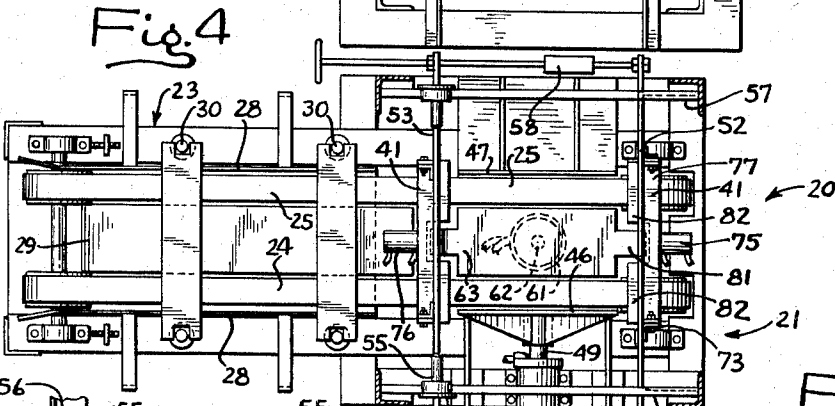
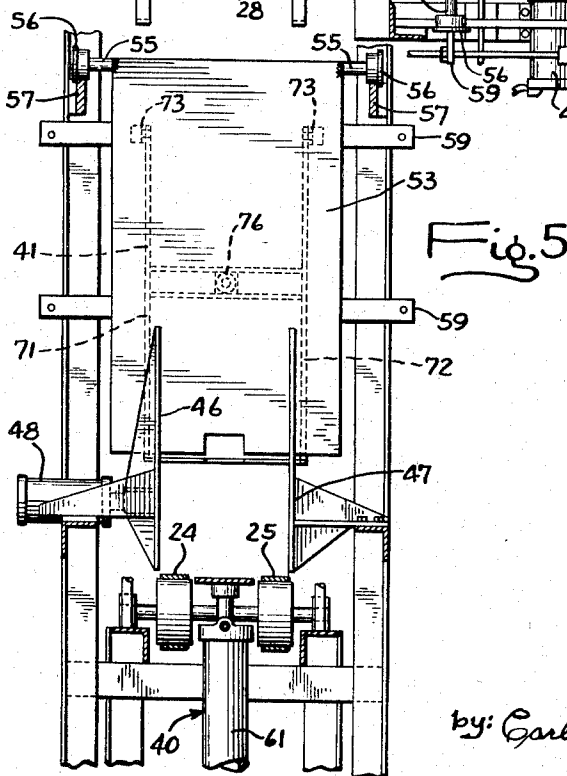
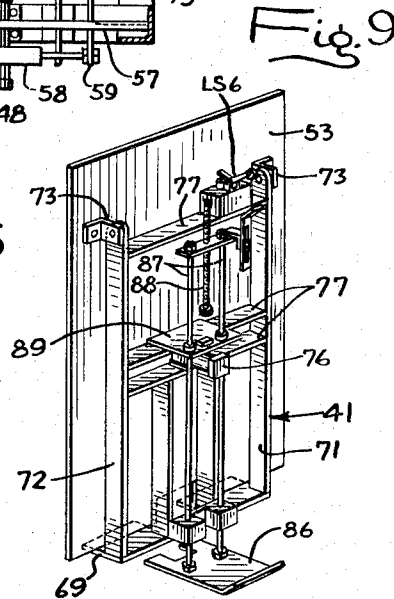
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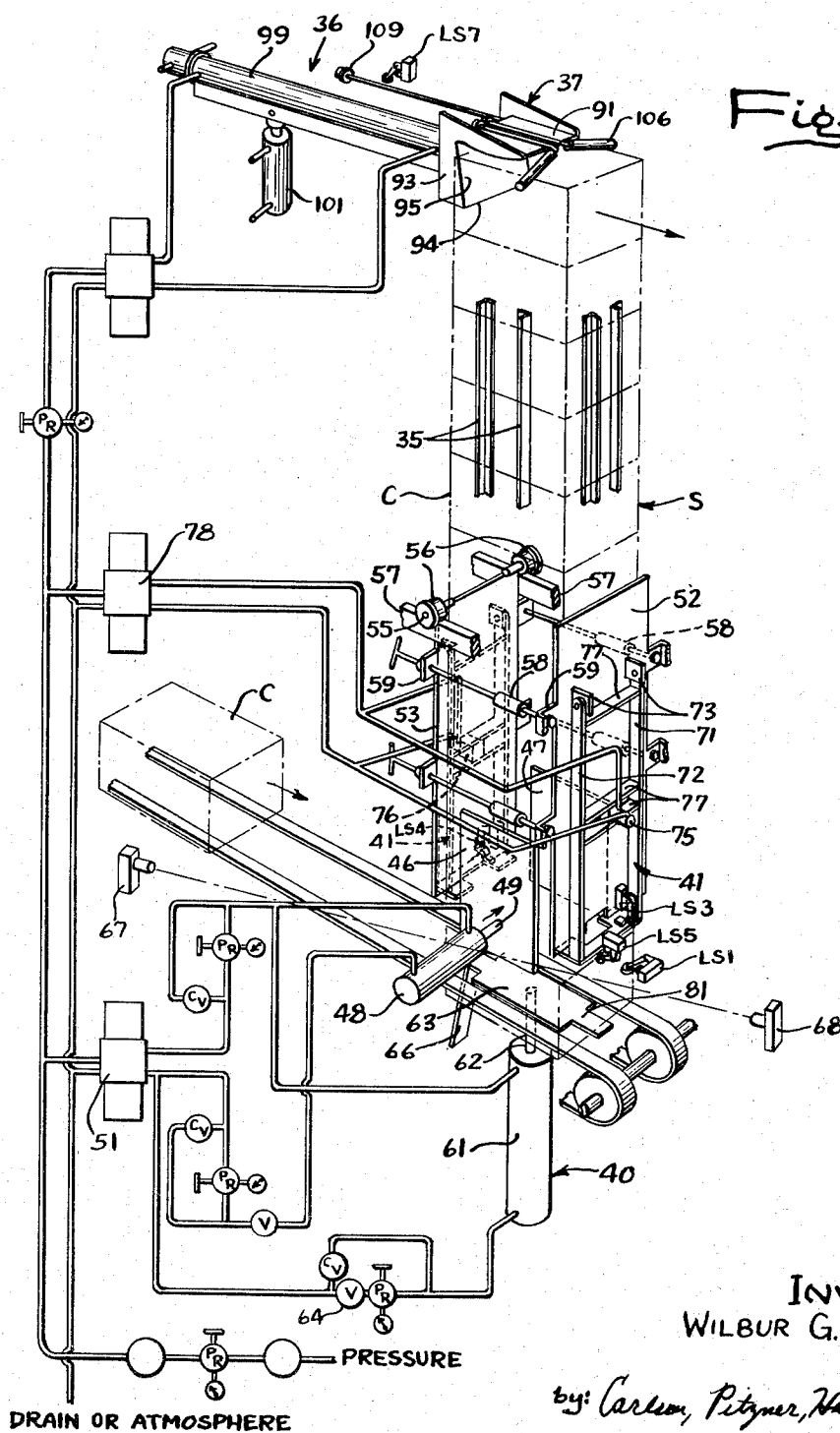
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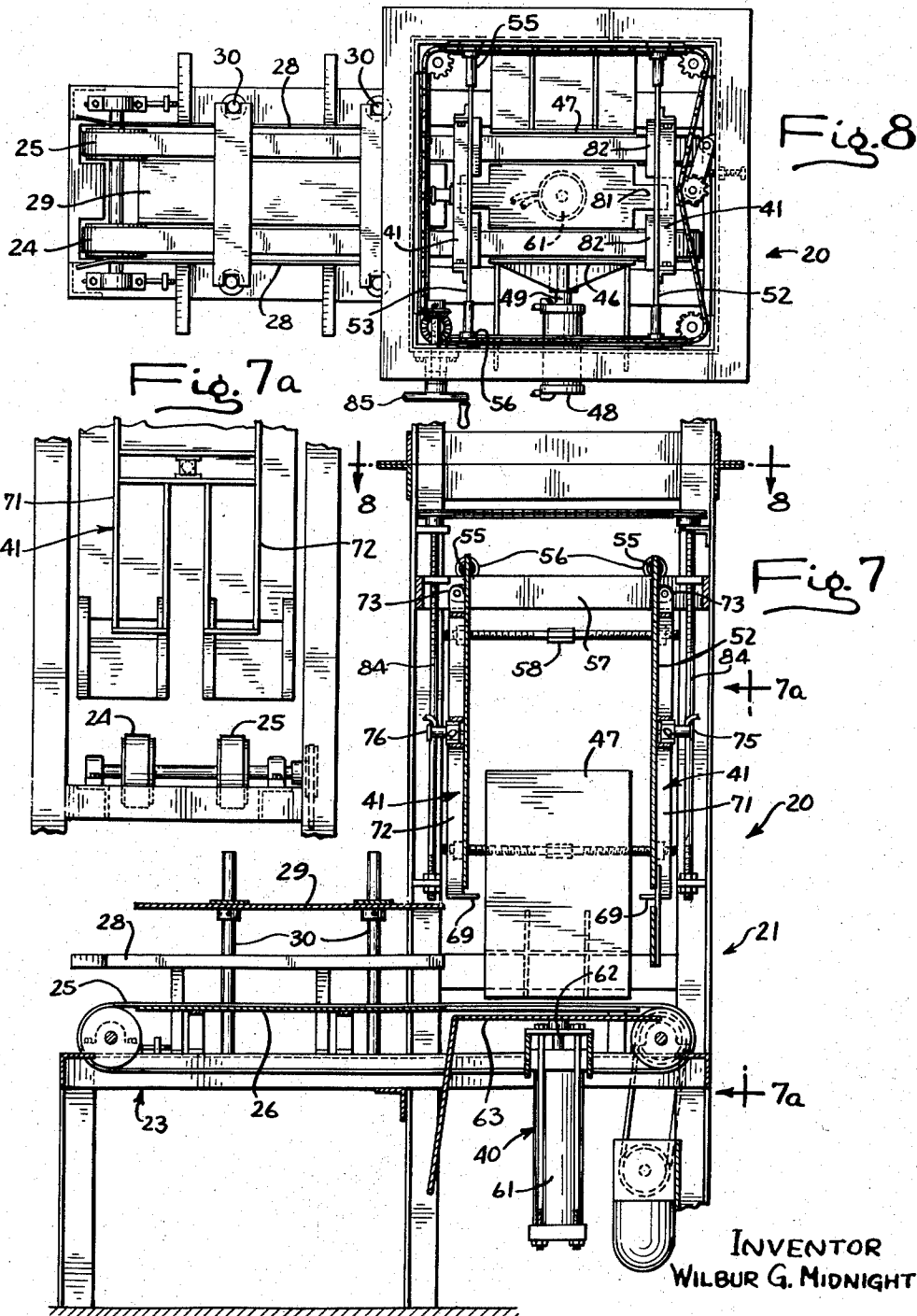
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6 Sheets-Sheet 5



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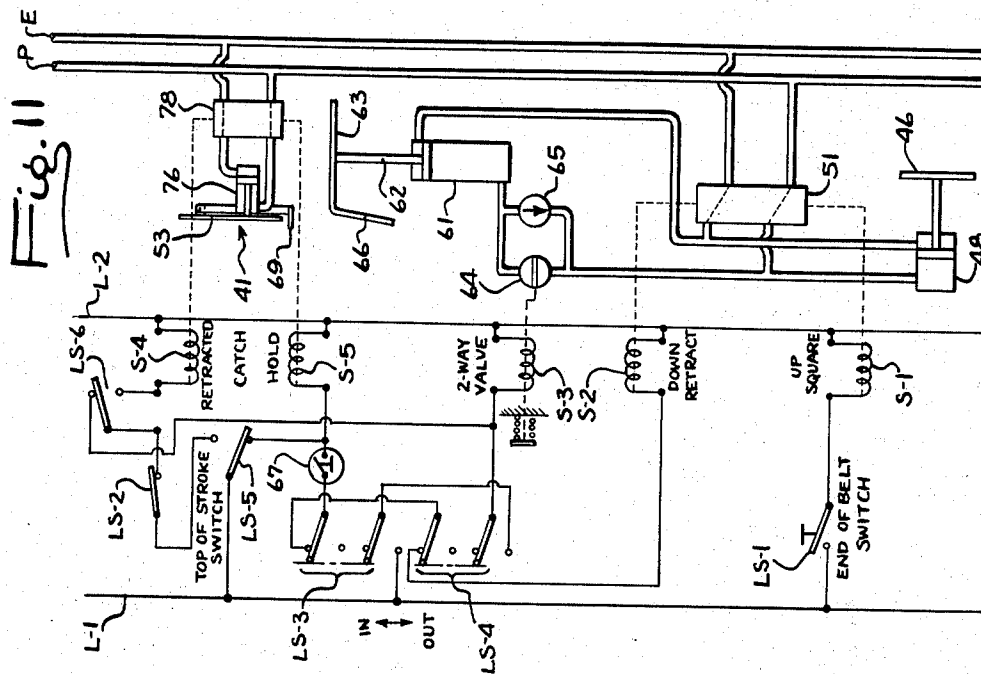
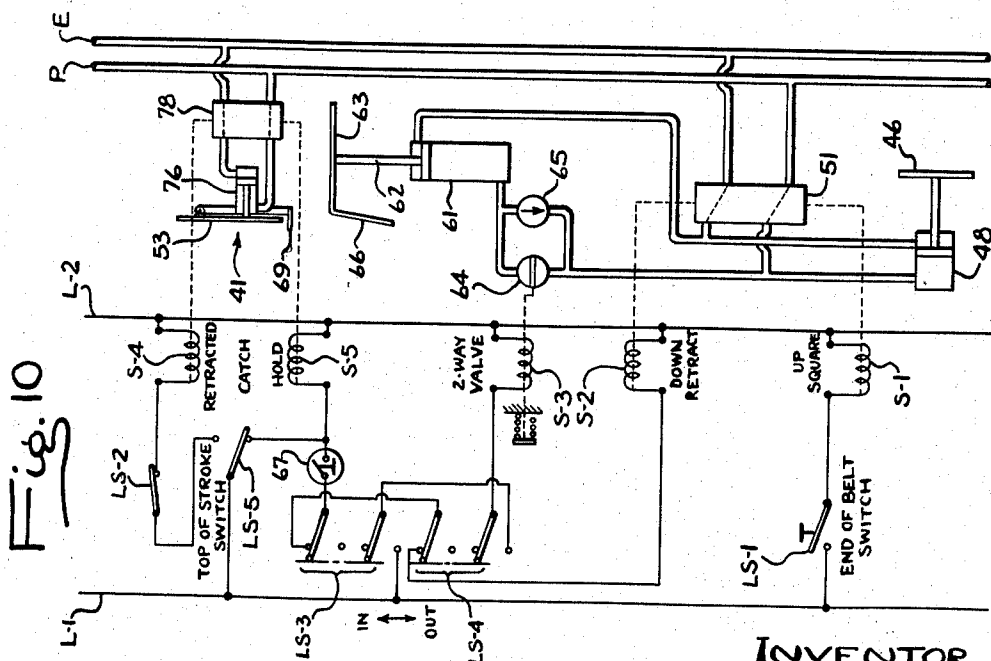
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6 Sheets-Sheet 6



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2,904,941

VERTICAL CARTON SEALER

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Application April 15, 1957, Serial No. 652,905

16 Claims. (Cl. 53—24)

The present invention relates to machines for handling fiberboard or corrugated boxboard shipping cases and more particularly to machines for squaring and sealing shipping cases or cartons of this type which are substantially rectangular in shape and have top and bottom flap closures adapted to be held in the closed position by means of glue or other appropriate adhesives.

Shipping cases or cartons, known in the trade as slotted cartons, and made of fiberboard or corrugated boxboard are commonly used for packaging a wide variety of products including canned foods and beverages. When such a shipping case has been filled and glue or adhesive has been applied to the flaps, the latter are closed and held in the closed position with sufficient force applied over a sufficient period of time to insure that there is satisfactory adhesion and proper sealing of the carton.

Employed in present commercial use for accomplishing this sealing action are horizontal machines which receive packed cartons from the adhesive applying and closing mechanism and maintain a continuous pressure on the carton flaps as the cartons travel continuously along a conveyor. This pressing mechanism commonly comprises a long series of rollers for exerting a sealing force on the cases. These rollers are generally loosely journaled and forcibly urged against the top and bottom of flaps of the cartons and wide, flat belts driven at the speed of the passing cartons have been utilized between the rollers and the cartons for both applying a sealing force to the cartons and for conveying the cartons.

One object of the present invention is to provide an improved vertical case or carton sealer mechanism which is adapted to apply a substantially uniform sealing pressure on the entire plane of the top and bottom flaps of a fiberboard or corrugated boxboard shipping case and to sustain this pressure for a substantial period of time to permit effective dispersion and setting of the adhesive applied for sealing the flaps.

Another object of the present invention is to provide an improved carton sealer mechanism of the character set forth which is adapted to apply a substantially greater and more uniform sealing force to the top and bottom closure flaps of a carton than has been achieved by machines of the type heretofore known, so as to effect a better dispersion of the adhesive into the paper fibers of the carton flaps and a more rapid setting of the adhesive.

A further object of the present invention is to provide an improved carton flap sealer machine which will preserve the dimensional integrity of the carton during the sealing operation and maintain the carton in a squared position in all dimensions and the closure flaps in proper alignment and abutting relation thereby improving the handling and stacking characteristics of the shipping carton, enhancing its appearance, and making the closed carton tight against the entrance of dirt and other foreign material.

Still another object of the present invention is to provide an improved vertical carton sealer machine of the type referred to above which is adapted to deliver a pro-

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cession of sealed shipping cartons to an overhead conveyor system thereby expediting delivery of the sealed cartons to the loading or other desired area of the plant without requiring further handling or transport of the sealed cartons on the plant floor.

A further object of the present invention is to provide an improved carton sealer machine of the foregoing character which is of simple and economical construction and which is arranged in such a manner as to occupy a minimum of floor space in the packing plant where the machine is used.

Other objects and advantages of the present invention will become apparent as the following description proceeds taken in connection with the accompanying drawings wherein:

Figure 1 is a perspective view of a vertical carton sealer machine embodying the present invention.

Fig. 2 is a side elevation view of a vertical carton sealer machine and showing the squaring and stacking arrangements.

Fig. 3 is a plan view of the machine taken substantially in the plane of line 3—3 of Fig. 2.

Fig. 4 is a section view similar to Fig. 3 but taken substantially in the plane of line 4—4 of Fig. 2.

Fig. 5 is a fragmentary elevation view taken substantially in the plane of line 5—5 of Fig. 2.

Fig. 6 is a diagrammatic representation of a vertical carton sealer mechanism illustrative of the present invention and showing certain supply and control conduits for operating the mechanism.

Fig. 7 is a fragmentary side elevation view of a modified carton sealer machine showing one means for adjusting the machine to receive various sizes of cartons.

Fig. 7a is a fragmentary elevation view of one end of the machine taken substantially in the plane of line 7a—7a of Fig. 7 and showing the end carton stops.

Fig. 8 is a plan view of the adjustable machine taken substantially in the plane of line 8—8 of Fig. 7.

Fig. 9 illustrates a further means for adapting the carton sealer machine for use with various sizes of cartons.

Fig. 10 is a circuit diagram for the electrical controls for the vertical carton sealer mechanism shown in Fig. 1 and showing the control circuit in the condition wherein the elevator mechanism is at the top of its stroke and just prior to the entrance of a carton into the sealer mechanism.

Fig. 11 is a modified circuit diagram for the electrical controls for the vertical carton sealer mechanism shown in Fig. 9 and in the same condition of operation.

There is shown in the drawings and will be described below in detail a preferred embodiment of a vertical carton sealer mechanism and certain modifications thereof. It should be understood, however, that there is no intention to limit the invention to the specific forms disclosed, but, on the contrary, it is intended to cover all modifications, alternative constructions, equivalents and uses falling within the spirit and scope of the invention as expressed in the appended claims.

General organization of the machine

Referring more particularly to the drawings, a machine 20 is there shown which represents one illustrative sealer embodiment of the present invention. The machine 20 is adapted primarily to receive shipping cases or cartons C having glued and closed, but not sealed, flaps from a packaging and closing machine. The machine 20 can be constructed to accommodate a particular size packing case or, alternatively, can be made adjustable to accommodate various sizes and shapes of cases without departing from the scope of the present invention. Inasmuch as the sealer mechanism illustrative of the present inven-

tion is adapted to receive and seal fiberboard or corrugated paper cases or cartons of various sizes and shapes and filled with various products, and also since the packaging and closing machinery when used does not form a part of the present invention, such machinery has not been shown.

The sealer machine 20 is organized on a generally rectangular upright frame which in this instance happens to be divided into a lower section 21 and an upper section 22. The lower section 21 of the frame includes a horizontal extension 23 supporting a loading conveyor which in the present instance is formed by a pair of laterally spaced flexible belts 24, 25 riding along a horizontal supporting deck 26. For guiding the packed cartons C as they are fed into the machine 20 by the conveyor belts 24, 25, a pair of laterally spaced guide rails 28 are mounted on the frame extension 23 and a hold down shoe 29 is provided above the conveyor belts for holding the glued but not sealed carton top flaps in the closed position and for preventing them from springing open before the carton enters the sealer machine 20. In the machine illustrated, the hold down shoe is adjustably supported on four upright posts 30. Alternatively, the hold down shoe can be adjustably suspended from the frame or mounted in any other suitable manner.

Turning now to the upper section 22 of the main frame, it will be noted that this section comprises a generally rectangular upright structure having a number of vertically disposed guide bars 35 mounted therein and adapted to guide the stack S of cases or cartons being moved upwardly through the upper section and prevent them from falling and, if desired, to guide the cartons so as to maintain each individual carton square and with its closure flaps properly aligned. Although in one preferred construction two guide members 35 are employed for each vertical side of the cartons being sealed, making a total of eight vertical guide members, it should be understood that any suitable number can be used so long as the desired result is accomplished.

Mounted on the upper end of the upper section is a carton ejector mechanism 36 having an ejector head 37 adapted to bear against the uppermost carton or case in the stack so as to exert a lateral thrust against the end or side of the carton for positively discharging the cartons from the top of the stack. From this point, the cartons can be carried by an overhead conveyor system to other areas in the plant.

During the time the packed and closed cartons are in the stack S, the upper cartons exert a sealing force on the glued flaps of the lower cartons thereby causing the flap adhesive to disperse into the paper fibers where it sets to seal the flaps closed. The use of the series of rollers and belts for exerting this sealing force is thereby eliminated because the weight of the cartons and their contents provides a substantial and effective sealing force on the glued flaps.

The carton squaring mechanism

The cartons C, having their flaps glued and closed but not sealed, are carried by the conveyor belts 24, 25, to a squaring mechanism which is located in the lower frame section 21 (Figs. 2, 4, 5). Two distinct arrangements are utilized for squaring the carton so that the flaps, when sealed, are aligned and abut each other. As a carton, carried on the conveyor belts 24, 25, enters the machine 20, it is halted, by end stops 45, between two parallel vertically spaced plates 46, 47, one of which is fixed to the lower section 21 of the frame and the other of which is movable thereon. To accommodate various sizes of cartons, any suitable means can be provided for adjusting the space between the plates.

At the end of the belts and adjacent the end stops 45 the carton entering the machine 20 engages a limit switch LS-1 which closes to energize a suitable motor 48 for advancing the movable plate 46 to engage the carton and

square it against the fixed plate 47. One illustrative form of motor is a piston and cylinder type motor mounted on the machine frame and having a piston rod 49 connected to the movable plate 46.

The squaring motor 48 is operated by pressure fluid such as compressed air supplied by a suitable pump or compressor (not shown). When compressed air is used, air from the cylinder is exhausted to the atmosphere. Although any suitable pressure fluid can be used, compressed air is particularly desirable by reason of its availability in most packaging plants and because it can be exhausted directly to the atmosphere instead of into a drain system. To control the flow of air to and from the motor 48, a suitable air control valve 51 is utilized and is operatively connected to a solenoid S-1 in the electrical control circuit of the machine so as to be energized to supply air to the squaring motor cylinder when the limit switch LS-1 at the end of the conveyor belt is engaged by a carton and closed (Figs. 6 and 10). When a carton has been squared and elevated into the stack S, and another freshly glued carton is carried by the conveyor belts, the first squaring plate 46 is withdrawn to receive the freshly glued carton. This operation is accomplished when the end of the belt limit switch LS-1 is open and when a second solenoid S-2 is energized to shift the control valve 51 and reverse the motor 48, as will be described in more detail below.

Although the end stops 45 which the carton initially engages provide a third alignment surface, the remaining two surfaces of the carton are squared and aligned in relation to the first two surfaces by a secondary squaring means comprising a pair of plates 52, 53 which are attached to the frame. These plates define spaced, parallel carton engaging faces disposed at right angles to the first pair of plates 46, 47. In order to accommodate various sizes of cartons, means are provided for varying the space between the squaring plates 52, 53. To this end, either one or both of the plates are adjustably mounted on the frame. One means for suspending these plates comprises an axle 55 fixed to the upper edge of the plates and connected between two slides or trolley wheels 56 guidably supported on a pair of tracks 57 mounted in the frame 21. The plates are held spaced apart by means of adjustable mechanical links 58, such as a screw having a right-hand thread on one end and a left-hand thread on the other, connected between nuts 59 on the squaring plates 52 and 53. By making both plates adjustable, the cartons are always centered in the machine frame.

To insure that each carton is properly squared, a carton, as it is elevated into the stack S, is simultaneously engaged between the second squaring plates 52, 53 and the first squaring plates 46, 47. A squaring force is thereby exerted on all four sides of the carton at one time. From the squaring means, the cartons are elevated into the upper frame 22 and between the guides 35 as additional cartons are inserted into the bottom of the stack by the elevator mechanism 40. Once the flap adhesive has set, the sealed carton flaps hold the cartons squared and in their finished shape.

Elevator mechanism

The elevator assembly, indicated generally at 40, comprises a lift mechanism including a motor such as for example, a pressure fluid operated piston and cylinder motor 61, the piston rod 62 of which is fixed to an elevator plate 63 positioned between the conveyor strips 24, 25 and adapted to lift a carton from the conveyor and elevate it through the squaring mechanism into the stack of cartons S. Pressure fluid such as air is supplied to the elevator motor 61 for raising and lowering the elevator plate 63. This air is under the control of the air control valve 51 and in addition under the separate control of a 2-way elevator control valve 64 in the lifting circuit of the motor 61. The elevator plate 63 is raised

when the end of belt limit switch LS-1 is closed to energize solenoid S-1 and thereby the 4-way control valve 51 and when the 2-way lifting control valve is energized to the open position by a solenoid S-3. The direction of the elevator motor 61 is reversed to lower the elevator plate 63 by energizing the solenoid S-2 to reverse the position of the air control valve 51. During the return or lowering stroke of the elevator motor 61, the 2-way solenoid operated valve 64 is by-passed by a check valve 65. Because in many instances both the top flaps and the bottom flaps of the carton are freshly glued, or the bottom flaps only are glued, it is desirable to hold the elevator plate 63 against the bottom of the lowermost carton in the stack until a succeeding carton is in a position to be carried to the squaring mechanism. One means of accomplishing this is by inserting an electric eye 67 or other similar switch means in series with the elevator direction reversing solenoid S-2 so that that solenoid is not energized if there is no succeeding carton on the conveyor to engage the bottom flaps of the lowermost carton stack.

In order to prevent a succeeding or following carton from being carried by the conveyors underneath the elevator plate 63 when the plate is in the raised position, the plate is provided with a depending tongue 66 which serves as a gate or stop for succeeding cases. This prevents the elevator mechanism from dropping onto a carton and crushing it and possibly from jamming the machine. The elevator operates in correlation with the squaring mechanism although it is under the independent control of the 2-way valve 64 and solenoid S-3.

Means are provided for holding the stack of cases within the frame and guides 35 when the elevator plate 63 is withdrawn to receive another case. To this end, carton catch means are provided, one illustrative form of which is shown in the drawings although it should be understood that other suitable means may be employed. Referring more particularly to Figs. 2 and 4, the catch mechanism 41 comprises an L-shaped lever swingably mounted on the vertical secondary squaring plates 52, 53 and having carton engaging means or catches 69 extending underneath the lower end of the squaring plates and inwardly between them in such a manner that when the catches 69 are in their innermost position, stacked cartons will rest on the engaging means 69 and be prevented from falling when the elevator plate 63 is lowered. As shown in the drawings, the swingable L-shaped catch mechanism 41 comprises a pair of legs 71, 72 spaced apart and swingably mounted on ears 73 fixed to the back of the secondary squaring plates 51, 52. The carton engaging means 69 forms the other leg of the L-shaped catch mechanism 41 and is secured to the bottom of the legs 71, 72 in position to extend beneath the squaring plates 52, 53 and inwardly therefrom to support a carton.

In order to elevate a squared carton into the vertical stack S, the main air control valve 51 being in the position for supplying air to lift the elevator plate 63, the elevator 40 is operated when the catches swing outwardly. The catches 69 are retracted as the catch mechanism 41 swings outwardly under the force of suitable motors, such as pressure fluid operated piston and cylinder type motors 75, 76, the cylinders of which are mounted on cross braces 77 between the catch legs 71, 72, and the piston rods of which abut against the rear surface of the plates 51, 52. With this construction the catches swing outwardly when the motors are energized in one direction and swing inwardly when the motor direction is reversed. The catch motors 75, 76 are energized by a supply of pressure fluid such as air under the control of a valve 78 operated by solenoids S-4 and S-5. When the pressure in the squaring cylinder motor 48 reaches a predetermined amount, a pressure operated limit switch LS-2 is closed to energize one of the catch solenoids S-4 which in turn operates the catch motor valve

78 to energize the catch motors 75, 76 for retracting the catches 69. As the catch mechanism 41 swings outwardly away from the squaring plates 52, 53 to withdraw the catches 69, catch limit switches LS-3 and LS-4 shift to energize the elevator solenoid S-3 and open the elevator valve 64. Air pressure from the air source through the main squaring means and elevator air control valve 51 then raises the elevator plate 63 and the carton carried on it into the stack S. When the case has been raised into position in the stack and between the secondary squaring plates 52, 53, an upper or top-of-stroke limit switch LS-5 is actuated to energize the other catch motor control solenoid S-5. The catch motor valve 78 is then energized to reverse the catch motors 75, 76 and allow the catch mechanism 41 to swing inwardly and close the catches 69 so that they are inserted beneath the carton on the bottom of the stack for holding that carton and the stack S when the elevator plate 63 is lowered.

Cartons passing through this machine are generally filled and are often heavy, making the stack of cartons also heavy. A substantial force is thus required to insert a carton into the bottom of the stack and at the same time to lift the entire stack of cartons. The bottom carton being inserted into the stack must transmit the lifting force from the elevator plate 63 to the stack and accordingly, it is desirable that the plate 63 have an area large enough to prevent damage to the bottom carton. For this reason, the elevator plate 63 is constructed as long and as wide as possible so as to support at least two parallel ends of the cartons without interfering with the squaring and catch mechanisms. To this end, the catch plates 69 are bifurcated and the elevator plate 63 is formed with oppositely projecting tongues 81 adapted to pass between the bifurcated portions of the catch plates 69 (Fig. 4). The plate 63, including the tongues, additionally serve to support the glued area of the carton to prevent the flaps from springing open before a subsequent carton is placed in the stack.

In order to make the carton sealing machine adjustable to accommodate various sizes and thicknesses of cases, the spacing between the squaring plates is adjustable as described above and the second pair of squaring plates 52, 53 and catch means 41 carried thereon are mounted for vertical adjustment within the lower frame section 21. One illustrative structure for accomplishing this vertical adjustment is shown in Figs. 7 and 8 and comprises a frame 83 adjustably mounted and guided within the lower frame section by means of elevating screws 84 or the like and carrying the squaring plates 52, 53 in substantially the same manner as described above. The squaring plates can be raised or lowered by turning a hand crank 85, for example, or by any other suitable mechanical means. When this modification is used, the operation of the machine is substantially as described above. It will be noted that, by lowering the secondary squaring plates and catch means, and thereby lowering the top-of-stroke limit switch LS-5, the stroke of the elevator mechanism 40 is shortened with a substantial saving in compressed air and even a substantial saving in time because the elevator travel is shortened.

As an alternative modification for adapting a sealer machine, of the character or type described above and having the secondary squaring means and catch means fixed in position to receive deep cartons, for use with different sizes of cartons, an auxiliary flap hold-down means can be provided (Fig. 9) to prevent the flaps on shallow cartons from springing open before the carton is elevated into the stack. One such auxiliary flap-hold-down means comprises a bifurcated plate 86 mounted for vertical sliding movement on the catch means 41 adjacent the entrance flap-hold-down plate 29 and adapted to engage the flaps of an entering carton. As the carton is lifted upwardly by the elevator mechanism 40 the auxiliary flap-hold-down plate 86 is engaged by the upper surface of the carton and is raised with it. When the catches are

withdrawn or retracted to permit the carton to be elevated into the stack, the auxiliary flap-hold-down plate 86, being mounted on the catch mechanism 41, is also retracted, and at the same time, being free of the elevated carton, drops into position for holding the flaps of a succeeding carton.

The auxiliary flap-hold-down plate 86 is mounted on the catch mechanism 41 by means of a pair of vertical rods 87 slidably engaged with brackets extending from the cross brace 77 between the catch legs 71, 72. To determine the lowermost position of the plate 86, an adjusting screw and stop 88 is provided on the catch engageable with a cross brace 89 between the rods 87. When the auxiliary flap-hold-down plate 86 is used, means are provided for elevating the carton before the catchers are retracted. This is accomplished by a 2-position limit switch LS-6 (Figs. 9 and 11) connected between the pressure switch LS-2 and the catch motor control solenoid S-4 and between the pressure limit switch LS-2 and the elevator control valve solenoid S-3.

When the auxiliary flap-hold-down plate is in its lowermost position, the 2-way elevator control valve 64 is opened when its solenoid S-3 is energized upon the closing of the squaring cylinder pressure limit switch LS-2. As the carton and auxiliary flap-hold-down plate 86 is raised, the flap-hold-down switch LS-6 is shifted to de-energize the solenoid S-3 and close the elevator control valve 64 and to energize the catch solenoid S-4 to retract the catches 69, thus momentarily stopping the elevating action. The remainder of the operation then continues as described above.

Carton discharge mechanism

Provision is made for positively ejecting a carton from the top of the stack and for doing so even when some adhesive has leaked out or been spilled between the cartons and has caused the upper carton and the one next below it to stick together. This action is accomplished by exerting both a downward and a lateral force on the topmost carton and by holding the next to the top carton against lateral movement. As a carton is raised in the stack S, the top carton is positioned in front of the L-shaped ejector head 37, which comprises a horizontal leg portion 91 and a vertical leg portion 93. To separate the upper cartons in the event they stick together, the vertical leg 93 applies a force on the upper carton at a point near the interface between the top two cartons. This is accomplished by providing a rounded carton contact surface 94 adjacent the lower edge of the vertical leg 93, and by sloping the inner surface 95 of the leg upwardly and away from the stack of cartons. A downward force on the uppermost carton is exerted by the weight of the ejector mechanism, which is pushed upwardly by the top carton as a carton is inserted into the bottom of the stack by the elevator mechanism. The horizontal leg portion 91 is formed with a lower convex carton engaging surface 96 for engaging the upper carton surface without digging or gouging into it.

The ejector head 37 is moved inwardly and outwardly by means of a motor such as a pressure fluid operated cylinder and piston type motor 99 hinged at one end to a frame 100 extending from the upper frame section 22. As before, the pressure fluid most commonly available is compressed air. When the top case has been ejected, the ejector head is retracted by reversing the direction of the motor 99. The discharge mechanism 36 will then drop into position in preparation for ejecting a succeeding carton. The shock of an abrupt drop is prevented by the provision of a suitable dashpot or damping mechanism 101. To prevent the outer portion of the vertical leg 93 from dropping past and then engaging the next carton in the stack in line to be discharged as the ejector head is retracted, a sled-like guide member 102 is provided on the lower portion of the vertical leg. This sled-like member will rest on top of the next carton in the stack

and will support the ejector head 37 sufficiently to allow it to slide back across the top surface of that carton without damaging the carton top or otherwise interrupting the operation of the machine.

The ejector mechanism is operated by controlling the application of air pressure to the piston and cylinder motor 99. This is accomplished by a 4-way valve 103 positioned to direct pressure fluid to the eject end of the motor 99 when a solenoid S-6 is energized and to direct pressure fluid to the retract end of the motor when a second solenoid S-7 is energized. The former solenoid S-6 is energized when the top carton engages a feeler 106 swingably mounted on ejector head and having a lever arm 107 for operative engagement with a limit switch LS-8 mounted on the cylinder 99. The outer limit of the ejector head is determined by the engagement of a dog 109, fixed on a rod 110 extending from the head 37, with a limit switch LS-7, also mounted on the cylinder 99, which energizes the retract solenoid S-7 when closed.

The feelers 106 also serve an additional function when the machine is being used for sealing bottom carton flaps only. In this application the top flaps have a tendency to spring open when the carton reaches the top of the stack. The head 37 then would engage the open flaps and crush or otherwise damage them. In order to prevent this, the feelers 106 extend downwardly and outwardly from the head so as to engage any open carton flaps and cam the same inwardly to a closed position.

Résumé of operation

The operation of each of the various mechanisms included within the machine has been discussed in detail and it is believed that a brief review from the standpoint of overall machine operation will be helpful here. As a carton emerges from the packing machine and adhesive is applied to the flaps, the flaps are closed and the carton enters the vertical case sealer machine 20. For purposes of illustration, it will be assumed that the elevator plate is in its raised position and that the control circuits are as shown in Fig. 10 or Fig. 11. In the machine, the carton is carried by conveyor belts 24, 25 to the squaring and elevating mechanism. As a carton enters the machine 20 it crosses the path of the electric eye 67 which closes a circuit to energize the elevator and primary squaring cylinder solenoid S-2 which in turn shifts the main air control valve 51 to lower the elevating plate 63 of the elevator mechanism 40 and retract the squaring plate 46. Immediately the pressure switch LS-2 opens and, when the elevator plate 63 is lowered, the top-of-stroke limit switch LS-5 shifts to the position in which it is in series with the catch solenoid S-4. The stop or gate 66 on the elevating plate 63 moves out of the way as the plate is lowered and allows an entering carton to be carried by the conveyor belts onto the lowered elevating plate 63.

The entering box closes the end of belt limit switch LS-1, thereby energizing the solenoid S-1 to shift the air control valve 51. The squaring cylinder 48 is then supplied with pressure fluid to move the squaring plate 46 to square the carton between the first squaring plates 46, 47. When the squaring pressure reaches a predetermined amount, the pressure switch LS-2 closes, energizing the catch solenoid S-4 and thereby the solenoid motors 75, 76 to retract the catches 69. The retraction of the catch mechanism shifts the catch limit switches LS-3 and LS-4 to energize the 2-way valve solenoid S-3 and thereby valve 64 to admit air pressure to the elevator motor 61 for moving the elevator plate upwardly and lifting the squared carton into the bottom of the stack S. At the top of the stroke when the carton has been inserted into the stack and between the secondary squaring plates 52, 53, the top-of-stroke limit switch LS-5 shifts thereby energizing the catch solenoid S-5 which in turn reverses

the catch motors 75, 76 whereby the catches swing inwardly beneath the inserted carton. As long as packed cartons are entering the machine, the electric eye switch 67 will remain closed and the cycle will be repeated. When the electric eye circuit is open, however, the elevator plate will remain in the raised position and against the bottom of the carton in the stack. In the modification employing an auxiliary flap-hold-down plate, the cycle is substantially the same, except that the closing of the pressure switch LS-2 on the squaring motor 48 energizes the 2-way valve S-3 to cause the lifting motor 61 to elevate the packed carton and to lift the flap-hold-down plate to a point where the flap-hold-down switch LS-6 is shifted. When this occurs, the elevating action is momentarily stopped, the catches are retracted, and the operation continues as described above.

It should be noted that the operation of each element, e.g. the squaring element, the elevator element, the catch elements, and the discharge element, is dependent upon the completion or satisfaction of certain preliminary operations. For example, the catches will not swing outwardly until the squaring mechanism is operated.

The vertical sealer machine described is capable of squaring and sealing at a fast rate cartons having freshly glued and closed flaps, and has been operated at a rate as high as 40 sealed cartons per minute. A substantial savings in valuable floor space is also possible, and sealed cartons are delivered at an elevator above the floor thereby permitting overhead conveying to other plant areas. A substantial floor area usually taken up by conveyors and the like is thus saved for other uses, and in addition, palletizing and other carton handling steps are eliminated. Furthermore, by performing the squaring and sealing operations simultaneously, carton sealing time is reduced and dirt collecting gaps between the carton flaps are eliminated.

I claim as my invention:

1. A carton sealer for sealing the freshly glued flaps of cartons, comprising in combination, a support frame, a conveyor for introducing cartons having glue freshly applied to their flaps into said support frame and with the freshly glued flaps in a horizontal plane, means mounted on said support frame for squaring said carton, a plurality of spaced vertical guides for holding said squared cartons in stacked vertical alignment, means for positioning the squared cartons onto the bottom of said stack, and means for removing a sealed carton from the top of said stack.

2. A carton flap sealer comprising, in combination, a support frame, a conveyor for carrying cartons to be sealed and for introducing a carton into said frame between a pair of spaced squaring plates, means for actuating said squaring plates to square said carton, a plurality of vertical guide members for holding a stack of said squared cartons in vertical alignment, a pair of catches at the bottom of said guide members, for supporting a stack of cartons within said guides, means for retracting said catches, and means for elevating said squared carton into said stack and between said guides when said catches are retracted.

3. A carton flap sealer comprising, in combination, a support frame, a conveyor for carrying cartons to be sealed and for introducing a carton into said frame between a pair of spaced squaring plates, means for actuating said squaring plates to square said carton, a plurality of vertical guide members for holding a stack of said squared cartons in vertical alignment, a pair of catches at the bottom of said guide members, means for retracting said catches in response to the squaring of said carton, means for elevating said squared carton into said stack and between said guides when said catches are retracted, said elevating means holding said carton in an elevated position until a succeeding carton is carried on said conveyor into said frame, and means for engaging said catches beneath the elevated carton when said elevating means

is lowered thereby to hold a stack of squared cartons in said support frame.

4. A mechanism for vertically stacking paperboard cartons, the flaps of which are coated with freshly applied adhesive and then folded and closed to a horizontal position, said mechanism comprising in combination, a vertically extending frame having spaced guide members mounted therein for holding such cartons in a vertical stack until the adhesive on the flaps sets, catch means for engaging the bottom of the lowermost carton in the stack to prevent the stack of cartons from dropping out of said frame, means for squaring a carton preliminary to the introduction of the same into the bottom of the stack, and means for positioning said squared carton on the bottom of the stack.

5. A mechanism for vertically stacking paperboard cartons the flaps of which are coated with freshly applied adhesive and then folded and closed to a horizontal position, said mechanism comprising in combination, a vertically extending frame having spaced guide members mounted therein for holding such cartons square and in a vertical stack until the adhesive on the flaps sets, catch means for engaging the bottom of the lowermost carton in the stack to prevent the stack of cartons from dropping out of said frame, means for squaring a carton preliminary to the introduction of the same into the bottom of the stack, means operative in response to the operation of said squaring means for releasing said catches, means operative in response to the release of said catches for positioning said squared carton on the bottom of the stack, and means operative in response to the positioning of a squared carton on the bottom of the stack for repositioning said catches beneath the stack.

6. A mechanism for vertically stacking paperboard cartons the flaps of which are coated with freshly applied adhesive and then folded and closed to a horizontal position, said mechanism comprising in combination, a vertically extending frame having spaced guide members mounted therein for holding such cartons square and in a vertical stack until the adhesive on the flaps sets, catch means for engaging the bottom of the lowermost carton in the stack to prevent the stack of cartons from dropping out of said frame, means for squaring a carton preliminary to the introduction of the same into the bottom of the stack, means for releasing said catches, means for positioning said squared carton on the bottom of the stack, and means engageable with the topmost carton in the stack for removing such carton from the stack, said carton positioning means being operative in response to the operation of said catch releasing means to release said catches which is in turn operative in response to the operation of said squaring means to square a carton.

7. A mechanism for vertically stacking paperboard cartons the flaps of which are coated with freshly applied adhesive and then folded and closed to a horizontal position, said mechanism comprising in combination, a vertically extending frame having spaced guide members mounted therein for holding such cartons in a vertical stack until the adhesive on the flaps sets, catch means for engaging the bottom of the lowermost carton in the stack to prevent the stack of cartons from dropping out of said frame, first squaring means for squaring a carton preliminary to the introduction of the same into the bottom of the stack, means for positioning said squared carton on the bottom of the stack, and second squaring means positioned substantially perpendicular to said first squaring means for completing the squaring of carton as it is positioned in the stack.

8. A mechanism for vertically stacking paperboard cartons the flaps of which are coated with freshly applied adhesive and then folded and closed to a horizontal position, said mechanism comprising in combination, a vertically extending frame having spaced guide members mounted therein for holding such cartons square and in

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a vertical stack until the adhesive on the flaps sets, first squaring means for squaring a carton preliminary to the introduction of the same into the bottom of the stack, second squaring means positioned substantially perpendicular to said first squaring means for completing the squaring of the carton, catch means mounted on said second squaring means for engaging the bottom of the lowermost carton in the stack to prevent the stack of cartons from dropping out of said frame, means operative in response to the operation of said first squaring means for releasing said catches, and means operative in response to the release of said catches for positioning said squared carton on the bottom of the stack.

9. A mechanism for vertically stacking paperboard cartons the flaps of which are coated with freshly applied adhesive and then folded and closed to a horizontal position, said mechanism comprising in combination, a vertically extending frame having spaced guide members mounted therein for holding such cartons square and in a vertical stack until the adhesive on the flaps sets, means for positioning a carton on the bottom of said stack, catch means for engaging the bottom of the lowermost carton in the stack to prevent the stack of cartons from dropping out of said frame, first squaring means for squaring a carton preliminary to the introduction of the same into the bottom of the stack, second squaring means positioned substantially perpendicular to said first squaring means for completing the squaring of the carton, said first and second squaring means engaging the cartons simultaneously as the carton is positioned on the bottom of the stack, said catch means being mounted on said second squaring means and extending there beneath for engagement with the lowermost stack carton.

10. The method of sealing freshly glued horizontally folded flaps of paperboard and corrugated boxboard cartons comprising the steps of aligning the vertical sides of a carton having freshly glued flaps in squared rectangular relation, exerting a sealing force on said flaps by placing said squared carton onto the bottom of a vertical stack of similarly squared cartons, and ejecting said carton after it has been subjected to said sealing force by being raised to a preselected elevation in the stack as successive squared cartons are placed below it in the stack.

11. The method of sealing freshly glued horizontally folded flaps of paperboard and corrugated boxboard cartons comprising the steps of aligning the vertical sides of a carton having freshly glued flaps in squared rectangular relation, exerting a sealing force on said flaps by placing said squared carton onto the bottom of a vertical stack of similarly squared cartons, inserting successive squared cartons having freshly glued flaps into the bottom of said stack, and ejecting said cartons from the stack after they have been raised to a preselected elevation in the stack.

12. A carton sealer for sealing freshly glued flaps of cartons by stacking the cartons in vertical relation with the freshly glued flaps horizontal to utilize the weight of the stacked carton as the flap sealing force, said sealer comprising in combination, a support frame, a conveyor on said frame for successively positioning in the sealer cartons having freshly glued horizontally disposed flaps, a first pair of spaced pressure plates guidably mounted on said frame adjacent to and on opposite sides of said conveyor for engaging opposite side walls of a carton, an actuator for positioning said plates in squaring engagement with the cartons, a second pair of spaced squaring plates mounted on said frame above said conveyor for squaring the opposite vertical end walls of the cartons, an elevator plate aligned between said squaring plates and engageable with the bottom of the carton, an actuator for raising said elevator plate to lift the cartons one at a time from between said first pair of squaring plates into

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a vertical stack of cartons between said second pair of squaring plates, a catch engageable with the bottom of the lowermost elevated carton for supporting the stack of cartons between said second pair of squaring plates as said actuators lower the elevator plate and separate the first pair of squaring plates, said conveyor positioning subsequent cartons having freshly glued flaps in the sealer for squaring and elevation into the stack of cartons, and a discharge mechanism located at a predetermined height above the conveyor for discharging the topmost carton from the stack.

13. A carton sealer for sealing freshly glued flaps of cartons by stacking the cartons in vertical relation with the freshly glued flaps horizontally disposed to utilize the weight of the stacked carton as the flap sealing force, said sealer comprising in combination, a support frame, means for successively conveying into the sealer cartons having freshly glued horizontal flaps, means for squaring a carton positioned in the sealer by said conveying means, means aligned between said squaring means and engageable with the bottom of the carton for lifting the cartons one at a time from between said squaring means into a vertical stack of cartons, and means located at a predetermined height above the conveyor means for discharging the topmost squared and sealed carton from the stack.

14. A mechanism for vertically stacking paperboard cartons, the flaps of which are coated with freshly applied adhesive and then folded and closed to a horizontal position, said mechanism comprising, in combination, a vertically extending frame for supporting a vertical stack of cartons until the adhesive on the carton flaps sets, means for positioning cartons having closed but not sealed flaps one at a time into the bottom of the stack, means for engaging the bottom of the lowermost carton in the stack to prevent the stack of cartons from dropping out of said frame, means for releasing said engaging means when said positioning means inserts a carton into the stack, and means for removing sealed cartons one at a time from the top of the stack.

15. A carton sealer for sealing the freshly glued flaps of cartons, comprising in combination, a support frame, a conveyor for introducing cartons having glue freshly applied to their flaps into said support frame and with the freshly glued flaps in a horizontal plane, a plurality of spaced vertical guides for holding said cartons in stacked vertical alignment, means for positioning the cartons onto the bottom of said stack, and means for removing a sealed carton from the top of said stack.

16. A mechanism for vertically stacking paperboard cartons, the flaps of which are coated with freshly applied adhesive and then folded and closed to a horizontal position, said mechanism comprising in combination, a vertically extending frame having spaced guide members mounted therein for holding such cartons in a vertical stack until the adhesive on the flaps sets, means for conveying a carton having glued, folded and closed flaps into said frame, catch means for engaging the bottom of the lowermost carton in the stack to prevent the stack of cartons from dropping out of said frame, means receiving cartons from said conveyor for positioning said cartons one at a time on the bottom of the stack, and means for removing sealed cartons one at a time from the top of said stack.

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