Nov. 13, 1962 J. L. NEAL ET AL 3,063,209

PACKAGING MACHINE AND METHOD

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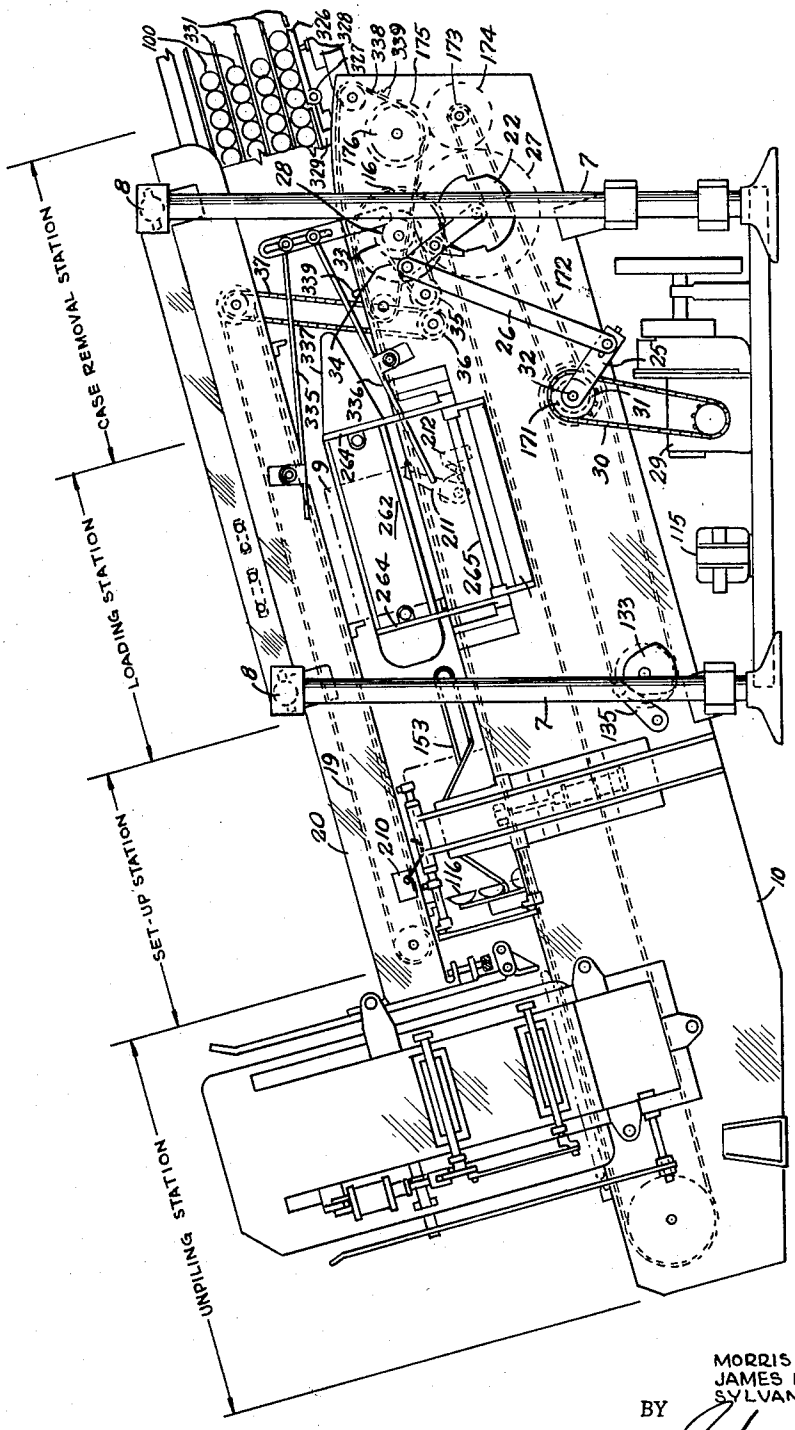


Fig. 1.

INVENTORS.
MORRIS P. NEAL
JAMES L. NEAL
SYLVAN V. DICE

BY John L. Dice

ATTORNEY

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PACKAGING MACHINE AND METHOD

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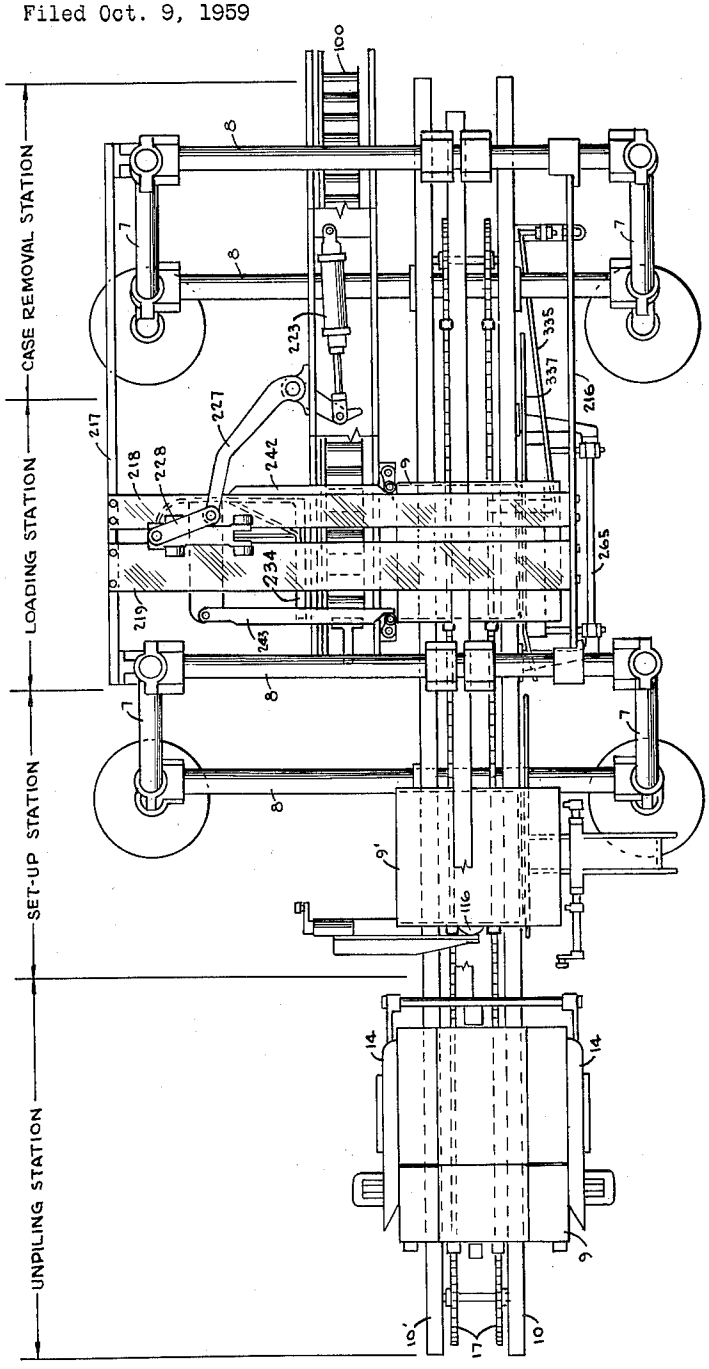


Fig. 2.

INVENTORS.
MORRIS P. NEAL
JAMES L. NEAL
SYLVAN V. DICE

BY John L. Dice

ATTORNEY

Nov. 13, 1962 J. L. NEAL ET AL 3,063,209

PACKAGING MACHINE AND METHOD

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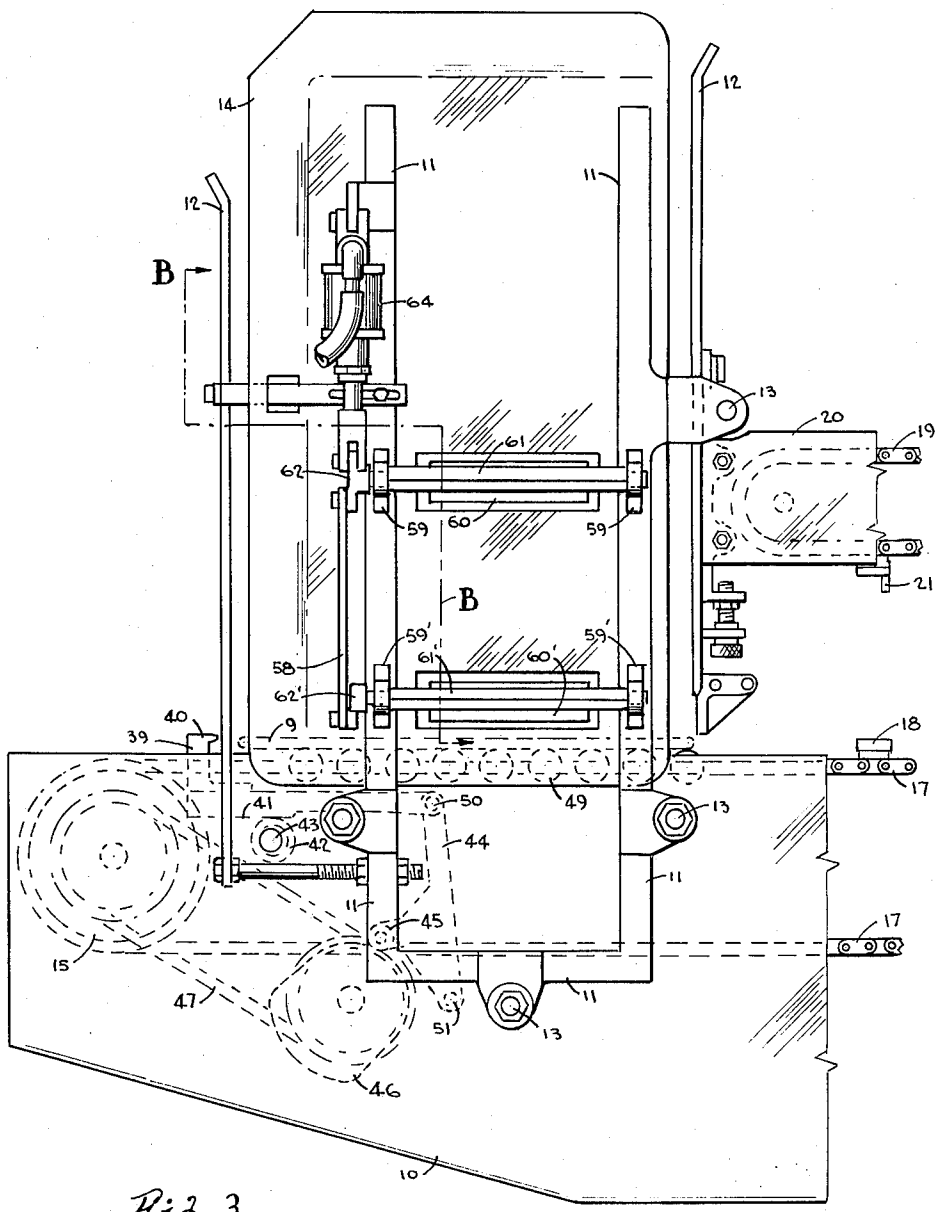


Fig. 3.

INVENTORS.
MORRIS P. NEAL
JAMES L. NEAL
SYLVAN V. DICE

BY John L. Dick

ATTORNEY

Nov. 13, 1962 J. L. NEAL ET AL 3,063,209

PACKAGING MACHINE AND METHOD

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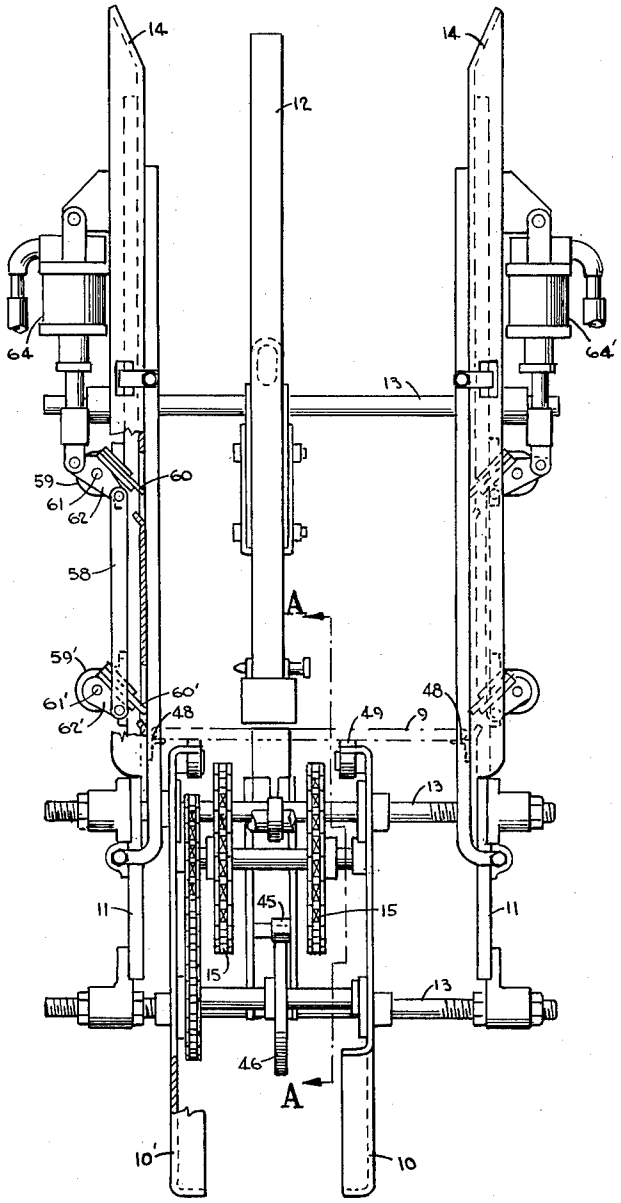


Fig. 4.

INVENTORS.
MORRIS P. NEAL
JAMES L. NEAL
SYLVAN V. DICE

BY John L. Vieil

ATTORNEY

Nov. 13, 1962 J. L. NEAL ET AL 3,063,209

PACKAGING MACHINE AND METHOD

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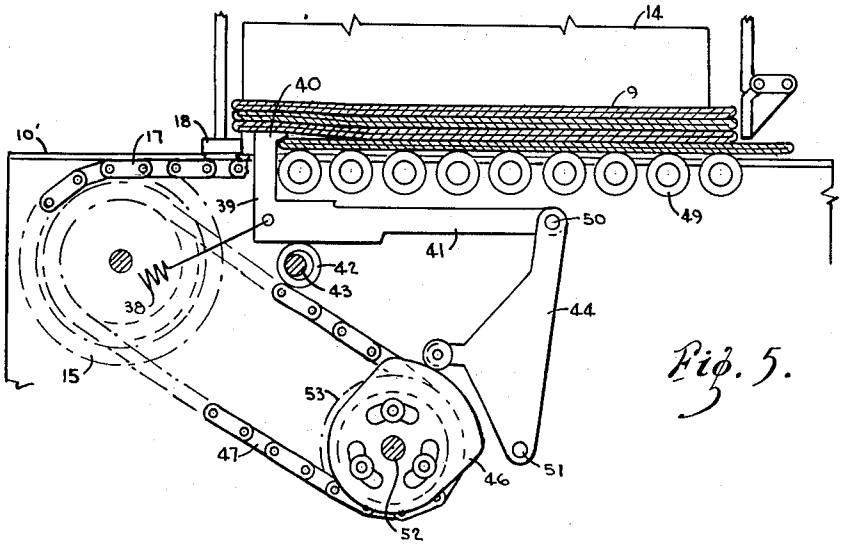


Fig. 5.

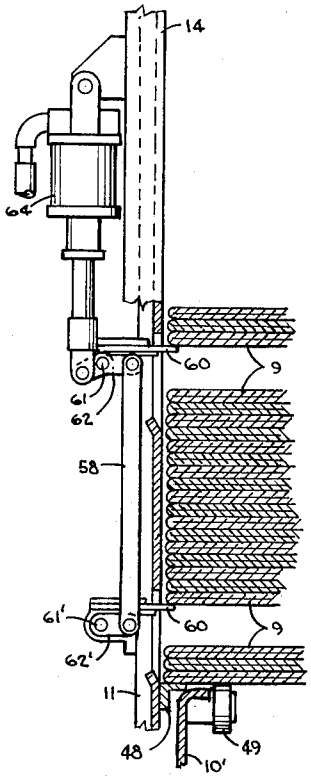


Fig. 6.

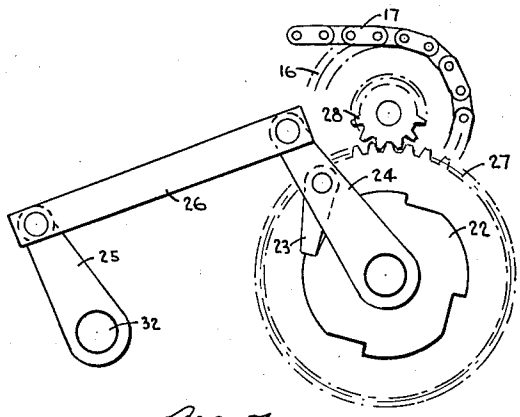


Fig. 7.

INVENTORS.
MORRIS P. NEAL
JAMES L. NEAL
SYLVAN V. DICE

BY

ATTORNEY

Nov. 13, 1962 J. L. NEAL ET AL 3,063,209

PACKAGING MACHINE AND METHOD

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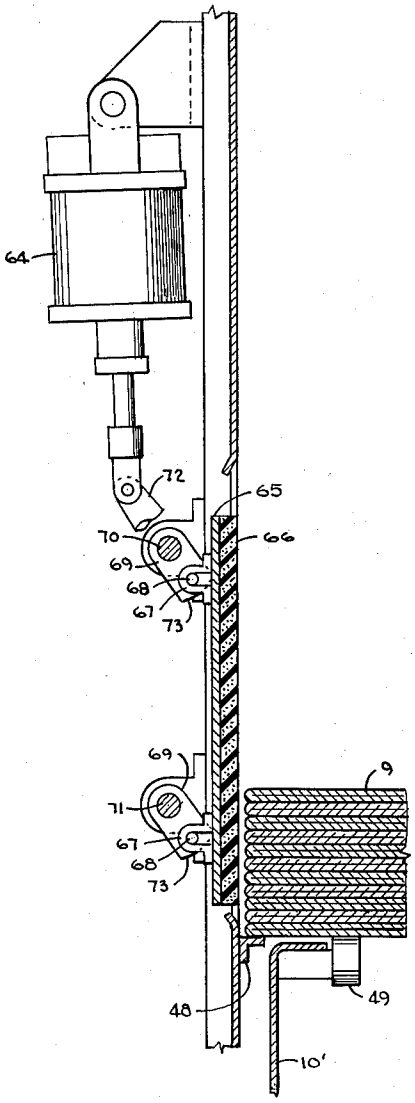


Fig. 8.

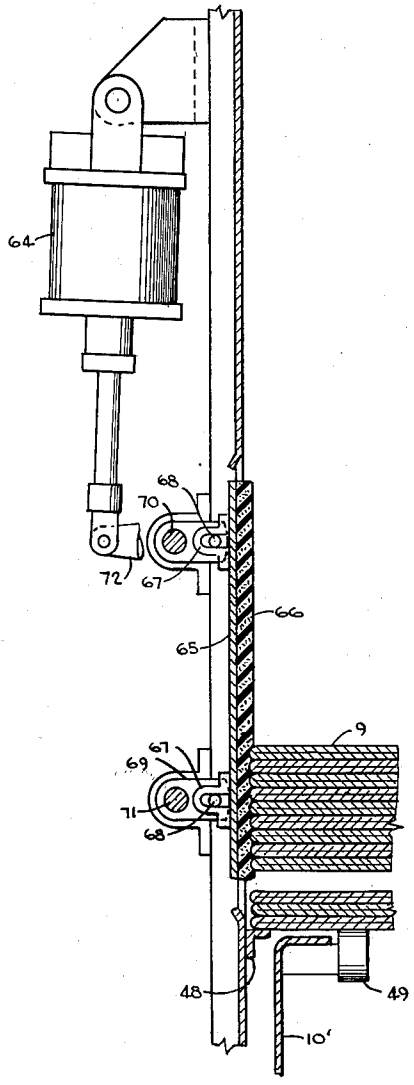


Fig. 9.

INVENTORS.
MORRIS P. NEAL
JAMES L. NEAL
SYLVAN V. DICE

BY John L. Dice

ATTORNEY

Nov. 13, 1962 J. L. NEAL ET AL 3,063,209

PACKAGING MACHINE AND METHOD

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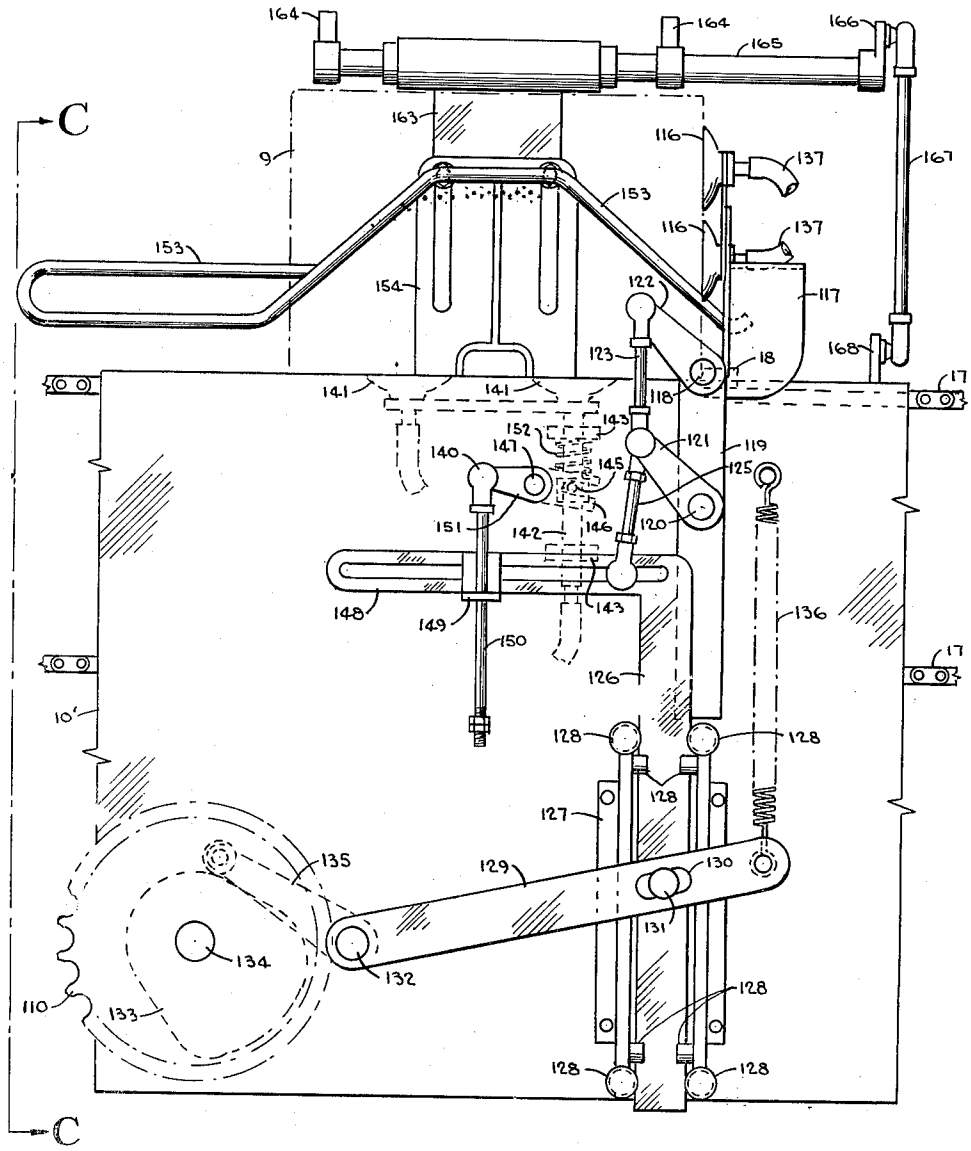


Fig. 10

INVENTORS.
MORRIS P. NEAL
JAMES L. NEAL
SYLVAN V. DICE

BY

ATTORNEY

Nov. 13, 1962 J. L. NEAL ET AL 3,063,209

PACKAGING MACHINE AND METHOD

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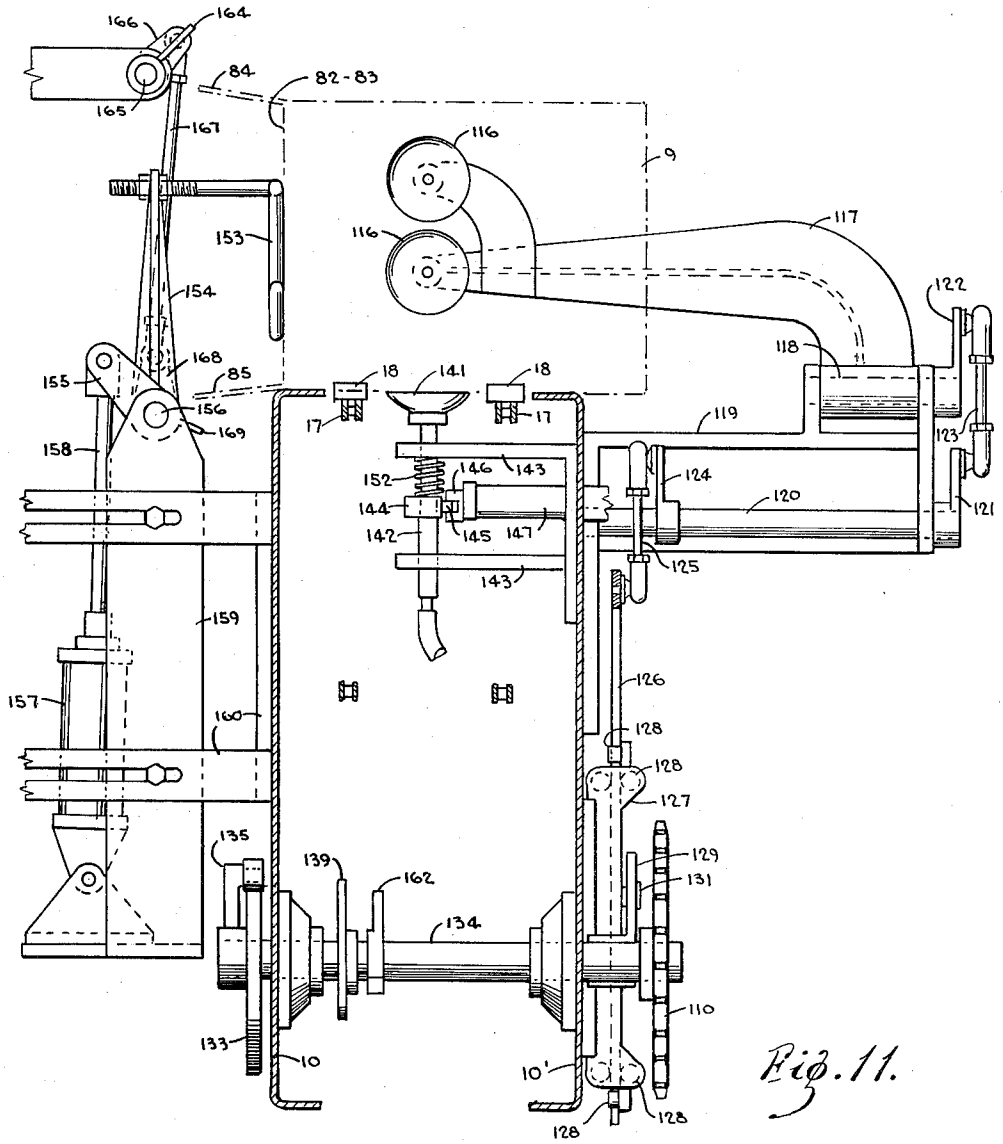


Fig. 11.

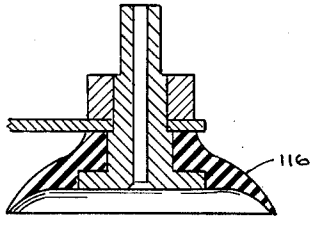


Fig. 12.

INVENTORS.
MORRIS P. NEAL
JAMES L. NEAL
SYLVAN V. DICE

BY John L. Dick

ATTORNEY

Nov. 13, 1962 J. L. NEAL ET AL 3,063,209

PACKAGING MACHINE AND METHOD

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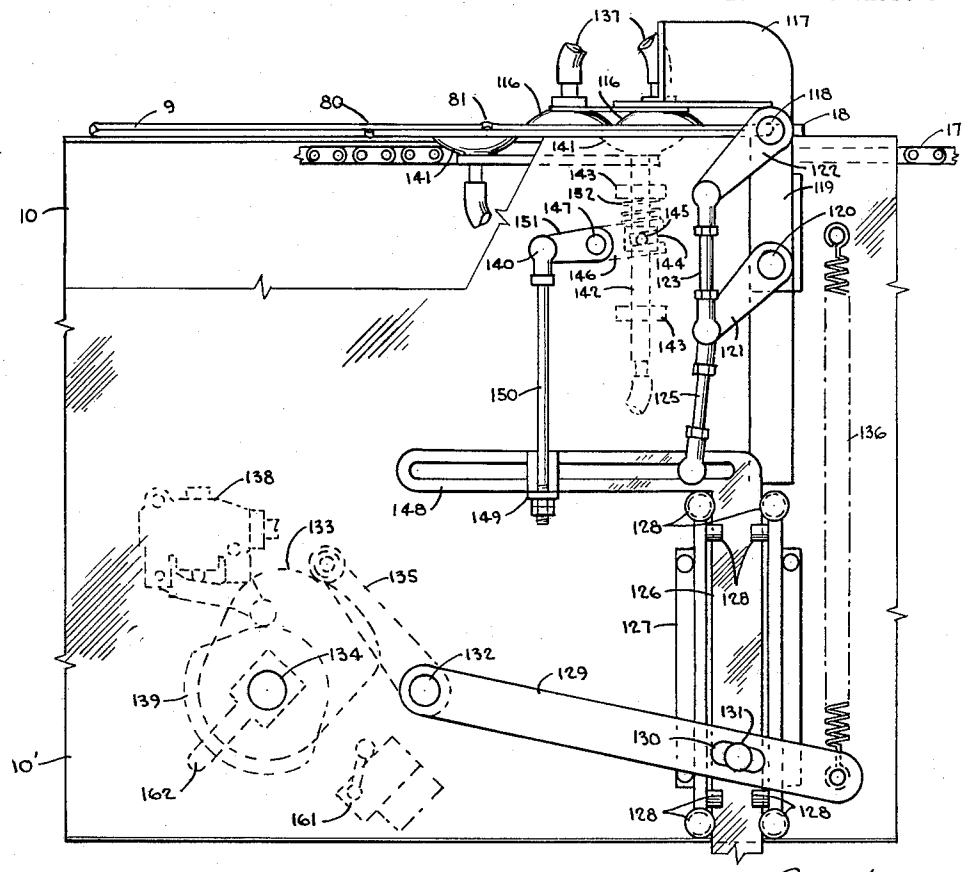


Fig. 13.

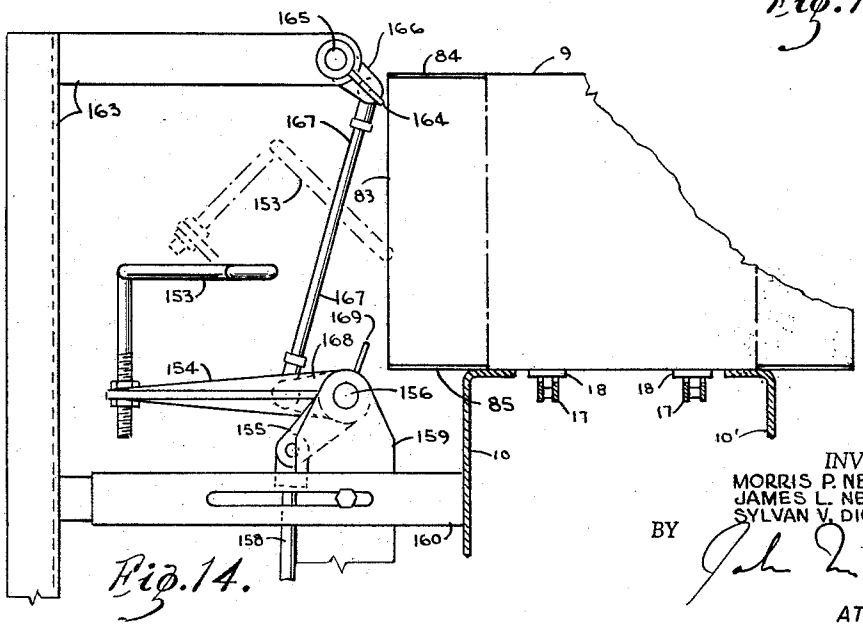


Fig. 14.

INVENTORS.
MORRIS P. NEAL
JAMES L. NEAL
SYLVAN V. DICE

BY John L. Dice

ATTORNEY

Nov. 13, 1962 J. L. NEAL ET AL 3,063,209

PACKAGING MACHINE AND METHOD

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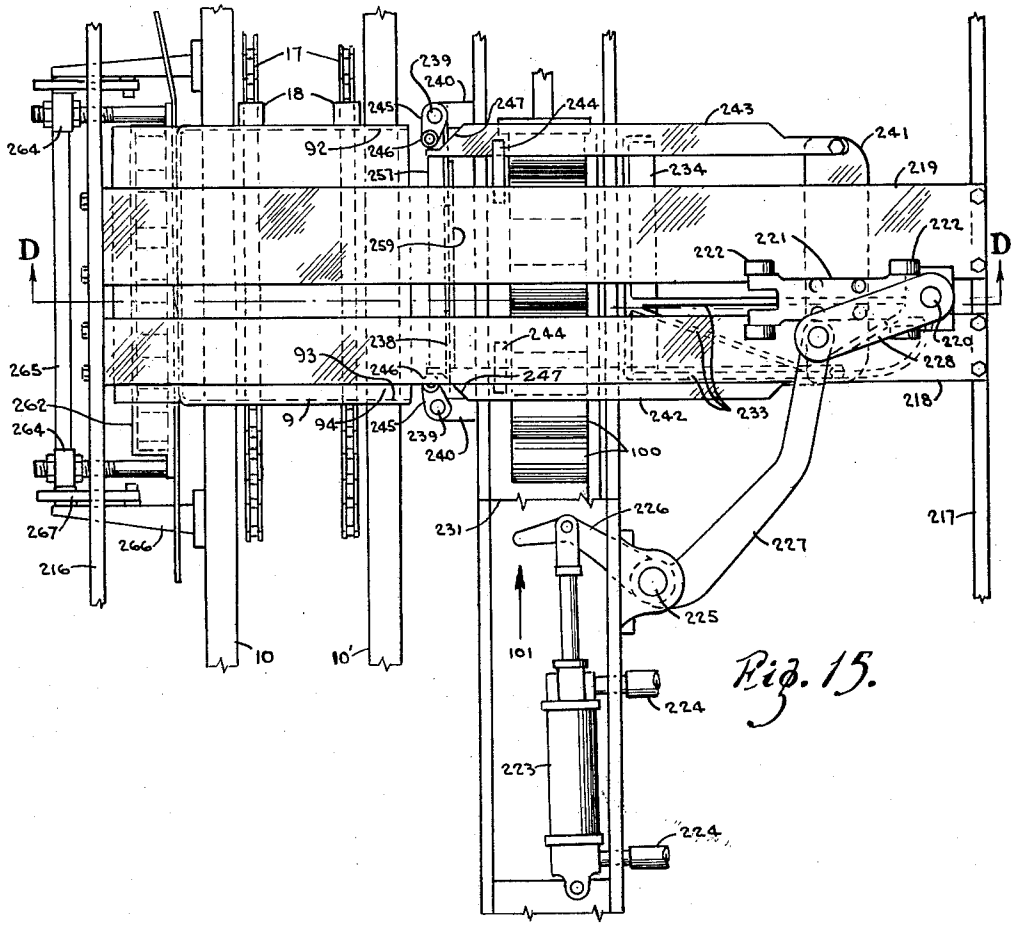


Fig. 15.

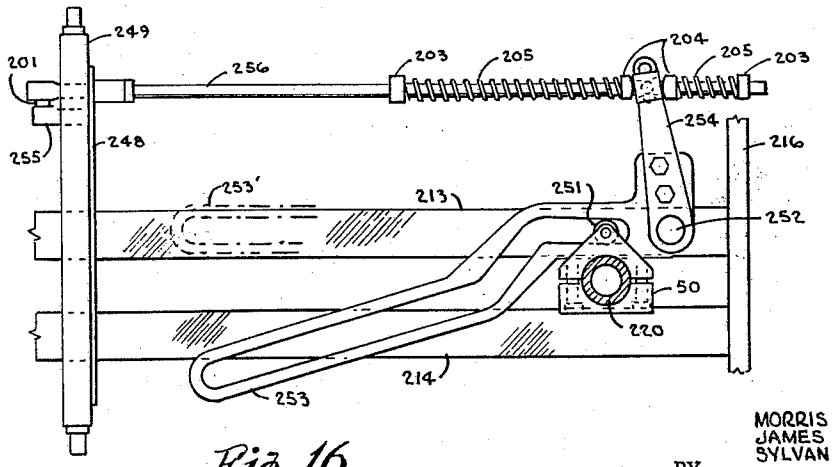


Fig. 16.

INVENTORS.
MORRIS P. NEAL
JAMES L. NEAL
SYLVAN V. DICE

BY John L. Neal

ATTORNEY

Nov. 13, 1962 J. L. NEAL ET AL 3,063,209

PACKAGING MACHINE AND METHOD

Filed Oct. 9, 1959 15 Sheets-Sheet 11

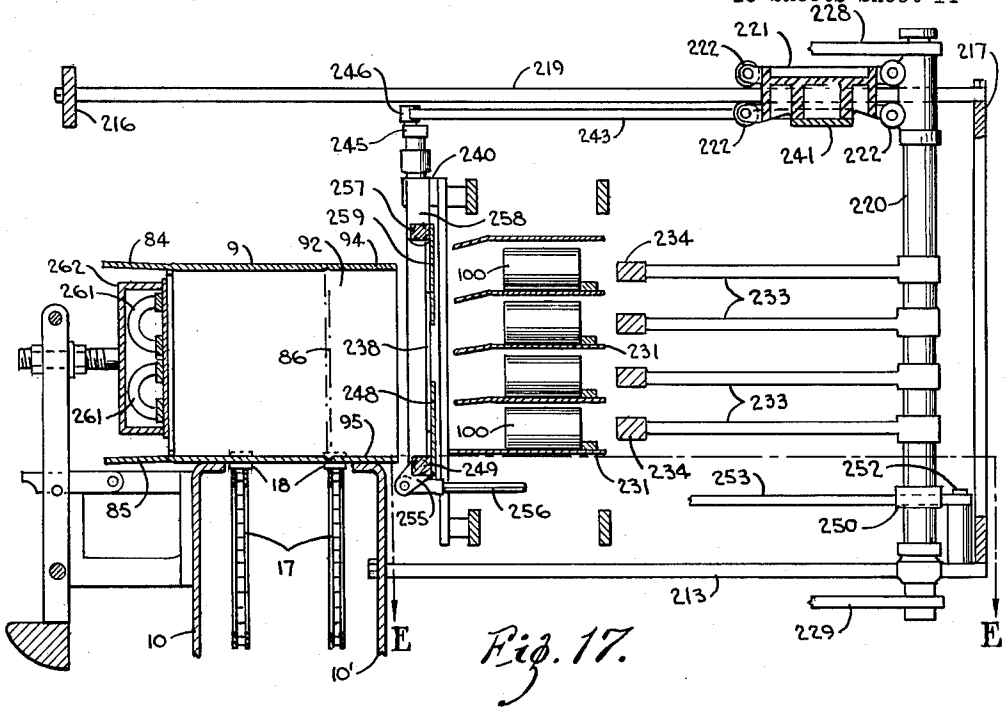


Fig. 17.

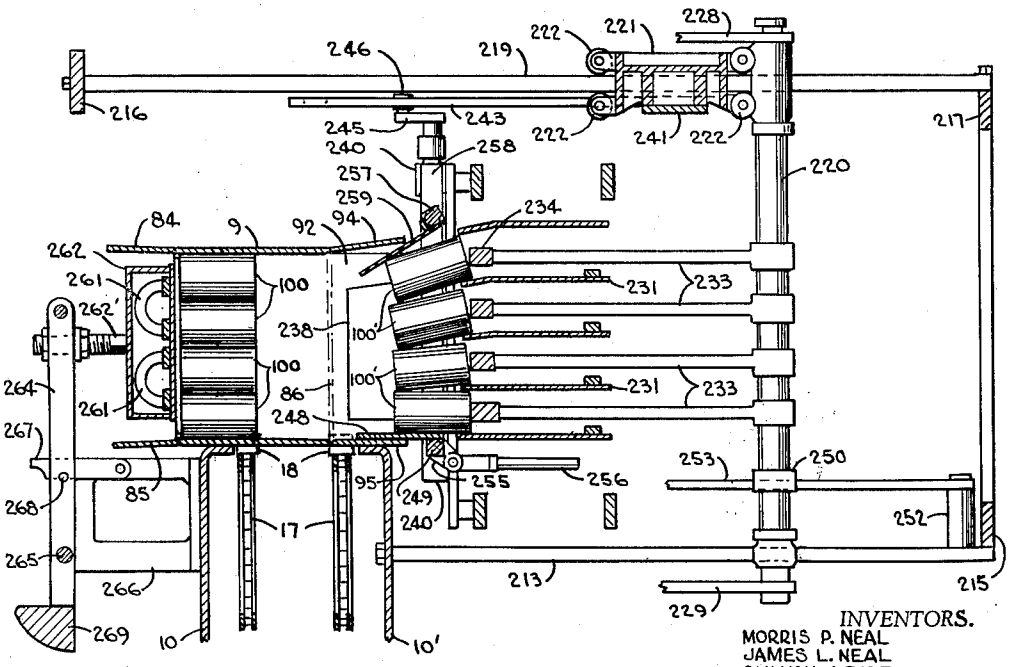


Fig. 18.

INVENTORS.
MORRIS P. NEAL
JAMES L. NEAL
SYLVAN V. DICE

BY John R. Dick

ATTORNEY

Nov. 13, 1962 J. L. NEAL ET AL 3,063,209

PACKAGING MACHINE AND METHOD

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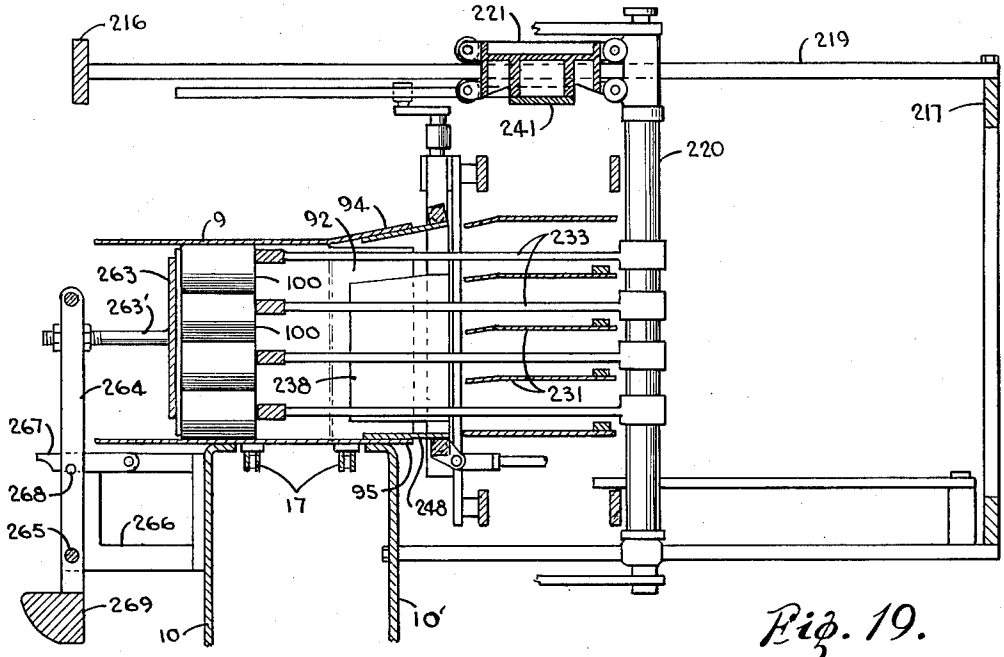


Fig. 19.

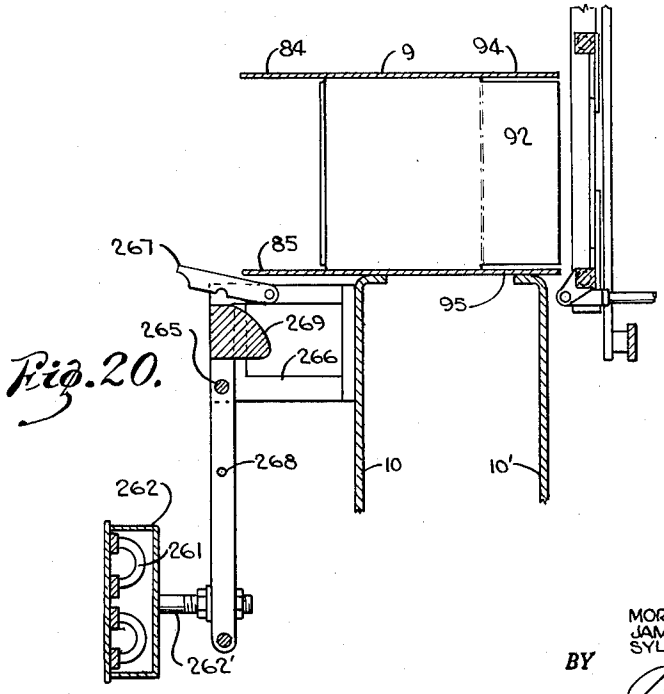


Fig. 20.

INVENTORS.
MORRIS P. NEAL
JAMES L. NEAL
SYLVAN V. DICE

BY

ATTORNEY

Nov. 13, 1962 J. L. NEAL ET AL 3,063,209

PACKAGING MACHINE AND METHOD

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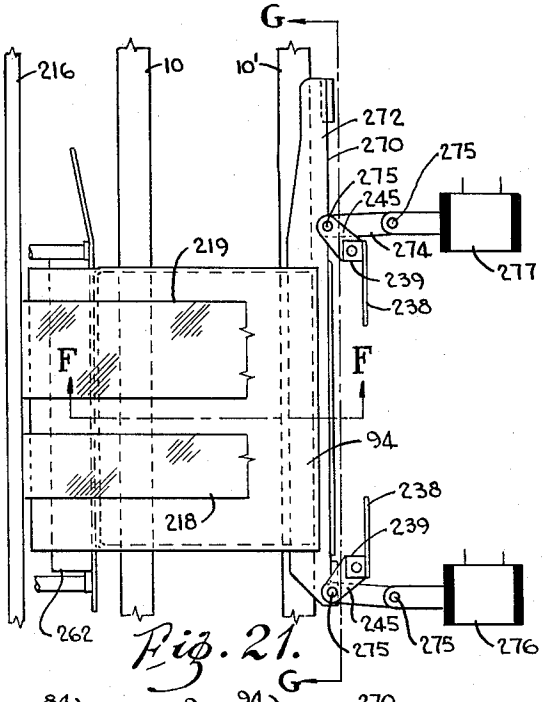


Fig. 21.

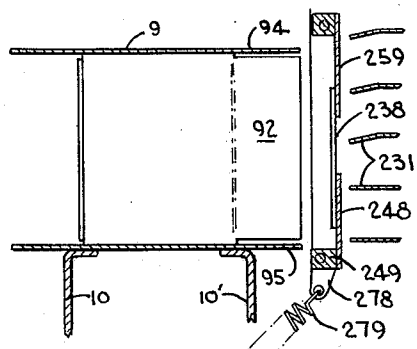


Fig. 24.

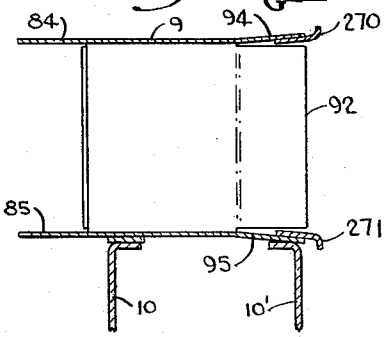


Fig. 22.

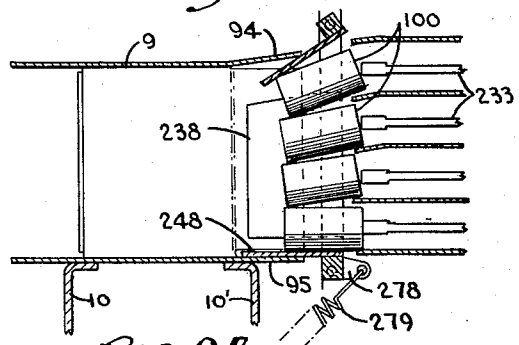


Fig. 25.

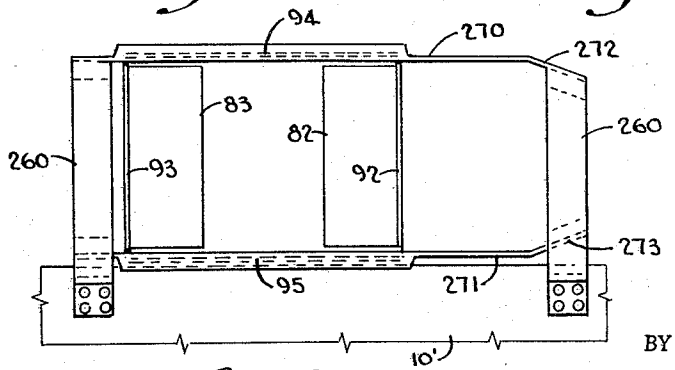


Fig. 23.

INVENTORS.
MORRIS P. NEAL
JAMES L. NEAL
SYLVAN V. DICE

BY

ATTORNEY

Nov. 13, 1962 J. L. NEAL ET AL 3,063,209

PACKAGING MACHINE AND METHOD

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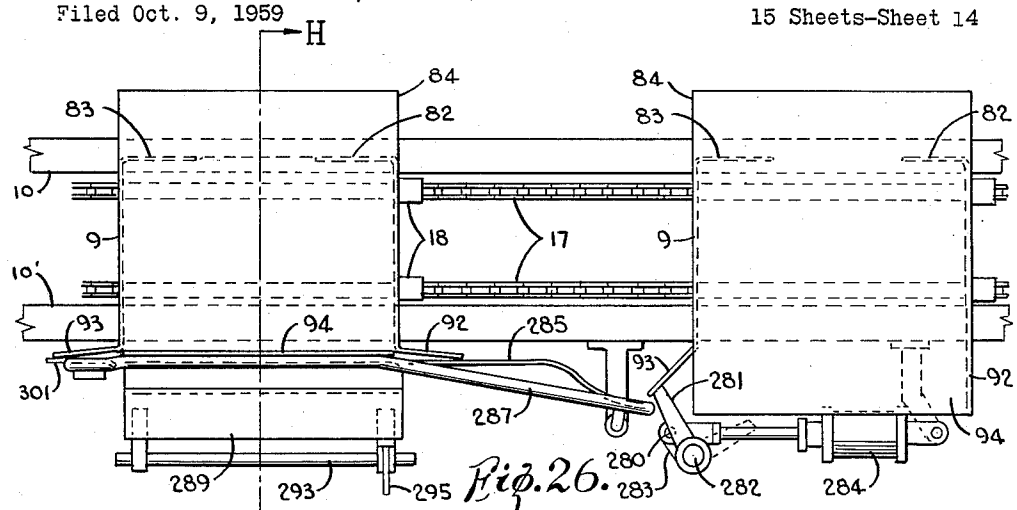


Fig. 26.

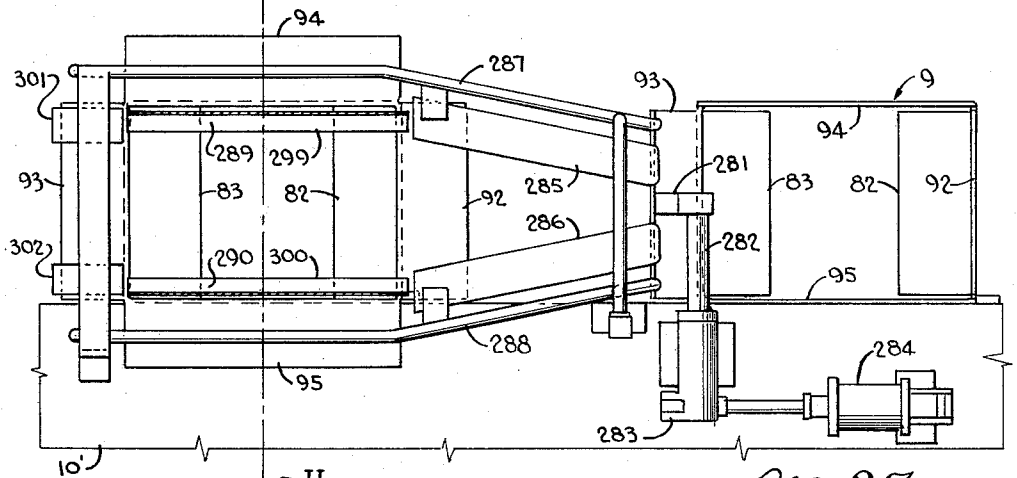


Fig. 27.

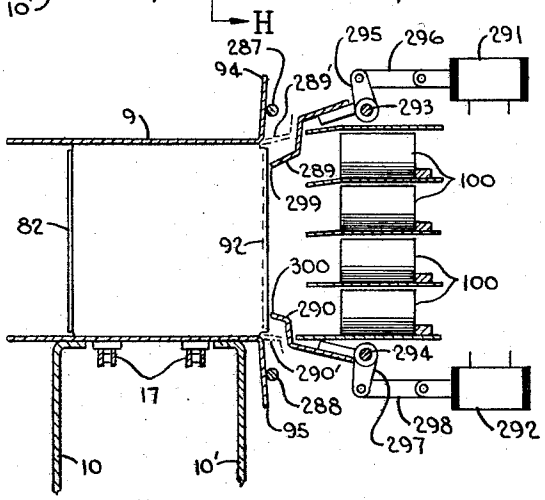


Fig. 28.

INVENTORS.
MORRIS P. NEAL
JAMES L. NEAL
SYLVAN V. DICE

BY John L. Dick

ATTORNEY

Nov. 13, 1962 J. L. NEAL ET AL 3,063,209

PACKAGING MACHINE AND METHOD

Filed Oct. 9, 1959 15 Sheets-Sheet 15

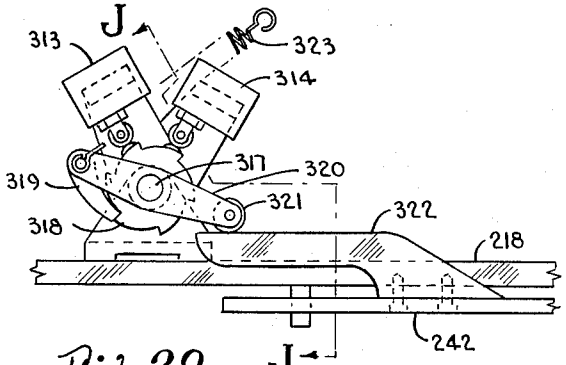


Fig. 29.

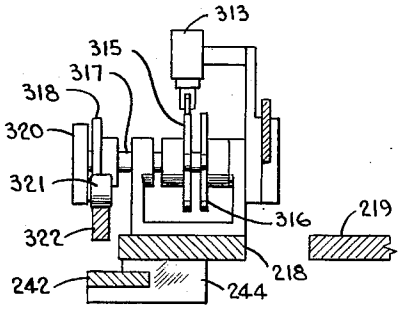


Fig. 30.

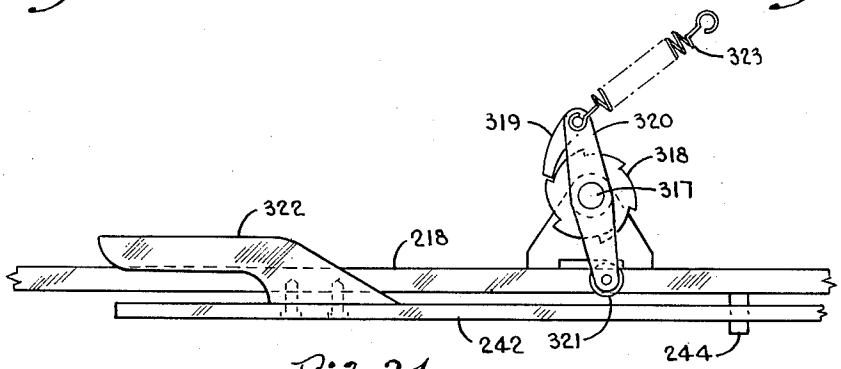


Fig. 31.

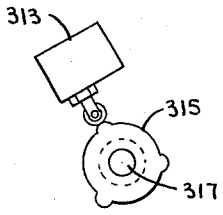


Fig. 32.

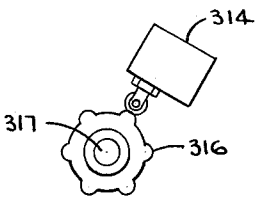


Fig. 33.

INVENTORS.
MORRIS P. NEAL
JAMES L. NEAL
SYLVAN V. DICE

BY John L. Dickel

ATTORNEY

United States Patent Office 3,063,209 Patented Nov. 13, 1962

3,063,209
PACKAGING MACHINE AND METHOD

James L. Neal, Morris P. Neal, and Sylvan V. Dice, Clearwater, Fla., assignors to A-B-C Packaging Machine Corporation, Clearwater, Fla., a corporation of Florida

Filed Oct. 9, 1959, Ser. No. 845,442
26 Claims. (Cl. 53—29)

This invention relates to a device for removing folded cartons from a pile, setting them up, loading cans into them and closing all the flaps of the cartons, at a high rate of speed and with an extreme minimum of jamming, skipping of cartons and other difficulties. The cartons may be of corrugated paper board and the cans may be empty or full.

The particular advantages of the device of our invention and the means whereby the objectives are accomplished are described below in connection with the detailed description.

The most important, outstanding and significant advantage of our machine is its extremely high rate of speed. The speed is so great that the machine can handle cases at a higher rate than cans can be fed into the machine, and can load cans into cases at a higher rate than cans can be fed into the machine, and can load cans into cases at a higher rate than can can be introduced into the loading station. Therefore, it is a significant advantage of the machine and unique with respect to machines of this type that the machine has a speed which is limited only by the rate at which cans can be fed to the machine.

An object of the invention is to provide such a machine which will not fail or jam if one or more of the cartons in the pile which is fed to the machine are jammed or battered.

Another object is such a machine which operates at an especialy high rate of speed with a minimum of malfunctioning.

Other objects will become apparent from the drawings and from the following detailed description in which it is intended to illustrate the applicability of the invention without thereby limiting its scope to less than that of all equivalents which will be apparent to one skilled in the art. In the drawings like reference numerals refer to like parts and:

FIGURE 1 is a partially schematic elevation of one embodiment of the machine of the invention, taken from what will be called herein, as a convention, the right hand side;

FIGURE 2 is a partially schematic plan view of the machine of FIGURE 1;

FIGURE 3 is a detailed elevation from the right hand side of the unpiling station portion of the machine of FIGURE 1;

FIGURE 4 is a partially cutaway and elevation of the portion of FIGURE 3, taken from the left end;

FIGURE 5 is a partial cross-sectional view of the portion of FIGURES 3 and 4 taken on line A—A in FIGURE 4;

FIGURE 6 is a fragmentary cross-sectional view taken on line B—B in FIGURE 3;

FIGURE 7 is a fragmentary enlarged cutaway elevation of a portion of the drive mechanism;

FIGURE 8 is a fragmentary cross-sectional view of a modification of the embodiment of FIGURE 6;

FIGURE 9 is a fragmentary cross-sectional view of the modified embodiment of FIGURE 8 wherein the elements thereof are in a different position;

FIGURE 10 is a fragmentary detailed elevation of the setup station portion of the machine of the embodiment of FIGURE 1, taken from the lefthand side;

FIGURE 11 is a partially cutaway, cross-sectional detailed view of a portion of the embodiment of FIGURE 1 which is shown in FIGURE 10, taken on lines C—C in FIGURE 10;

FIGURE 12 is a detailed cross-sectional view of one of the elements of FIGURES 10 and 11;

FIGURE 13 is an elevation corresponding to FIGURE 10, of a portion of a mechanism of FIGURE 10 showing some of the elements thereof in a different position;

FIGURE 14 is a fragmentary cross-sectional view from the same point as FIGURE 11, of a portion of a mechanism of FIGURE 11 showing some elements of FIGURE 11 in a different position;

FIGURE 15 is a detailed plan view of the loading station portion of the embodiments of FIGURES 1 and 2;

FIGURE 16 is a fragmentary cutaway detailed plan view of a portion of the mechanism for operating one of the elements of FIGURE 15 taken on line E—E in FIGURE 15;

FIGURE 17 is a cross-sectional detailed view of the portion of FIGURE 15 taken on line D—D in FIGURE 15;

FIGURE 18 is a cross-sectional detailed view corresponding to FIGURE 17 showing some of the elements thereof in a different position;

FIGURE 19 is a partially schematic, partially fragmentary cross-sectional view of a modified embodiment taken from the same point as FIGURE 17;

FIGURE 20 is a fragmentary, cross-sectional view corresponding to FIGURES 17, 18 and 19, showing a portion of the elements thereof in a different position;

FIGURE 21 is a schematic plan view of a modified embodiment of a portion of the loading station;

FIGURE 22 is a fragmentary cross-sectional view taken on line F—F in FIGURE 21;

FIGURE 23 is a fragmentary elevation taken on line G—G in FIGURE 21;

FIGURE 24 is a fragmentary cross-sectional view of a portion of a modified embodiment of the loading station taken at about the center of the loading station;

FIGURE 25 is a fragmentary schematic cross-sectional view corresponding to FIGURE 24 showing a different position of part of the elements therein;

FIGURE 26 is a cutaway, fragmentary plan view of a modified embodiment of a portion of the loading station;

FIGURE 27 is an elevation of the modification of FIGURE 26;

FIGURE 28 is a cross-sectional view of the modification of FIGURES 26 and 27 taken on a plane corresponding to line H—H in each of FIGURES 26 and 27;

FIGURE 29 is a fragmentary elevation of switching mechanism;

FIGURE 30 is a cross-sectional view taken on lines J—J in FIGURE 29;

FIGURE 31 is a fragmentary view of a portion of FIGURE 29 plus additional elements, showing change of position;

FIGURE 32 is a fragmentary view of elements from FIGURES 29 and 30; and

FIGURE 33 is a fragmentary view of elements from FIGURES 29 and 30.

For convenience, the detailed description of the machine has been divided into sections devoted to several stations. At each of the stations a carton passing through the machine is maintained stationary for a certain length of time.

The first station comprises means for maintaining a pile of cartons and feeding cartons one at a time from the pile to the next station. It has been designated the "unpiling station" and may also be referred to variously as the "magazine" station or "feeding" station. The second station is referred to as the "set up station" and at this station each folded carton is set up, that is, unfolded into

rectangular form. It is also preferred to close two of the flaps at this station. Following the set up station, the case travels to the "loading station" where cans are loaded into the case. As a final step, loaded cases are removed from the loading station and one or more additional flaps may be closed. The loaded cases may then be transported to storage areas or to other machines by any sendable method.

No means are shown for maintaining the flaps closed, as by bonding or gluing with cement or adhesive or by fastening with staples or the like, but, if desired such means may be added to the machine or provided in a machine through which the cases may pass after leaving the machine of the invention.

The machine of the invention may be utilized in many instances to load empty cans into cases which are then not securely fastened shut but are transported to areas where the cans are filled, the cans first being removed from the cases, then filled and then reloaded into the cases whereupon the flaps of the cases are then sealed closed. The containers referred to herein generally as "cans" will be understood from the description to be any sort of container, filled or unfilled, and not limited as to material of construction, size, shape or number which may be packed in a carton. Thus they may be of cardboard, glass or metal and may be cylindrical or rectangular and may be packed as few as one to a carton.

The main frame of the machine comprises right main frame member **10** and left main frame member **10'**.

The machine may be supported by tubular upright frame members **7** and tubular horizontal members **8** and held thereby in an angular position to cause cans **100** to roll or slide into the loading station by gravity.

In FIGURES 1 and 2 there are shown inclined tracks **331** down which cans **100** are fed into the machine. A part of the lowermost track **331** is a hinged plate **326** pivotally mounted on shaft **327**. The plate is forced downward by the weight of cans **100** to thereby close switch **328**. If there are no cans on plate **326** it is raised by the action of counterweight **329**, which opens switch **328** to stop the machine, by reason of switch **328** being wired in series with a control for the main drive of the machine.

Unpiling Station

At this station the machine maintains a pile of folded cartons each lying in a horizontal position and each piled one above another, removes one carton at a time from the bottom of the pile and feeds each such carton to the next station.

The frame of the magazine is provided by bars **11** and **12** which are supported by cross bars **13**, the lowermost three of bars **13** being attached to and supported by main frame members **10** and **10'**. Cross bars **13** are threaded to permit adjustment of the lateral spacing of bars **11** to accommodate various sizes of cartons.

To the bars **11** are attached walls **14** which hold the pile of folded cartons in lateral position. The bars **12** hold the cartons in fore or aft position.

Between frame members **10** and **10'** are sprockets **15** and **16** which carry chains **17**. Attached to chains **17** are lugs **18** which carry the cartons from one stage to the next along main frame members **10** and **10'**. A second chain **19** is mounted in a frame **20** and has lugs **21** thereon which move from stage to stage simultaneously with lugs **18**. The chain **19** is driven intermittently from ratchet wheel **22** thru gear **27**, pinion **28**, sprocket **33**, chain **34**, gears **35** and **36** (which reverse the direction of rotation) and chain **37**, as shown in FIGURE 1.

The intermittent movement of chain **17** is obtained by means of the ratchet wheel **22** and pawl **23** mounted on arm **24** (see FIGURES 1 and 7). Arm **24** is driven by crank **25** acting thereon, crank **25** being driven by main drive motor **29** which drives chain **30** which passes over sprocket **31** attached to shaft **32** to which crank **25** is firmly attached. The ratchet wheel **22** drives gear **27** engaging a pinion **28** fastened to the shaft of sprocket **16**. The gear ratio is 4 to 1, so that 90 degree rotation of the ratchet wheel will cause one complete turn of sprocket **16**.

Before lugs **18** engage a folded carton, and to make sure that only one carton is carried forward at a time, additional driving means is provided, as shown especially in FIGURE 5 and also in FIGURES 3 and 4, to select one carton and position it for the lugs to carry forward. This means comprises arm **39** and finger **40**. Arm **39** is mounted on a bar **41** which is held by spring **38** downwardly against roller **42** adjustable for height by rotation of rotatable eccentric shaft **43**. Bar **41** is reciprocated by arm **44** which is pivotally attached at **50** to arm **41** and pivotally mounted on fixed shaft **51**. Cam follower roller **45** is attached to plate **44** and driven by cam **46** to impart motion to plate **44**. Cam **46** is rotatably driven at a speed determined from that of main chains **17**, by reason of drive chain **47** being driven by a sprocket mounted on the shaft on which sprocket **15** is mounted.

Arm **39** is shown in FIGURE 3 in a retracted position. Finger **40** may be wedge shaped as shown and when the arm is carried forward by the cam, is shown in FIGURE 5, finger **40** can separate the lowest carton from the carton next above at its rearward edge. Arm **39** can then carry it forward to break any adhesion between the lowest carton and the next carton.

Cam **46** may be rotatably adjustable on shaft **52** in relation to sprocket **53** which is rigidly affixed to shaft **52** and driven by the chain drive **47**. Such adjustment permits timing of the drive so that the separating action of finger **40** and driving action of arm **39** take place just before the lugs **18** begin to drive the carton forward.

Folded cartons **9** may be partly supported by angle members **48** as shown in FIGURE 6, but the greater part of the weight of the pile of cartons **9** may be carried by the rollers **49** to reduce the force required to drive each bottom carton forward out from under the pile and thereby prevent damage to the edge of the cartons by the driving lugs **18**.

To further reduce the force required to slide each bottom carton out from under the pile, lifting plates **60** and **60'** may be placed at each side of the magazine. These plates may be fixed to bars **61** and **61'** pivotally mounted in bearings **59** and **59'** and can be turned by cranks **62** and **62'** through an angle of 45 degrees. The plates **60** and **60'** are shown in their inoperative position in FIGURE 4. In FIGURE 6 the plates are turned to their lifting position in which they lift the cartons **9** while the lowest carton is removed; then the plates are returned to the position in FIGURE 4 to allow the cartons to feed downward.

Cranks **62** and **62'** may be operated by compressed air cylinders **64** which act directly against cranks **62** which in turn drive cranks **62'** through links **58**. The air to the cylinders may be regulated by suitable valves and cams (not shown), but driven by chain **17**. The return stroke of each cylinder may be made by the action of an internal spring within each cylinder.

In the alternative method of lifting the folded cartons as shown in FIGURES 8 and 9 there may be provided at each side of the magazine a plate **65** having at its inner surface a layer of foam rubber or like spongy material **46**. Plates **65** may be supported by slotted brackets **67** mounted on pins **68** carried by arms **69**. Arms **69** may be fixed to shafts **70** and **71** and the upper shaft **70** may have an arm **72** connected to a cylinder **64**.

When air is admitted to cylinder **64**, arms **69** move plates **65** inward and upward. Arms **69** may have cylindrical surfaces **73** so that when the plates **65** reach the position shown in FIGURE 9, the plates are moved upward only, with the cylindrical surfaces **73** maintaining a constant pressure on the plates to lift the cartons. Plates **65** and brackets **67** form the connections by which the lower arms are caused to follow the movement of the

upper arms, that is, serve the function of links 58 in the embodiment of FIGURES 3, 4 and 6.

Set-Up Station

At this station the cases are unfolded and two of the flaps may be closed. The chains 17 carrying lugs 18 are driven by an intermittent motion which causes the cases to stop at the set-up station while these operations are performed.

The cases are formed with cutaway parts to form flaps as shown at points 80 and 81 (FIGURE 13). The cases are also formed with creases at 80 and 81 so that they will hinge at these points in being set up.

To lift the end wall of the case, vacuum cups 116 are mounted on a swinging arm 117. The arm 117 is mounted on a shaft 118, the center of which is coaxial with the rear hinge point of the case when the case is carried into temporarily stationary position at the set-up station by the lugs 18.

The arm 117 and shaft 118 are carried by a bracket 119 which may be supported by frame member 10'. To operate the arm 117, a second shaft 120 may be mounted in bracket 119 and the shafts may have crank arms 122 and 121 attached respectively thereto. Link 123 may be pivotally attached to the ends of arms 121 and 122. Shaft 120 may also carry crank arm 124 having link 125 pivotally attached thereto at its outer end. The link 125 may be pivotally attached at its other end to slide bar 26 which may be supported by guiding member 127 which is provided with a series of rollers 128 to reduce friction when the bar 126 is moved by arm 129 which is provided with slot 130 which receives stud 131 fixed to bar 126.

Lever 129 may be securely fixed to a shaft 132 rotatably mounted in the frame and shaft 132 may be oscillated by a cam 133 mounted on a shaft 134 which is rotatably mounted in the frame so that cam 133 drives lever 135 firmly fixed to shaft 134.

The action of cam 133 through levers 135 and 129 and stud 131 may drive the bar 126 downward to swing the arm 117 and vacuum cups 116 down on to the folded carton in the position shown in FIGURE 13, acting through the linkages previously described. The downward movement of lever 129 also increases the tension in the spring 136 which has one end connected to the lever 129 and the other end connected to the frame.

Vacuum cups 116 may be connected through tubes 137 (only partly shown for simplicity) to vacuum pump 115 (FIGURE 1). By means of valve 138 which may close and open tubes 137 vacuum cups 116 are enabled to hold or release the carton as the valve 138 is operated by cam 139 on shaft 134.

The cycle of operations is therefore: first, a case or carton 9 is carried to the position shown in FIGURES 13 and 14. The arm 116 is then brought downward so that vacuum cups 116 are pressed onto the upper surface of the case. Then valve 138 opens so that vacuum is appiled to the cups. The cam 133 then releases the arm 135 and the spring 136 raises the lever 129. By means of the connecting links and levers the arm 117 is hingeably moved to the position shown in FIGURES 10 and 11 and the vacuum cups bring the upper side of the case to a vertical.

While one side of the case is being raised it is desirable to hold down the lower side of the case with vacuum cups 141 which are positioned below the case. Cups 141 are mounted on a sliding tube 142 supported by brackets 143. On the tube 142 is a block 144 provided with a stud 145. Tube 142 extends through a helical compression spring 152 which bears upwardly against the uppermost of brackets 143 and downwardly against block 144. A forked lever 146 engages the stud and the lever 146 is fixed as a crank arm to a shaft 147.

The slide bar 126 has an extension 148 carrying a lug 149. Rod 150 is pivotally connected at 140 to crank arm 151 on shaft 147 and extends slidably through lug 149. At the lower end of rod 150 are nuts positioned so that when the extension 148 is at the lowest point of travel, the lug 149 will act thereagainst to pull rod 150 downward and thereby raise the cups 141 up firmly against the lower side of the case 9. This movement also compresses spring 152 between block 144 and upper bracket 143.

When cam 133 releases arm 135 and permits spring 136 to raise lever 129, it also allows spring 152 to force downward block 144, tube 142 and vacuum cups 141. The vacuum cups move only a small distance and hold the lower side of case 9 firmly down against the frame members 10 and 10' while the upper side is forced into set-up position by cups 116 but they preferably do not move far enough downward to break the vacuum of the cups.

After the case has been set-up to the position shown in FIGURES 10 and 11, two of the vertical flaps shown as flaps 82 and 83 may be closed by arm 153. Arm 153 may be mounted on one end 154 of a bell crank extended from shaft 156. The other end 155 of the bell crank may be connected to an air cylinder 157 by a rod 158. Shaft 156 and cylinder 157 may be supported by a frame 159 attached to frame member 10. Compressed air is admitted to cylinder 157 through tubing (not shown) extending from switch 161 to the cylinder and is controlled by a valve opened at the correct time by switch 161 which is operated by arm 162 on shaft 134.

Arm 153 is shown in retracted position in FIGURE 14. This figure also shows the arm in dotted outline in a position about halfway through its stroke. FIGURES 10 and 11 show the arm in the position of having closed the flaps.

The case is formed with upper and lower flaps shown as 84 and 85. It is desired to spread these flaps outward during at least the initial portion of the time of closing the vertical flaps 82 and 83. To lift flap 84, fingers 164 are mounted on a shaft 165 which is mounted on bracket 163 which is rotated by an arm 166 and rod 167. The rod 167 is moved by an arm 168 on shaft 155. Another pair of fingers, one of which is shown at 169, is carried by shaft 155 to press down the lower flap 85. The fingers 164 and 169 are positioned so that they engage upper and lower flaps 84 and 85 and push them out of the way just before arm 153 begins to close the vertical flaps.

Shaft 134 is driven by a sprocket 110 timed to operate in conjunction with chains 17, so that the set-up operation is performed while chains 17 are not in motion.

Loading Station

In FIGURES 15 and 17 a carton and cans are shown in position for loading. In FIGURE 18 part of the loading action is shown as having been completed. In FIGURE 19 the cans are shown as having been forced fully into the carton by loading rams. In FIGURE 20 there is shown the manner in which a portion of the machine may be swung outward to permit a case to be removed.

In the modified embodiment of FIGURES 21, 22, and 23, two flaps may be plowed open as the carton is moved along the frame prior to reaching the loading station. In FIGURES 24 and 25 and also in FIGURES 26, 27 and 28 there are shown additional modified embodiments.

Referring now to FIGURES 15, 16, 17 and 18, attached to main frame members 10 and 10' there may be provided horizontal bars 213 and 214 (FIGURE 16).

Longitudinal bars 215 and 216 and 217 are supported parallel to members 10 and 10' by bars 213 and 214 which extend horizontally from member 10' to bar 215 and by bracket members, not shown, but attached to the frame members 10 and 10'. Two horizontal guide plates 218 and 219 extend between bar 216 and bar 217.

Carriage 221 is supported by plates 218 and 219 and can move laterally along the plates on wheels 222 above and below the plates which also serve to cause tube 220 which depends downward from the carriage, to be maintained in a vertical position. Tube 220 may also be

guided at its lower end by bars 213 and 214 between which it extends.

To move the tube 220 laterally a double acting cylinder 223 is provided. The cylinder is operated by compressed air supplied to tubes 224 from air valves, not shown, but operating in conjunction with movement of the chains 17.

Cylinder 223 may rotate a vertical shaft 225 thru arm 226 firmly attached to the shaft. Fixed to the upper and lower ends of shaft 285 are arms 227 pivotally connected to links 228 and 229 which are pivotally connected to tube 220. When the cylinder is operated it therefore moves the tube 220, by means of the arms 227 and links 228 and 229, along the guide bars toward the carton.

Furthermore, lever 211 (FIGURE 1) is operated by carton 9 to close switch 212 and thereby indicate that a carton has arrived at the loading station; switch 212 is installed as an interlock with the switch (not shown) which governs the operation of cylinder 223, so that rams 233 will not operate to drive cans into a carton unless a carton is present at the loading station to receive the cans.

The cans 100 are supported by a series of decks 231 which are the bottom surfaces or members of runways of tracks in which cans are fed to the machine. The decks form inclined planes so that the cans are fed by gravity in the direction of the arrow 101 (FIGURE 15).

Vertical tube 220 has attached to it a series of rams 233, each of which has a wide end at 234 to push against a number of cans. The rams are spaced to fit between the decks and therefore when the tube 220 is moved thru its stroke the cans are pushed into the carton.

As shown in FIGURES 15, 17 and 18 the carton 9 has foldable vertical flaps 92 and 93 and foldable horizontal flaps 94 and 95. To make sure that these flaps are wide open and to provide a funnel for entrance of the cans to maintain correct orientation of the cans and prevent jamming, a series of hinged smooth plates are positioned at the entrance to the carton.

Two of these funnel plates 238 are attached to vertical shafts 239 which are journaled in brackets 240. Attached to carriage 221 is plate 241, to which are attached cam bars 242 and 243. The cam bars are also supported by guides 244. Shafts 239 have attached to the upper ends, cranks 245 which have at their ends rollers 246. Cam bars 242 and 243 have cam surfaces 247 at their ends which are adapted to move rollers 246 so that when tube 220 is moved thru the first part of its stroke, the cam bars cause shafts 239 to turn thru 60° to 90°. This rotation of shafts 239 brings the funnel plates 238 against flaps 92 and 93 and into the carton as shown in FIGURE 18 to provide smoothly converging sides to guide the cans into the carton.

To provide a smooth entrance for the cans at the lower side of the carton plate 248 may be mounted on square horizontal shaft 249 which may be rotated by the linkage shown in FIGURE 16. Tube 220 carries a bracket 250 which is provided with a roller 251. Stud 252 on bar 213 pivotally supports slotted arm 253 and roller 251 operates in the slot of arm 253. The slot is shaped so that the first part of the stroke of the tube 220 does not operate the arm; the second part of the stroke moves the arm to the position shown in dotted lines 253' and the third part of the stroke does not move the arm. Arm 253 has attached to it arm 254. Shaft 248 has attached to it crank arm 255 which is connected to arm 254 by rod 256, one end of which is pivotally connected to crank 255 at 201. Collars or blocks 203 are firmly fixed to rod 256 and collars or blocks 204 are slideably mounted thereon; interposed between collars 203 and 204 are springs 205. Arm 254 is provided at its end with an aperture through which rod 256 passes so that collars 204 are urged against opposite sides of the end of arm 254 by springs 205. When arm 253 is moved it will therefore turn shaft 249 thru 60° to 90° to bring plate 248 down on flap 95 so that plate 248 then provides a smooth runway for the cans 100 to slide on.

Near the upper surface of the carton may be another square shaft 257 rotatably mounted in brackets 258. Shaft 257 carries plate 259 which normally hangs in a vertical position by gravity. As the cans are forced into the carton the upper layer of cans force the plate 259 under the flap 94 to open it somewhat and assure smooth entrance of the cans.

One of the features of the machine of our invention is that it can load one layer of cans into a carton, or, by adjustment, load two layers of cans into a carton as indicated in FIGURE 18. To accomplish the latter the rams are caused to make two loading strokes while the carton remains in the position shown. The distance moved in the loading stroke by rams 233 may be the same for loading both the first and second layer of cans, the ends of the rams being approximately at line 86 which is the hinge point of the carton flaps at the end of each stroke. Accordingly, the stroke of the rams is not long enough to drive the first layer cans fully into the carton. To cause the first layer of cans to travel the remaining distance into each carton, they may be given a sufficiently high velocity by the rams that inertia carries them at least part of the remaining distance and may be provided in a housing 262 against which the carton rests to create a magnetic field which may act on the cans to cause them to travel the entire distance into the carton.

Thus, as shown in FIGURE 18 a first layer of cans 100 after being loaded into the carton may be held in place by magnets 261 while a second layer of cans 100' is being forced past the funnel plates by rams 233.

A preferred sequence of operations may thus be as follows:

A carton is carried into position by chains 17 and lugs 18 and operates lever 211 to close switch 212 (FIGURE 1) and cause the cans resting on hinged portion 326 of lowermost deck 331 to maintain switch 328 closed. The air cylinder 223 begins to move tube 220 and carrying rams 233. The cam surfaces 247 of cam bars 242 and 243 turn funnel plates 238 so that plates 238 extend into the carton and force carton flaps 92 and 93 somewhat outwardly. Shaft 249 is turned to cause plate 248 to hold down flap 95 and extend into the carton as a ramp on which the cans can travel. The cans are pushed forward by rams 233 and they force plate 259 into the position shown in FIGURE 18 to guide cans into the carton. At the end of the ram stroke rams 233 stop moving toward the carton but the cans due to their inertia continue to move into the carton.

As the cans leave rams 233 and travel into the carton, toward the closed flaps 82 and 83, they may enter the field of magnets 261 and be drawn with rapidly increasing force, as they approach the magnets, toward and against flaps 82 and 83 and may be held thereagainst by the field of said magnets acting thereupon.

After the return stroke of the rams, a second layer of cans may be fed along the inclined surfaces of the decks and into position to be carried by a second stroke of the rams into the carton. The carton is then carried away by the chains and the next carton brought into position.

Referring now to FIGURE 19 there is shown a modified embodiment wherein the rams have sufficient stroke to force the cans fully into the carton. In this case no magnets are used but a plate 263 holds the carton in position.

Magnet housing 262 or plate 263 is suported so that it can be swung out of position to permit sidewise manual removal of a case 9 from the loading station if this should be necessary due to jamming of the cans in the case or other malfunction at the loading station.

Arms 264 are attached to housing 262 or plate 263 by members 262' or 263' and are hingably supported on hinge bar 265 mounted in bracket 266. Arms 264 are normally held upright by latch 267 on pin 268. The

latch can be raised and the frame swung outward as shown in FIGURE 20. Counter weight 269 may be attached to arms 264 to balance the weight of magnets 261 and housing 262 or the weight of plate 263 and thus facilitate raising the unit back to the upright position.

In FIGURES 21, 22 and 23 there is shown means for plowing outward the upper and lower horizontal flaps of the case in place of utilizing plates 248 and 259 and the mechanism for operating them. Plates 270 and 271 are supported by suitable brackets 260 which may be attached to 10'. The plates have inclined surfaces at 272 and 273 and when a case is carried along the frame by lugs 18 the horizontal flaps 94 and 95 of the case are plowed open by plates 270 and 271, which thereupon act as funnel members to direct cans into the carton. Side funnel members may be provided by plates 238 which may be operated through links 274 pivotally attached at points 275 by solenoids 276 and 277, as an alternative to being operated by cams 242 and 243.

As shown in FIGURES 24 and 25, plate 243 mounted on shaft 249 may be operated by utilizing a spring in place of the mechanism of FIGURE 16. Shaft 249 may be provided with crank arm 278 having tension spring 279 attached to the end thereof so that plate 248 is normally held upright by the action of spring 279. When cans are forced into the case as shown in FIGURE 25, plate 248 is forced by the cans toward a horizontal position and holds down the case flap 95 and provides a smooth ramp or funneling member to guide the cans 100 into carton 9.

Referring now to FIGURES 26, 27 and 28, flaps 92, 93, 94 and 95 may be moved out of the way of entering cans by mechanism operating at both the set up station and the loading station and also between these two stations.

The forward end flap 93 is first opened to a position where it can be plowed back. This is accomplished at the set up station by an arm 281 mounted on a shaft 282 supported by the frame. Connected to the shaft 282 is an arm 283 operated by a cylinder 284, The piston of which is pivotally connected to the outer end of arm 283 at 280. Cylinder 284 may be connected to the source of air which operates air cylinder 157 to tuck in flaps 82 and 83 as shown in FIGURES 14 and 11 and cylinder 284 may thus be operated simultaneously with cylinder 157.

As the case is moved forward by chains 17 the vertical flaps 82 and 83 may then be plowed back by plates 285 and 286 and then held open by edges 299 and 300 of plates 289 and 290 until the case moves to the position where flap 93 is held open by plates 301 and 302. Horizontal flaps 94 and 95 are plowed open by inclined bars 287 and 288 and thus when the case reaches the loading position all four front flaps are open.

Vertical flaps 92 and 93 are held open as the case passes the loading station by edges 299 and 300 of movable plates 289 and 290 which prevent these flaps from returning to their previous position. Plates 289 and 290 are fixedly attached to shafts 293 and 294 which are journaled in brackets not shown and are provided with crank arms 295 and 297. These arms may be acted on by solenoids 291 and 292 through links 296 and 298, each pivotally connected at each end, to rotate shafts 293 and 294. After the case 9 is in position for loading at the loading station and before cans 100 begin to enter the case, the plates 289 and 290 are moved to the position shown by lines 289' and 290' by solenoids 291 and 292 while flaps 93 and 92 are held in open position respectively by plates 301 and 302 and by plates 285 and 286.

In FIGURES 29, 30, 31 and 32 and 33 there is shown means whereby rams 233 may be caused to operate either once or twice while a case is at the loading station to load respectively either one layer of cans or two layers of cans into the case. The mechanism comprises switches 313 and 314; switch 313 is operated by three-lobed cam 315 and switch 314 is operated by six-lobed cam 316. The cams are mounted firmly on cam shaft 317 turned by ratchet wheel 318 which is mounted thereon and driven by pawl 319 which is pivotally attached to lever 320; lever 320 is rotatably mounted to rotate around the axis of shaft 317 and restrained from such rotation by tension spring 323 attached to one end thereof. On one end of lever 320 is a roller 321 operated by a cam 322 mounted on the cam bar 242, which moves with the stroke of the loading rams 233. When the cam 322 is in the position shown in FIGURE 31 (at one extreme of the stroke of bar 242) the spring 323 has turned lever 320 and pawl 319 to a new position. The position of the elements at the other end of the stroke of ram 233 and bar 242 is shown in FIGURE 29 and during the stroke of ram 233 and bar 242, while roller 321 is operated by cam 322 to move lever 321, pawl 319 turns the ratchet wheel and cams 60 degrees, so that at each stroke cam 316 operates switch 314 but switch 313 is operated only every second stroke. Either switch may be placed in circuit with the chain driving means by switches not shown. With switch 314 in circuit the case is moved forward after each ram stroke. With switch 313 in circuit the case is moved forward after every second ram stroke.

The speed of the machine of our invention is accomplished by the action in combination of nearly all of its elements rather than by any essential or critical single element or concept in the machine and the many factors and elements hereinbefore described contribute toward achieving such speed.

These contributions can be divided into two categories, the first category being those elements and inter-relationships which contribute toward accomplishing high speed when nothing is awry, for example, when all of the cases in the magazine meet every specification as to shape and size and have not been battered or otherwise damaged in shipping, when the cams themselves are undamaged and unbattered and do not turn sidewise or otherwise get out of position in the tracks (the tracks being of conventional prior art form) and when every element in the machine does its job just as it is supposed to do, for example, when no vacuum cup misses its grip, when lugs 18 and finger 40 do not fail to separate one and only one carton from the pile, when flaps of the carton are closed in the proper way and at the proper time, when no can turns sidewise as it is loaded into the carton, etc. Thus, speed is accomplished by providing elements which cooperating in combination provide high speed when no such malfunction occurs. Secondly, a high speed is provided when the elements cooperate in combination with an absolute and extreme minimum of malfunction on the part of any one element.

But the second catgory consists of reducing to a minimum the time which may be lost as a result of interruption of the process due to jamming or other malfunction and the damage caused to cans, cases or machine when any such malfunctioning occurs.

It may be seen from the foregoing detailed description that the cooperation of elements 18, 49 and finger 40 and its driving mechanism at the unpiling station uniquely operate to separate one and only one carton from the pile and feed it to the next station in the machine even when the cartons have been damaged badly in shipping, as for example is the case when a stack of cartons are strapped with steel strapping and then dropped heavily so that the strapping bites deeply into the edges, or when a stack of cartons strapped with steel strapping is dropped from the height onto a corner of the stack. These elements of the magazine and feeding station also cooperate to feed a carton from the pile to the next station when only one, two or three cartons remain in the pile and this achievement is especially outstanding when it is ob-

served that this is accomplished even though such one, two or three remaining cartons are badly damaged.

Thus the failure of the unpiling station is reduced to an extreme minimum which may be one in 1000 or one in 5000 or less.

Switch **210**, however, is installed at the set-up station to indicate the presence at the set-up station of a carton and the elements of the set-up station will not function, in fact the entire machine stops, if this switch indicates that a carton is not at the set-up station when it is supposed to be. At the same time an indicator light is lit and an audible signal such as a horn or buzzer may be caused to be sounded. Thus, the operator is immediately informed of the omission and may immediately correct the omission with the result that the loss of time or interruption to the process may be held to as low as ten seconds or no more than thirty seconds.

An additional advantage provided at the unpiling station is that by withdrawing and feeding cartons from the bottom of a pile rather than from the top of a pile it is not necessary to provide a hole in the floor to receive the pile or to alternatively elevate the entire machine as would be the case if cartons were fed from the top of a pile.

In similar fashion, the co-action of the elements at the set-up station provides high reliability and a minimum of failure even though cartons be badly mashed, dented, battered or bent.

Extreme speed is provided at the loading station whereas in most machines heretofore proposed or heretofore used the speed with which cans can be inserted into the carton is a limiting factor on the entire machine.

As previously mentioned, cans are virtually thrown into the carton by loading ram **233** and by reason of the presence of the magnets the bottom layer of cans is drawn into the carton and held in place by the action of the magnets without the loading ram being required to travel into the interior of the carton, thereby saving time in the loading ram cycle. The cans are caused to be introduced into the carton straight and parallel with one another by the action of the funnel flaps. As a result of these cooperating elements acting in combination, cans are introduced into the carton with extreme rapidity and with only the most seldom jamming or turning crosswise of a can.

However, if at any time one or more cans turn crosswise while traveling into the carton, the jamming may be relatively easily and quickly cleared by unlatching the latch **267** and opening side **262**.

Jamming at the loading station is particularly minimized by the inter-action of switches **212** and **230** and **328** with the switch (not shown) which operates cylinder **223** whereby the presence of both a carton and the proper number of cans at the loading station actuates the loading action and whereby the loading operation is not begun unless both the cans and case are present. As a result the loading operation is not delayed as a result of a mechanical initiation of loading action. In other words, the loading operation begins just as soon as cans and case are present rather than undergoing the delay which would have to be provided as a safety factor if the operation were mechanically initiated. At the same time, jamming is avoided if either cans or case fail to arrive by the time such mechanical initiation of the operation would have begun.

Jamming is also minimized or prevented at the loading station by reason of the fact that cylinder **223** is air operated and the air pressure supplied to cylinder **223** is controlled by conventional means, which for simplicity are not shown, so that the operating force acting on rams **233** is limited, and therefore the force applied to the cans being loaded by the rams is limited to a maximum amount insufficient to crush the cans if one or more of the cans jams or turns crosswise during the operation. The force may be adjusted by adjusting the air pressure so that no cans are crushed or so that only a relatively few cans are somewhat dented but most are not dented or crushed. The result is that damage to the cans in the event of a jam is minimized and damage to the case almost entirely avoided.

The most important advantage, however, is that because most of the cans are not crushed, the jamming may be easily cleared by unlatching latch **262**, lowering arms **264**, and removing the case and cans. This can be done easily and quickly, whereas if the force is not thus limited the cans and case may be removed or pushed into surrounding parts of the machine so that relatively great time and effort are required to remove the resulting wreckage from the machine.

An important concept in providing for high speed operation and prevention of jamming is realized by the action of chains **17** and lugs **18**: from the moment the machine takes hold of a carton by virtue of lugs **18** becoming engaged with a carton at the unpiling station, and until the loading operation is completed and the case is delivered out of the loading station, the machine does not let loose of the carton at any time nor transfer the carton from one holding element to another. That is, once a carton is gripped by a pair of lugs **18**, the same pair of lugs grips the same cartons throughout the entire process. As a result, malfunctions which often occur when an object is transferred from one handling unit to another are entirely avoided.

A machine in accordance with this invention may be operated to load cans into cases at the rate of 50 per minute and operate at an effective rate nearly as high over prolonged periods of time. Prevention of jamming may be seen to be of the utmost importance in accomplishing such a high effective rate over a period of time. For example, in two hours 6000 cases are packed if there is no malfunction or jamming of the machine; this is equal to 12,000 cases in four hours or 24,000 cases in an eight hour shift. A malfunctioning or jamming in one-tenth of one percent of the operations conducted at each station, that is, one in 1000 times at each of the stations, which caused a down-time or interruption of one minute for each such jam or malfunction, might be typical of machines heretofore used or proposed and would result in nine minutes down-time per hour or a 15% reduction in the overall rate of efficiency. The total number of cases packed per hour would thereby be reduced from 2550 and in a day from 24,000 to 21,400, the effective rate reduction being from 50 per minute to 42.5 per minute.

With the machine of our invention, any jamming or malfunctioning might take place at each station once in every five-thousand to fifteen-thousand operations. For purposes of an example, we might assume a fairly severe rate of malfunctioning (for the machine of the invention) namely, malfunction and jamming at each station every 6000 cases. Then, with a loss of time or interruption of twenty seconds for each jam or malfunction, the reduction in number of cases packed is 50 every two hours or 25 each hour. For a day the reduction is from 24,000 to 23,800 and the reduction in rate is only from fifty per minute to about 49.6 per minute.

While certain modifications and embodiments of the invention have been described, it is of course to be understood that there are a great number of variations which will suggest themselves to anyone familiar with the subject matter thereof and it is to be distinctly understood that this invention should not be limited except by such limitations as are clearly imposed in the appended claims.

We claim:

1. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps extending therefrom) from a pile, setting them up and filling them with containers, the combination of carrying out sequentially the

steps of: providing such flat cartons in a pile so that the weight of the pile is on the lowermost carton, engaging the lowermost carton with a member and moving said member substantially parallel to the flat surfaces of said carton to slidably remove said carton from under said pile and at the same time restraining the pile from like movement, causing the underside of said lowermost carton to undergo rolling friction rather than sliding friction while slidably removing said lowermost carton from under said pile and, engaging said lowermost carton with at least one additional and separate member at nearly the same time as engaging it with said first member and causing said additional member to move in engaged relation with said carton for a short distance in a direction at least nearly parallel to the direction of travel of said carton to aid in separating said carton from said pile and starting it on its passage through subsequent steps further characterized by extending said first member between said lowermost carton and the next uppermost carton.

2. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps extending therefrom) from a pile, setting them up and filling them with containers, the combination of carrying out sequentially the steps of: providing such flat cartons in a pile so that the weight of the pile is on the lowermost carton, engaging the lowermost carton with a member and moving said member substantially parallel to the flat surfaces of said carton to slidably remove said carton from under said pile and at the same time restraining the pile from like movement, causing the underside of said lowermost carton to undergo rolling friction rather than sliding friction while slidably removing said lowermost carton from under said pile and engaging said lowermost carton with at least one additional and separate member at nearly the same time as engaging it with said first member and causing said additional member to move in engaged relation with said carton for a short distance in a direction at least nearly parallel to the direction of travel of said carton to aid in separating said carton from said pile and starting it on its passage through subsequent steps, further characterized by the step of engaging the side of said pile with a plurality of lifting members and at least partially lifting a portion of the weight of said pile from said lowermost carton while slidably removing said lowermost carton from under said pile, further characterized by extending said first member between said lowermost carton and the next uppermost carton.

3. In a process of removing flat, collapsed cartons from a pile, the combination of carrying out the steps of; providing such flat cartons in a pile so that the weight of the pile is on the lowermost carton, engaging the lowermost carton with a member and moving said member substantially parallel to the flat surfaces of said carton to slidably remove said carton from under said pile and at the same time restraining the pile from like movement, engaging sides of said pile with a plurality of lifting members and at least partially lifting a portion of the weight of said pile from said lowermost carton while slidably removing said lowermost carton from under said pile.

4. The process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps, extending therefrom) from a pile, setting them up and filling them with containers, which includes the steps of providing such flat cartons in a pile, engaging a carton at one end of the pile with a member and moving said member to remove said carton from said pile, then setting up said carton, then moving said set-up carton to a loading station, then loading containers into said carton, the steps of: directly engaging said containers with mechanical thrusting members to thrust them into said carton during only a portion of their travel into said carton and causing said thrusting members to act vigorously to cause at least a portion of the travel of said containers into said container to occur as a result of inertia imparted to them by said thrusting members and magnetically urging said containers toward the bottom of said carton during the final portion of the travel of said containers into said carton and applying a force to said containers to thrust them into said carton limited to a maximum amount insufficient to crush most of the containers entering a carton at one time if a container jams so as to restrain entry of at least some of said containers into the carton.

5. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps extending therefrom) from a pile, setting them up and filling them with containers, the combination of carrying out sequentially the steps of: providing such flat cartons in a pile so that the weight of the pile is on the lowermost carton, engaging the lowermost carton with a member and moving said member substantially parallel to the flat surfaces of said carton to slidably remove said carton from under said pile and at the same time restraining the pile from like movement, moving said carton to a set-up station with said flaps extending laterally to the direction of said movement, then while maintaining engagement of said member with said carton, gripping one side panel of said carton by first vacuum means and preventing longitudinal movement of said side panel and gripping one end panel of said carton by second vacuum means at substantially the same time and then moving the second gripping means backwardly and upwardly through an arc of substantially 90° and at the same time rotating said means substantially 90° to rotate said gripped end panel upwardly and backward with respect to direction of movement of said carton to provide said gripped end panel upstanding at substantially 90° to said gripped side panel to thereby provide said sides and ends in set-up position while holding said side in approximately the original gripped position by said first vacuum means, then slightly opening at least one of the bottom side flaps and while holding said side flap at least partially open closing the bottom end flaps, then moving said engaging member to move said set-up carton to a next station.

6. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps extending therefrom) from a pile, setting them up and filling them with containers, the combination of carrying out sequentially the steps of: providing such flat cartons in a pile so that the weight of the pile is on the lowermost carton, engaging the lowermost carton with a member and moving said member substantially parallel to the flat surfaces of said carton to slidably remove said carton from under said pile and at the same time restraining the pile from like movement, then while maintaining engagement of said member with said carton, gripping one side panel of said carton by first vacuum means and gripping one end panel of said carton by second vacuum means at substantially the same time and then moving the second gripping means through an arc of substantially 90° and at the same time rotating said means substantially 90° to provide said gripped end panel upstanding at substantially 90° to said gripped side panel to thereby provide said sides and ends in set-up position while holding said side in approximately the original gripped position by said first vacuum means, causing the underside of said lowermost carton to undergo rolling friction rather than sliding friction while slidably removing said lowermost carton from under said pile and engaging said lowermost carton with at least one additional and separate member at nearly the same time as engaging it with said first member and causing said additional member to move in engaged relation with said carton for a short distance in a direction at least nearly parallel to the direction of travel of said carton to aid in separating said carton from said pile and starting it on its passage through subsequent steps, further characterized by extending said

first member between said lowermost carton and the next uppermost carton.

7. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps, extending therefrom) from a pile, setting them up and filling them with containers, which includes the steps of providing such flat cartons in a pile, engaging a carton at one end of the pile with a member and moving said member to remove said carton from said pile, then setting up said carton, then moving said set-up carton to a loading station, then loading containers into said carton: the characterizing steps of directly engaging said containers with mechanical thrusting members to thrust them into said carton during only a portion of their travel into said carton and causing said thrusting members to act vigorously to cause at least a portion of the travel of said containers into said container to occur as a result of inertia imparted to them by said thrusting members and applying a force to said containers to thrust them into said carton limited to a maximum amount insufficient to crush containers entering a carton at one time if a container jams so as to restrain entry of at least some of said containers into the carton.

8. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps, extending therefrom) from a pile, setting them up and filling them with containers, which includes the steps of providing such flat cartons in a pile, engaging a carton at one end of the pile with a member and moving said member to remove said carton from said pile, then setting up said carton, then moving said set-up carton to a loading station, then loading containers into said carton: the characterizing steps of applying a force to said containers to thrust them into said carton limited to a maximum amount insufficient to crush most of the containers entering a carton at one time if a container jams so as to restrain entry of at least some of said containers into the carton and magnetically urging said containers toward the bottom of said carton during the final portion of the travel of said containers into said carton.

9. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps, extending therefrom) from a pile, setting them up and filling them with containers, which includes the steps of providing such flat cartons in a pile, engaging a carton at one end of the pile with a member and moving said member to remove said carton from said pile, then setting up said carton, then moving said set-up carton to a loading station, then loading containers into said carton: the characterizing steps of directly engaging said containers with mechanical thrusting members to thrust them into said carton during only a portion of their travel into said carton and causing said thrusting members to act vigorously to cause at least a portion of the travel of said containers into said container to occur as a result of inertia imparted to them by said thrusting members and magnetically urging said containers toward the bottom of said carton during the final portion of the travel of said containers into said carton and applying a force to said containers to thrust them into said carton limited to a maximum amount insufficient to crush most of the containers entering a carton at one time if a container jams so as to restrain entry of at least some of said containers into the carton.

10. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps extending therefrom) from a pile, setting them up and filling them with containers, which includes the steps of providing such flat cartons in a pile, engaging a carton at one end of the pile with a member and moving said member to remove said carton from said pile then setting up said carton, then moving said set-up carton to a loading station, then thrusting containers toward and into said carton in a generally horizontal direction, then moving said engaging member to move said carton away from said loading station; the step of applying a force to said containers to thrust them into said carton limited to a maximum amount insufficient to crush most of the containers entering a carton at one time if a container jams so as to restrain entry of at least some of said containers into the carton.

11. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps, extending therefrom) from a pile, setting them up and filling them with containers, which includes the steps of providing such flat cartons in a pile, engaging a carton at one end of the pile with a member and moving said member to remove said carton from said pile, then setting up said carton, then moving said set-up carton to a loading station, then causing said containers to travel laterally to load said containers into said carton, and magnetically urging said containers toward the bottom of said carton during the final portion of the travel of said containers into said carton.

12. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps extending therefrom) from a pile, setting them up and filling them with containers, which includes the steps of providing such flat cartons in a pile, engaging a carton at one end of the pile with a member and moving said member to remove said carton from said pile then setting up said carton, then moving said set-up carton to a loading station, then thrusting containers toward and into said carton in a generally horizontal direction, then moving said engaging member to move said carton away from said loading station: the step of directly engaging said containers with mechanical thrusting members to thrust them into said carton during only a portion of their travel into said carton and causing said thrusting members to act vigorously to cause at least a portion of the travel of said containers into said container to occur as a result of inertia imparted to them by said thrusting members.

13. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps extending thereform) from a pile, setting them up and filling them wtih containers, which includes the steps of providing such flat cartons in a pile, engaging a carton at one end of the pile with a member and moving said member to remove said carton from said pile then setting up said carton, then moving said set-up carton to a loading station, then thrusting containers toward and into said carton is a generally horizontal direction, then moving said engaging member to move said carton away from said loading station; the step of magnetically urging said containers toward the bottom of said carton during the final portion of the travel of said containers into said carton.

14. The process of claim 13 further characterized by the step of directly engaging said containers with mechanical thrusting members to thrust them into said carton during only a portion of their travel into said carton and causing said thrusting members to get vigorously to cause at least a portion of the travel of said containers into said container to occur as a result of interia imparted to them by said thrusting members.

15. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, and bottom side flaps, extending therefrom) from a pile, setting them up and filling them with containers, which includes the steps of providing such flat cartons in a pile, engaging a carton at one end of the pile with a member and moving said member to remove said carton from said pile, then setting up said carton, to provide laterally extending vertical bottom flaps and laterally extending horizontal bottom flaps,

then moving said set-up carton to a loading station, then loading containers into said carton while maintaining said carton stationary providing a hinging ramp member adjacent each said flap to hingably open toward the inside of said carton to thereby partially open said flap and to then hold partially open said flap from the inside and to provide a guiding ramp adjacent the inner surface of said flap to guide containers into said carton past the edge of the panel at which said flap is attached.

16. In a process of removing flat, collapsed, cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps, extending therefrom) from a pile, setting them up and filling them with containers, the combination of carrying out the steps of: providing such flat cartons in a pile, engaging a carton at one end of the pile with a member and moving said member substantially parallel to the flat surfaces of said carton to remove said carton from said pile and to move it to a set-up station with said flaps extending laterally to the direction of said movement, then while maintaining engagement of said member with said carton gripping a hingedly attached lower side panel with first vacuum gripping means and gripping an adjoining upwardly disposed end panel of said carton by second vacuum gripping means and then opening said carton by both moving and rotating the second vacuum gripping means upwardly and backward (with respect to the direction of movement of said carton to set set-up station) substantially through an arc of 90° while maintaining said lower side panel substantially in its original gripped position with said first vacuum gripping means and moving said member in the same direction to remove said carton from said set-up station.

17. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps, extending therefrom) from a pile, setting them up and filling them with containers, which includes the steps of providing such flat cartons in a pile, engaging a carton at one end of the pile with a member and moving said member to remove said carton from said pile, then setting up said carton to provide laterally extending vertical bottom flaps and laterally extending horizontal bottom flaps, then moving said set-up carton to a loading station, then loading containers into said carton while maintaining said carton stationary: the steps of acting on said carton at said loading station by first slightly opening the vertical bottom flaps and the lowermost horizontal bottom flap, then after initiation of the step of loading containers into said carton, slightly opening the uppermost horizontal bottom flap.

18. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps, extending therefrom) from a pile, setting them up and filling them with containers, which includes the steps of providing such flat cartons in a pile, engaging a carton at one end of the pile with a member and moving said member to remove said carton from said pile, then setting up said carton to provide laterally extending vertical bottom flaps and laterally extending horizontal bottom flaps, then moving said set-up carton to a loading station, then loading containers into said carton while maintaining said carton stationary: the steps of acting on said carton at said loading station by first slightly opening the vertical bottom flaps, then slightly opening the lowermost horizontal bottom flap, then after initiation of the step of loading containers into said carton, slightly opening the uppermost horizontal bottom flap.

19. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps, extending therefrom) from a pile, setting them up and filling them with containers, which includes the steps of providing such flat cartons in a pile engaging a carton at one end of the pile with a member and moving said member to remove said carton from said pile, then setting up said carton to provide laterally extending vertical bottom flaps and laterally extending horizontal bottom flaps, then moving said set-up carton to a loading station, then loading containers into said carton while maintaining said carton stationary: the steps of acting on said carton at said loading station by first slightly opening the lowermost horizontal bottom flap, then slightly opening the vertical bottom flaps, then after initiation of the step of loading containers into said carton, slightly opening the uppermost horizontal bottom flap.

20. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps, extending therefrom) from a pilot, setting them up and filling them with containers, which includes the steps of providing such flat cartons in a pile, engaging a carton at one end of the pile with a member and moving said member to remove said carton from said pile, then setting up said carton, to provide laterally extending vertical bottom flaps and laterally extending horizontal bottom flaps, then moving said set-up carton to a loading station, then loading containers into said carton while maintaining said carton stationary: the steps of acting on said carton at said loading station by first slightly opening the vertical bottom flaps, then slightly opening the lowermost horizontal bottom flap, then after initiation of the step of loading containers into said carton, slightly opening the uppermost horizontal bottom flap by thrusting said containers against and past it.

21. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps, extending therefrom) from a pile, setting them up and filling them with containers, which includes the steps of providing such flat cartons in a pile, engaging a carton at one end of the pile with a member and moving said member to remove said carton from said pile, then setting up said carton, to provide laterally extending vertical bottom flaps and laterally extending horizontal bottom flaps, then moving said set-up carton to a loading station, then loading containers into said carton while maintaining said carton stationary: the steps of acting on said carton at said loading station by first slightly opening the vertical bottom flaps, then after initiation of the step of loading containers into said carton, slightly opening both the horizontal bottom flaps by thrusting said containers against and past them.

22. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps, extending therefrom) from a pile, setting them up and filling them with containers, which includes the steps of providing such flat cartons in a pile, engaging a carton at one end of the pile with a member and moving said member to remove said carton from said pile, then setting up said carton, to provide laterally extending vertical bottom flaps and laterally extending horizontal bottom flaps, then moving said set-up carton to a loading station, then loading containers into said carton while maintaining said carton stationary: the steps of acting on said carton as it moves to said loading station by first plowing open the horizontal bottom flaps, then acting on said carton at said loading station by slightly opening the vertical bottom flaps.

23. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps, extending therefrom) from a pile, setting them up and filling them with containers, which includes the steps of providing such flat cartons in a pile, engaging a carton at one end of the pile with a member and moving said member to remove said carton from said pile, then setting up said carton to provide laterally extending vertical bottom flaps

and laterally extending horizontal bottom flaps, then moving said set-up carton to a loading station, then loading containers into said carton while maintaining said carton stationary: the steps of acting on said carton as it moves to said loading station by first slightly opening the forward vertical bottom flap, then plowing fully open both vertical bottom flaps and both horizontal bottom flaps.

24. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps, extending therefrom) from a pile, setting them up and filling them with containers, which includes the steps of providing such flat cartons in a pile, engaging a carton at one end of the pile with a member and moving said member to remove said carton from said pile, then setting up said carton, to provide laterally extending vertical bottom flaps and laterally extending horizontal bottom flaps, then moving said set-up carton to a loading station, then loading containers into said carton while maintaining said carton stationary: the steps of acting on said carton as it moves to said loading station by first plowing fully open the vertical bottom flaps, then acting on said carton at said loading station by slightly opening the lowermost horizontal bottom flap, then after initiation of the step of loading containers into said carton, slightly opening the upper most horizontal bottom flap.

25. In a process of removing flat, collapsed cartons (each comprising four joined panels with flaps, including bottom end flaps and bottom side flaps, extending therefrom) from a pile, setting them up and filling them with containers, which includes the steps of providing such flat cartons in a pile, engaging a carton at one end of the pile with a member and moving said member to remove said carton from said pile, then setting up said carton, to provide laterally extending vertical bottom flaps and laterally extending horizontal bottom flaps, then moving said set-up carton to a loading station, then loading containers into said carton while maintaining said carton stationary: the steps of acting on said carton as it moves to said loading station by first plowing open the vertical bottom flaps, then acting on said carton at said loading station by slightly opening the horizontal bottom flaps.

26. In the process of filling a set-up carton with containers at a loading station: the characterizing step of magnetically urging said containers toward the bottom of the carton during the final portion of the travel of said containers into said carton.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,063,209 November 13, 1962

James L. Neal et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 8, line 67, for "suported" read -- supported --; column 9, line 39, for "The" read -- the --; line 47, for "82 and 83" read -- 92 and 93 --; column 16, line 47, for "wtih" read -- with --; line 53, for "is" read -- in --; same column 16, line 63, for "get" read -- act --; column 18, line 16, for "pilot" read -- pile --.

Signed and sealed this 7th day of January 1964.

(SEAL)

Attest:

ERNEST W. SWIDER

Attesting Officer

EDWIN L. REYNOLDS

Acting Commissioner of Patents