United States Patent [19]

Klund

[11] **3,911,799**

[45] **Oct. 14, 1975**

[54] **BOX POSITIONING AND TRANSFER MECHANISM**

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[73] Assignee: **Delkor Industries, Inc.**, Minneapolis, Minn.

[22] Filed: **July 12, 1974**

[21] Appl. No.: **488,044**

Related U.S. Application Data

[63] Continuation of Ser. No. 339,729, March 9, 1973, abandoned.

[52] **U.S. Cl.** ..... **93/53 R;** 93/36 R; 93/53 AC; 93/53 SD; 198/167

[51] **Int. Cl.**[2] **B31B 1/76;** B31B 5/02

[58] **Field of Search** ..... 93/53 R, 53 AC, 53 SD, 93/49 R, 52, 36 R; 198/167

[56] **References Cited**

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[57] **ABSTRACT**

This is a box positioning and transfer mechanism incorporating opposed sets of individual rollers each of which may be individually driven for frictionally engaging opposite walls of a set-up box to transfer the box from one location to another and precisely position the same for an operation to be performed thereon.

9 Claims, 5 Drawing Figures

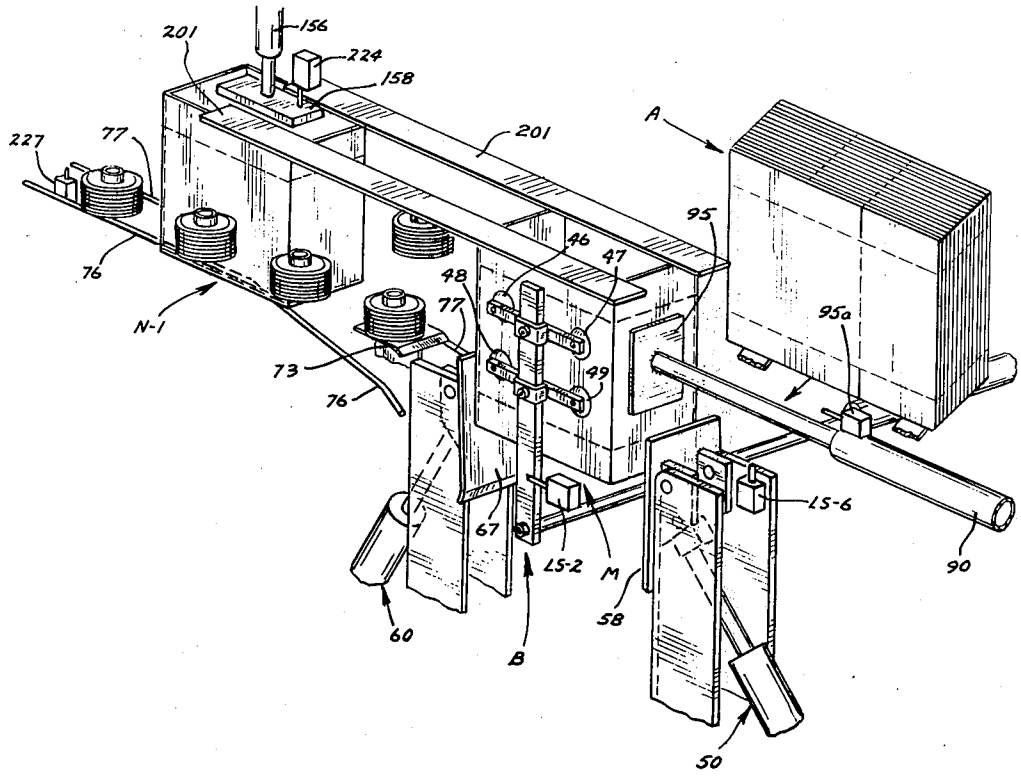


FIG. 2

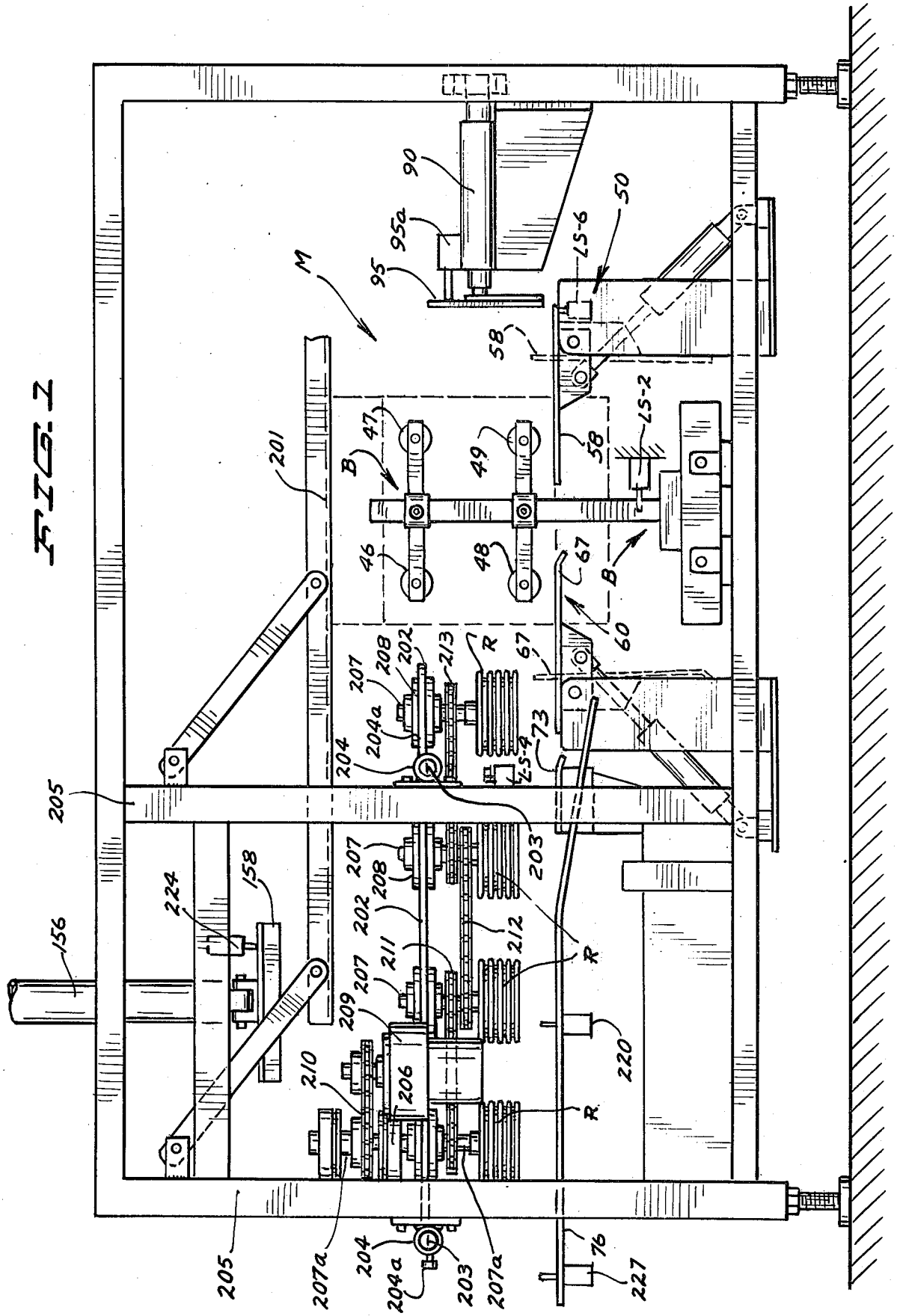

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FIG. 2

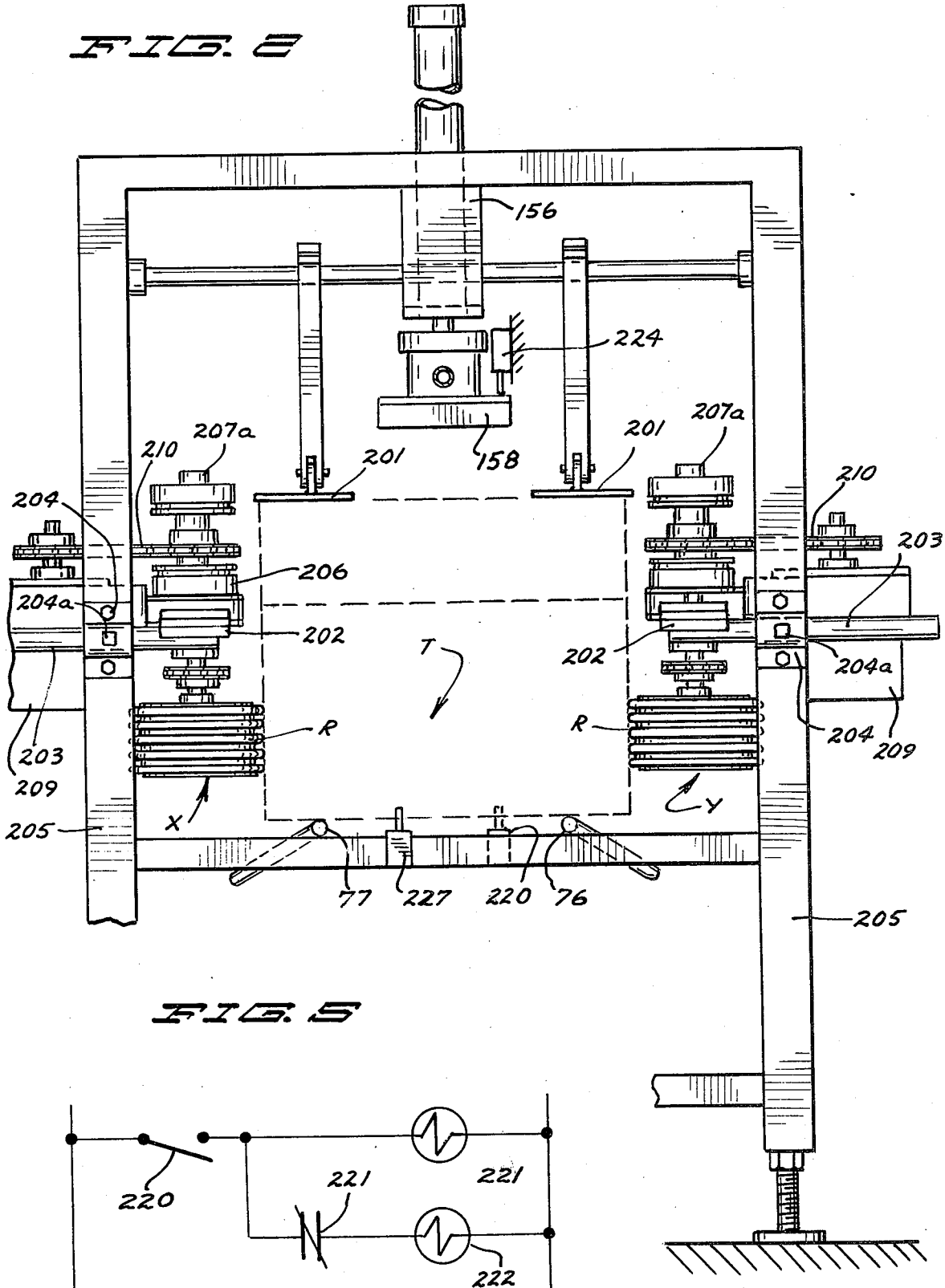

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FIG. 5

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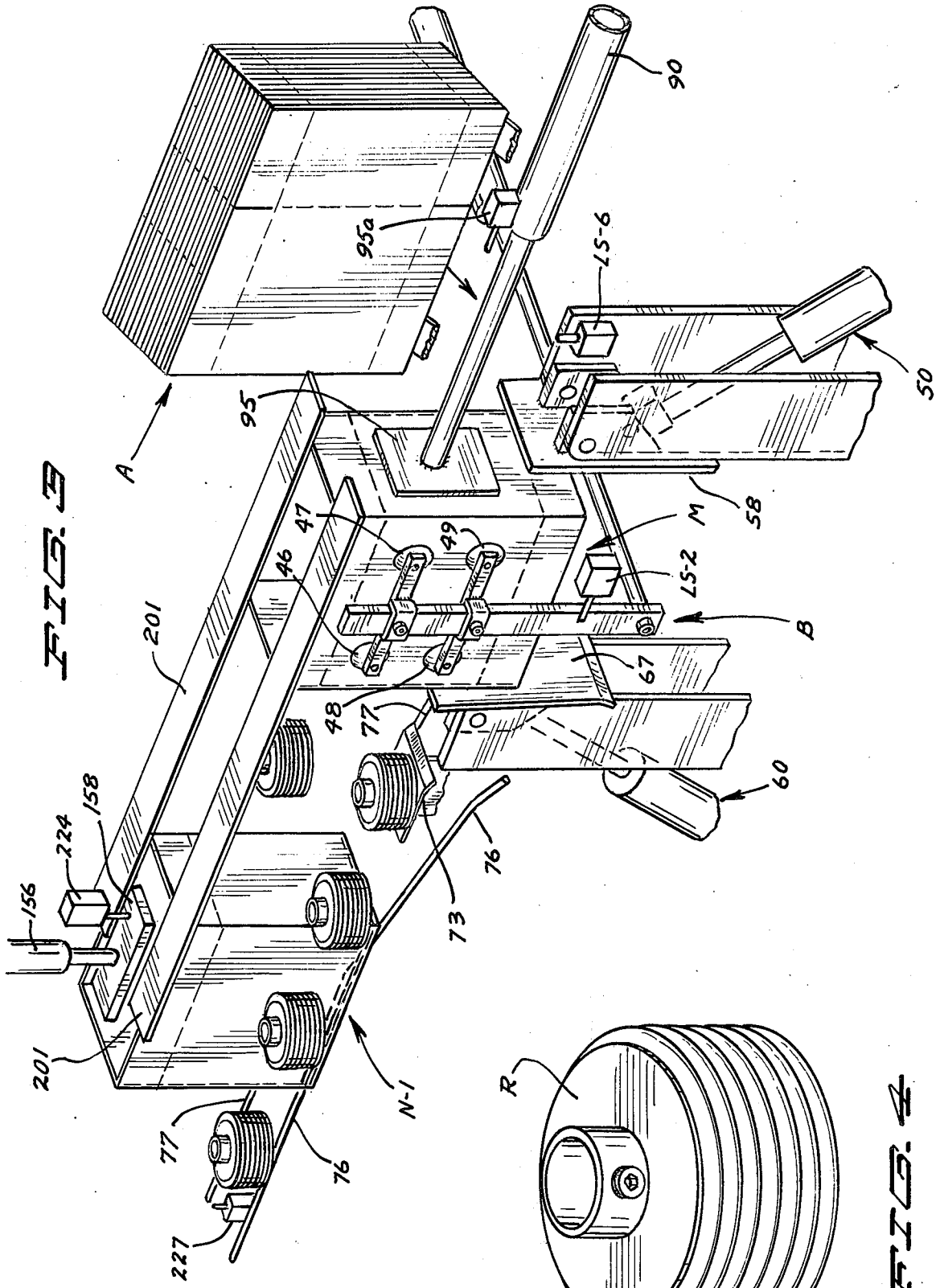

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FIG. 3

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FIG. 4

BOX POSITIONING AND TRANSFER MECHANISM

This is a continuation, of application Ser. No. 339,729, filed Mar. 9, 1973, now abandoned.

In the past many different types of box transfer mechanisms have been used. For example, flight bars mounted on a chain and sprocket driving mechanism are frequently employed for engaging for lower trailing edge of the box to push the same from one location to another. These are cumbersome, expensive and do not produce the precise positioning of the boxes which is frequently required. Another type of transfer mechanism frequently used involves a push plate attached to a plunger rod such as that disclosed in Berney U.S. Pat. No. 3,435,738. Also suction cups have been used to set up and position boxes such as are also disclosed in said Berney Patent. The problems with the prior art box transfer devices have been that the ones which provide precise transfer movement and positioning are relatively expensive and complicated.

It is an object of the present invention to provide a relatively simple and inexpensive positive box positioning and transfer mechanism which will frictionally engage opposed walls of a set-up box and maintain such engagement throughout a precisely predetermined transfer and positioning path.

It is another object to provide such a box transfer and positioning mechanism incorporationg a pair of opposed sets of spaced apart rollers for frictionally engaging opposite walls of a set-up box to move the same from one location to another while maintaining constant and precise positioning control thereof.

These and other objects and advantages of this invention will be apparent from the following description made in connection with the accompanying drawing wherein like reference characters refer to similar parts throughout the several views, and in which:

FIG. **1** is a top plan view of a box set-up machine incorporating my roller transfer mechanism;

FIG. **2** is a side elevation thereof;

FIG. **3** is a diagrammatic perspective view thereof;

FIG. **4** is a perspective view of a transfer roller, per se; and

FIG. **5** is a wiring diagram of the roller transfer drive control system.

For purposes of illustration the roller transfer device embodying this invention is shown in conjunction with the box set-up machine which is disclosed and claimed in Berney U.S. Pat. No. 3,435,738. Portions of the Berney apparatus which are pertinent to this disclosure have been illustrated herein. Other portions have been omitted. For convenience the reference characters used in Berney will be used in this disclosure to identify similar parts shown or referred to herein.

The Berney apparatus removes a collasped folding carton from a magazine or Feeder Mechanism A and opens the same into set-up position. The suction cups **46–48** of the opening mechanism B of Berney open the collasped box and positions the same at the station M.

The flap closers **50** and **60** are shown in flap closing position in FIG. **1** and in this position the bottom end flaps are pushed up into closed position and the side major flaps are still down in open position awaiting transfer to the next station (position N-1). Both sets of upper flaps remain open until after the case has been packed.

After the ends flaps have been closed the box is ready to be moved into the main flap closing position. With my improved transfer mechanism a short stroke air cylinder **90** operates an upstanding pusher plate **95.** A pair of upper hold down rails **201** engage the upper edges of the open top flaps and hold the box down at stations M and N-1 and extends between said stations. The pusher plate **95** is moved by actuation of the air cylinder **90** into engagement with the trailing end panel of the box to move the box into the transfer path defined by the roller transfer and positioning mechanism.

ROLLER TRANSFER MECHANISM

Two sets X and Y of transfer rollers are respectively mounted on suitable supporting frame structures **202,** each of which is carried by a pair of laterally extending support rods **203.** The individual rollers are designated by the letter R. The support rods **203** are respectively mounted in supporting sleeves or slide bearings **204** which are rigidly connected to upstanding frame members **205.**

The mounting of the support rods **203** in the bearings **204** permits the lateral position of the supporting frames **202** to be varied to adjust the spacing between the two sets X and Y of the transfer rollers. Suitable means for locking the same in the desired adjusted spaced relation are provided such as the set screws **204***a*. The rollers R are mounted on upstanding shaft members **207** which are journaled in bearings **208** mounted on support frame member **202.** A suitable drive motor **209** is provided for each set of rollers X and Y and has a positive driving connection (through a magnetic clutch and brake control **206**) with one of the roller shafts **207***a* as by a chain and sprocket drive **210.** The shaft **207***a* has a driving connection with the next adjacent roller shaft **207** as by the chain and sprocket driving coupling **211** and chain and sprocket drives **212** and **213** respectively connect the next adjacent roller shafts **207** to produce a positive drive train from the power source **209.** The two sets of rollers are mounted in opposed relation to each other as best shown in FIGS. **1** and **3** and define a transfer path T therebetween. The spacing therebetween can be adjusted as described above to accommodate different size boxes therebetween and produce the desired frictional engagement between the respective roller surfaces and the sides of the box.

In the form shown the rollers R are of a ribbed or finned design and have a durometer hardness of between **25** and **50** in order to prevent damage to the side wall of the box.

OPERATING CYCLE

As previously stated the feeder and set-up mechanism is similar to the Berney feeder and set-up mechanism A and the operating cycle of this mechanism and control thereof is similar to Berney. When the set-up box reaches the first flap closing station M the limit switch LS-2 is actuated which energizes an air solenoid (not shown) which actuates the flap closers **50** and **60** in the same manner as disclosed in Berney. When the closer plates **58** and **67** are swung up into horizontal case supporting position the limit switch LS-6 is actuated. In the embodiment disclosed herein position M constitutes the "rest position" wherein a set-up box is supported on plates **58** and **67** and the box will not be moved out of this position until a demand limit switch **227** (in series with LS-6) is actuated after completion

of the gluing operation of the leading box. This operation will now be described.

When the demand limit switch **227** has been actuated and the limit switch LS-**6** is closed the vacuum to suction cups **46** to **49** is interrupted and the solenoid valve (not shown) is actuated which introduces pressurized air into the end of air cylinder **90** which moves the plate **95** into pushing engagement with the box on the plates **58** and **67.**

The box is transferred by pusher plate **95** into the roller transfer path T between the first opposed pair of rollers R. The rollers which are running pick up the box and transfer it to position N-**1.** During this transfer movement the plow and support bars **76** and **77** close the bottom main flaps and also a glue applicator (not shown) similar to that disclosed in Berney applies glue thereto.

As soon as the leading edge of the box reaches the roller pick-up location a limit switch LS-**4** actuates air control solenoid valves (not shown) to return all of the following air cylinders back into retracted position.

1. Air cylinder for the case opening mechanism B.
2. The air cylinders for the first flap closers **50** and **60,** and
3. The air cylinder **90** for the pusher plate **95.** The return of pusher plate **95** closes limit switch **95***a*.

The box is carried by the opposed sets or rows of rollers X and Y into glue setting position N-**1.** A limit switch **220** mounted on the supporting and plow rods **76** and **77** is actuated by contact with the leading edge of the box and energizes adjustable time delay relays **221** and **222** which are of conventional design available on the market such as those manufactured by Warner Electric Brake and Clutch Co. of Beloit, Wisconsin. Relay **222** "times out" first and when this happens the brake and clutch mechanism **106** is actuated to release the clutch and apply the brake. This stops the rollers with the box positioned at station N-**1** below the pressuring applying plate **158.**

Time delay relay **222** also actuates the ram **156** through an air solenoid valve (not shown) and sends the pressure plate **158** down into the box and into pressure applying position against the bottom flaps of the box. Time delay relay **221** controls the time of energization of the coil of relay **222** and when **221** times out to open its contacts, the coil of relay **222** is deenergized and the contacts of **222** are opened. This releases the brakes of mechanism **106** and deenergizes the ram solenoid valve (not shown) for ram **156** and returns the ram back into raised position where it actuates limit switch **224.** This engages the clutches of mechanism **106** and starts the rollers R which discharge the box to the next station (not shown). The rollers remain running until stopped by engagement of the next box with limit switch **220.** When the box is discharged from glue setting position N-**1** demand limit switch **227** is actuated to close the circuit to the solenoid valve (not shown) which supplies air to ram **90** of pusher plate **95** which then moves the box into the transfer path T in the manner previously described. Limit switch **95***a* is a safety switch which must be closed before the set-up mechanism B can be actuated. The circuitry for the control and actuation of the pusher plate **95,** the flap folders **50** and **60** and the box set-up mechanism B is similar to that disclosed in Berney.

It will be apparent that the speed of operation of the roller transfer mechanism is considerably faster than the operation of the Berney apparatus since the short stroke of the pusher plate **95** requires considerably less time than the long stroke of the Berney transfer system. It is, of course, apparent that the next box cannot be set-up by the vacuum cup set-up mechanism B until the return stroke of the piston **90** has moved the pusher plate **95** back into retracted position. Therefore with the short stroke piston in combination with the roller transfer mechanism disclosed herein, the speed capability of the Berney apparatus is greatly increased. After the bottom side flaps have been plowed into closed position by the bars **76** and **77** the box is ready for the bottom gluing operation wich is accomplished at position N-**1** by means of a gluing apparatus such as disclosed in Berney. The adjustment of time delay relays **221** and **222** permits adjustment of the dwell time of the pressure applying plate **158** against the flaps and also permits the box to be centered under the plate **158.**

It will be seen that I have provided a highly efficient transfer mechanism which frictionally engages the opposite walls of a set-up box to transfer the same from one position to another and maintain full positioning control of the box during the transfer movement. The transfer mechanism has been disclosed in conjunction with the Berney set-up and gluing apparatus disclosed in U.S. Pat. No. 3,435,738 as previously indicated herein; however, it will be apparent that the opposed sets of driven transfer rollers can be used with many other operations involving transfer and positioning control of set-up boxes.

It will of course be understood that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of this invention which is defined by the appended claims.

What is claimed is:

1. A carton erecting mechanism comprising:

a magazine for storing a plurality of collapsed folding cartons;

suction cup means for removing one of said collapsed folding cartons from said magazine and opening said collapsed folding carton at a first work station;

first piston and cylinder means with the piston movable along an axis having a vertical component for pushing the minor flaps of said carton into a closed position while the carton is located at said first work station;

second piston and cylinder means for pushing the carton from said first work station;

carton transfer means comprising a plurality of pairs of rollers arranged, when driven, to transport a box inserted at one end along a transfer path, one end of said box transfer means being arranged adjacent to said first work station to receive said carton from said second piston and cylinder means;

means constructed and arranged to control said second piston and cylinder means to push the box from said first work station to insert it into one end of said carton transfer means after said first piston and cylinder means has closed the minor flaps of said carton;

means for driving said pairs of rollers of said carton transfer means when the carton is inserted at one end of the transfer path to propel the carton until it reaches a second work station, said pairs of rol-

lers supporting said carton at said second work station;

means for performing carton assembly operations at said second work station; and

means for driving said pairs of rollers of said carton transfer means after completion of carton assembly operations at said second work station to remove the carton from said second work station.

2. Apparatus of the class described in claim **1** wherein additional control means are provided for delaying the driving of the pairs of rollers after insertion of the carton into one end of said carton transfer means until any box remaining at said second work station has been removed from said second work station.

3. A carton erecting mechanism comprising:

a magazine for storing a plurality of collapsed folding cartons;

suction cup means for removing one of said collapsed folding cartons from said magazine and opening said collapsed folding carton at a first work station;

first piston and cylinder means with the piston movable along an axis having a vertical component for pushing the minor flaps of said carton into a closed position while the carton is located at said first work station;

second piston and cylinder means for pushing the carton from said first work station;

carton transfer means comprising a plurality of pairs of rollers arranged, when driven, to transport a box inserted at one end along a transfer path, one end of said box transfer means being arranged adjacent to said first work station to receive said carton from said second piston and cylinder means after the piston has been extended by less than one-half of the length of the carton along the axis defined by the transfer path;

means constructed and arranged to control said second piston and cylinder means to push the box from said first work station to insert it into one end of said carton transfer means after said first piston and cylinder means has closed the minor flaps of said carton;

means for driving said pairs of rollers of said carton transfer means when the carton is inserted at one end of the transfer path to propel the carton until it reaches a second work station;

means for performing carton assembly operations at said second work station; and

means for driving said pairs of rollers of said carton transfer means after completion of carton assembly operations at said second work station to remove the carton from said second work station.

4. A box transfer mechanism for receiving a partially made-up box at a first work station for performance of one or more box assembly operations, for transferring the box to a second work station for one or more additional operations and for removing the box from the second work station, comprising:

box delivery means for delivery a partially made-up box to the first work station for the performance of at least one box assembly operation;

means for performing at least one box assembly operation on the box at said first work station;

a plurality of pairs of rollers mounted for rotation about parallel vertical axes and arranged to form a box transfer path having a path width related to the width of the box after completion of the box assembly operations at said first work station such that each of the pairs of said plurality of pairs of rollers is constructed and arranged to frictionally engage the sides of the box without slippage;

push means for urging the box from said first work station into frictional engagement with a pair of said plurality of pairs of rollers;

controlled drive means for driving said plurality of pairs of rollers to propel the box along the transfer path defined by said plurality of pairs of rollers;

first control means for activating said controlled drive means after completion of the box assembly operations at the first work station;

second control means for deactivating said controlled drive means after the box arrives at the second work station;

means for performing at least one additional box assembly operation on said box at the second work station; and

third control means for activating said controlled drive means to propel the box along the box transfer path and away from the second work station after said additional box assembly operation has been performed.

5. Apparatus of the class described in claim **4** wherein said first control means delays actuation of said controlled drive means subsequent to completion of box assembly operations at said first work station until any box remaining at said second work station has been removed from said second work station.

6. Apparatus of the class described in claim **4** wherein said push means is a pneumatic piston and cylinder arrangement arranged to exert a force on said box in a direction along the box transfer path.

7. Apparatus of the class described in claim **5** where the movement of the box, due to the action of the pneumatic piston and cylinder arrangement prior to engagement with said plurality of pairs of rollers, is less than one-half of the length of the box.

8. Apparatus of the class described in claim **4** wherein the plurality of pairs of rollers is constructed with adjustable path width to accommodate boxes of varying dimensions.

9. Apparatus of the class described in claim **8** wherein the initial position of the push means is adjustable to accommodate boxes of varying dimensions.

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