United States Patent [19]

Pluntz

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[54] **BOX INVERTING APPARATUS**

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[52] **U.S. Cl.** ..... **214/1 Q;** 198/243

[51] **Int. Cl.** **B65g 7/00**

[58] **Field of Search** ..... 214/1 Q, 1 QA, 130 R; 198/237, 239, 243

[56] **References Cited**

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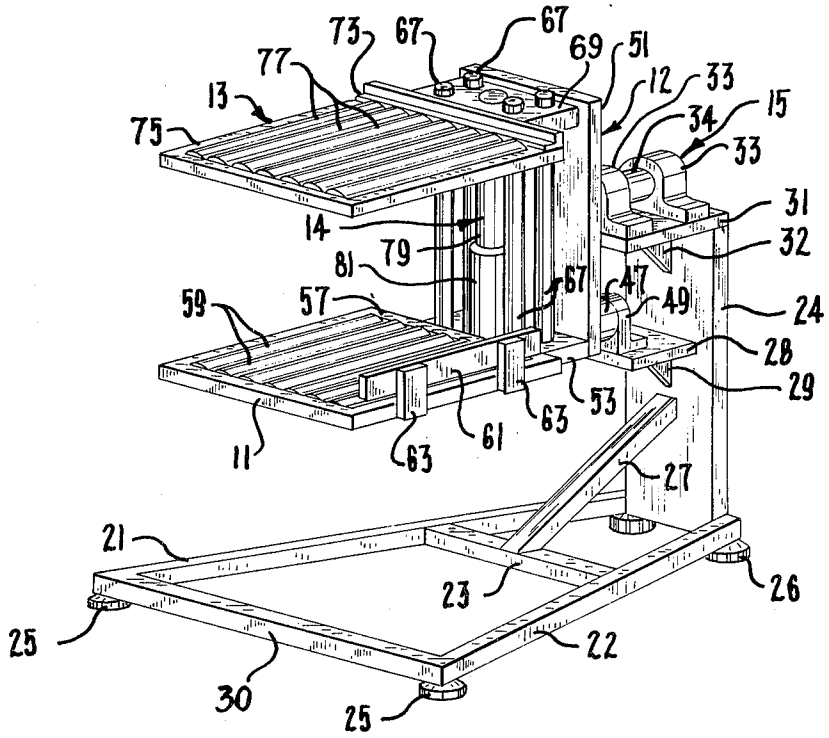
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Attorney, Agent, or Firm—Fitch, Even, Tabin & Luedeka

[57] **ABSTRACT**

Apparatus is described for inverting boxes of different heights in conjunction with an in-feed conveyor and an out-feed conveyor. The relative position of two conveyor segments is changed to clamp a box therebetween. The conveyor segments are then inverted and the box released to continue on the out-feed conveyor in the inverted position.

1 Claim, 2 Drawing Figures



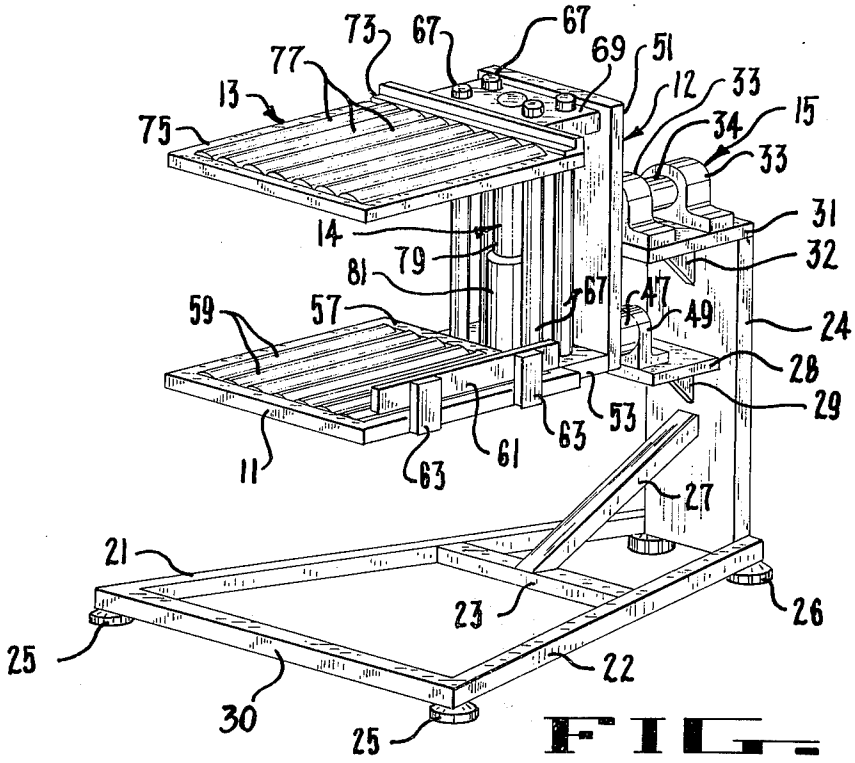

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FIG. 1

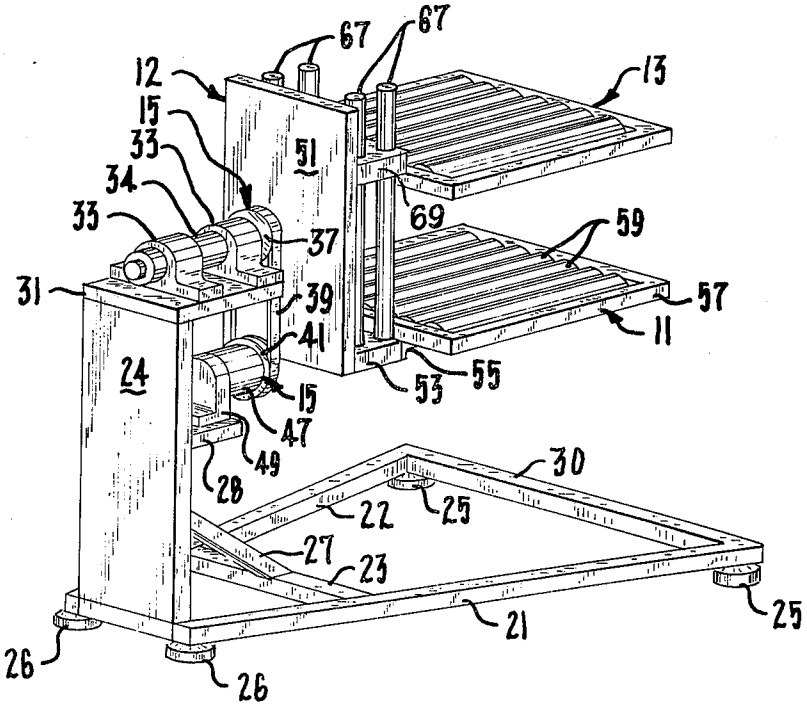

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FIG. 2

BOX INVERTING APPARATUS

This invention relates generally to materials handling equipment and, more particularly, to apparatus for inverting boxes of different heights on a conveyor.

In the packaging of various kinds of objects in boxes, particularly boxes having top and bottom flaps, such as RSC boxes, it is frequently desirable that the boxes be glued by automated equipment. Typically, such equipment automatically applies the glue, closes the flaps of the box, and may provide suitable pressure to ensure good adhesion. Good flap adhesion on a box is necessary for the package to conform to the uniform freight classification rules and the national motor freight classification rules.

Automatic gluing of the bottom flaps of a box may sometimes be accomplished using special machinery that squares the box, applies adhesive and closes the flaps and then inserts a plunger through the open end to apply pressure while adhesive sets. More often, the bottom flaps will be closed but not sealed, and the box then filled with the contents. Subsequently, adhesive is simultaneously applied to the top and bottom flaps. The weight of the contents maintains the necessary pressure on the bottom flaps while the adhesive sets, and pressure for sealing the top flaps of the filled box may be applied by a suitable top flap hold down blanket conveyor, as is known in the art.

Where the boxes are not completely filled by the product however, top flap sealing becomes more complicated. It is possible to provide a filler in each box to provide a back-up for the top flaps so that compression on the glued flaps can be adhieved. Due to the nature of certain products however, the product may not stack the same within each box, thus requiring variations in the thickness of the fillers.

An alternative technique designed to obviate the need for fillers is to invert the boxes after applying the glue and closing the flaps. If both the top and bottom flaps are to be sealed, either hot melt adhesive alone or in combination with a cold-setting adhesive is applied to the bottom flaps to obtain a quick bond before inversion. After inversion the contents of the inverted box provide the needed compression on what were previously the top flaps while a cold setting adhesive establishes the bond.

Where the boxes are of different heights, that is, where boxes of various heights are coming down a common conveyor line, it has heretofore been necessary to utilize several diverter lines to separate the boxes by height. Each diverter line then goes into a separate sealing apparatus which first applies glue, closes the flaps, and then transfers the box into a slide chute within the machine. In the slide chute, the box is gradually turned over as it progresses around the slide and is brought back toward the infeed end of the sealer at a different level than that which it entered, usually above or below the normal height that the box entered. The box then exits the machine and moves on for pallet loading or warehousing. Diverter lines and separate sealers for each box height add considerably to the cost of the materials handling equipment.

It is an object of the present invention to provide improved apparatus for inverting boxes of different heights on a conveyor, thereby allowing the boxes to be handled in the same manner whether they are completely filled or only partially filled.

Another object of the invention is to provide apparatus for inverting boxes on a conveyor which is capable of handling different heights of boxes.

Another object of the invention is to provide apparatus for inverting boxes for different heights on a conveyor which is relatively simple and low in cost.

Various other objects of the invention will become apparent to those skilled in the art from the following description, taken in connection with the accompanying drawings wherein:

FIG. 1 is a perspective view of apparatus constructed in accordance with the invention; and

FIG. 2 is a view of the apparatus of FIG. 1 from another perspective.

Very generally, the apparatus of the invention comprises a lower conveyor segment **11** supported on a frame **12** in alignment with the upstream portion, not shown, of an in-feed conveyor. An upper conveyor segment **13** is also supported on the frame. Control means **14** are provided for changing the relative position of the upper and lower conveyor segments to clamp box, not shown, therebetween. Means **15** are provided for inverting the frame such that the upper and lower conveyor segments are inverted. The control means are operable to change the relative position of the upper and lower conveyor segments to release the box with the lower conveyor segment in alignment with the downstream portion of an out-feed conveyor.

Referring now more particularly to the drawings, the apparatus of the invention is supported on a base comprising a pair of convergent beams **21** and **22** having a crossbeam **23** extending therebetween slightly towards the closer ends from the midpoint. A channel plate **24** is welded in an upright position to the closer ends of the beams **21** and **22**. The spread ends of the beams **21** and **22** are supported on adjustable pads **25**. A pair of adjustable pads **26** are provided at the lower end of the channel plate **24**. A beam strut **27** extends from the crossbeam **23** to the center of the channel plate **24** for rigidity. A crossbeam **30** joins the wide ends of the beams **21** and **22**.

A horizontal support bracket **28** is attached to the channel plate **24** about half-way up. The support bracket **28** includes a stiffening rib **29**. A similar support bracket **31** having a stiffening rib **32** is secured to the channel plate **24** at its upper end. The two brackets **28** and **31** thus provide horizontal shelves for supporting further components, described below.

The upper bracket or shelf **31** supports a pair of bearing housings **33** through which a rotary support shaft **34** extends. The frame **12**, which is, in the illustrated form of the invention, a carrier plate, is supported on the end of the shaft **34**. The inverting means **15** include a sprocket **37** mounted on the shaft **34** which is driven by a drive chain **39** from a sprocket **41**. The sprocket **41** is driven by a driving means or motor **47**. The driving means **47** is mounted to the bracket **28** by means of a mounting plate **49**.

The frame **12** comprises an upright carrier plate **51** from which a horizontal bottom plate **53** extends. A generally L-shaped bracket **55** is mounted to the bottom plate **53**, and the lower conveyor segment is supported therefrom. The lower conveyor segment includes a conveyor segment frame **57** which is mounted in cantilever fashion from the bracket **55**. A plurality of rollers **59** extend across the frame **57** and are rotatably supported therein. At one end of the frame **57**, a

stop plate **61** is mounted on a pair of mounting brackets **63.**

Four upright guide rods **67** are mounted to the bottom plate **53** on the carrier plate **12.** The rods **67** extend parallel with each other, and slidably support a plate **69** by means of a plurality of bushings, not shown.

A mounting bracket **73** is affixed to the plate **69** and supports a frame **75** of the upper conveyor segment **13.** The frame **75** supports a plurality of conveyor rollers **77** which extend across the frame and are rotatable therein.

For the purpose of supporting and slidably moving the plate **69** and hence the frame **75** on the rods **67,** a pneumatic cylinder **14** is provided. The cylinder **14** is secured to the lower plate **53** and includes a main portion **81** and a movable upper portion **79** which is attached to the plate **69.** The portion **79** is moved within the main portion **81** by suitable pneumatic controls, not shown, to move the plate **69** and hence the upper conveyor portion **13** with respect to the frame **12.**

In using the apparatus of the invention in conjunction with a standard manufactured random case sealer, not shown, the boxes are run through the random size case sealer in the standard manner and a hot melt quick setting adhesive is applied to the bottom flaps. At the same time, a cold flow slow setting adhesive is applied to the top flaps. The standard top and bottom flap closure is made as the box progresses through the random case sealer. The normal compression action sets the bottom flaps on which the hot melt quick setting adhesive has been applied, thus securing the bottom closure with the weight of the contents of the box providing the desired compression.

The boxes then move into the apparatus of the invention. To ensure that the top flaps are held closed down, a suitable top flap blanket hold down conveyor, not shown, may be used.

The box enters the apparatus of the invention from the powered upstream side of the conveyor by moving in to the conveyor segment **11** (from the left in FIG. **1**) and coming up against the stop plate **61.** A suitable detector switch, not shown, senses the box presence, signalling the cylinder **14** to retract. At the same time, a suitable safety gate, not shown, located on the incoming conveyor, operates to prevent any additional boxes from moving onto the lower conveyor segment **11.**

Upon actuation of the cylinder **14,** the plate **69** slides downwardly on the rods **67** to bring the upper conveyor segment into engagement with the box, the variation in box height falling within the range of movement of the upper conveyor segment. As soon as the upper conveyor segment **13** contacts the box, a suitable switch, not shown, provides a signal to the driving means **47.** The driving means **47** drives the shaft **34** through the chain **39** to rotate the carrier plate **12** through 180°. The axis of this rotation is substantially parallel with the axes of rotation of the conveyor segment rollers **59** and **77** and is therefore perpendicular to the general direction in which the boxes travel on the conveyor. When complete rotation is made, a further suitable switch (not shown) signals the cylinder **14** to return the upper conveyor segment **13** to the fully extended position. This lowers the inverted box to a fixed exit conveyor level and the box exits from the apparatus onto the downstream portion of the conveyor, not shown (to the right of FIG. **1**). For this purpose of effecting exit, the conveyor segment **13** includes intermittent power means (not shown) connected to part of all of the rollers.

A further sensor switch (not shown), located on the exit conveyor (not shown) and remote from the box inverter, provides an indication that the box has cleared the box-inverter. At this point, the drive means **47** reverses rotation, reinverting the carrier plate **12** and returning the upper conveyor segment **13** back to its original open position indicated in FIG. **1.** The unillustrated safety gate on the upstream side of the conveyor may then retract and allow a further box to enter the apparatus,

It may therefore be seen that the invention provides improved apparatus for inverting boxes of different heights on a conveyor. The apparatus, when used in connection with a standard random case sealing equipment, alleviates the problem of void spaces in boxes being sealed. Only a single conveyor line is required with the apparatus of the invention, and the boxes are inverted to continue at the same conveyor level at which they enter.

Although the invention is described herein such that rotation of the frame occurs on an axis which is perpendicular to the conveyor direction, it is within the purview of the invention to utilize other axis orientations. In such cases, it may be necessary to supply power to the upper conveyor segment **13** in order to move the box onto the out-feed conveyor.

Various modifications of the invention in addition to those shown and described herein will become apparent to those skilled in the art from the foregoing description and accompanying drawings. Such modifications are intended to fall within the scope of the appended claims.

What is claimed is:

1. Apparatus for inverting boxes of different heights on a conveyor, comprising, a lower conveyor segment, a stop plate on the downstream end of said lower conveyor segment for stopping a box thereon, a rotary carrier plate for supporting said lower conveyor segment aligned with the upstream portion of a conveyor, an upper conveyor segment moveably supported on said carrier plate, said upper and lower conveyor segments each including a plurality of parallel rollers for supporting the boxes, a pneumatic cylinder coupled to said upper conveyor segment for moving same toward and away from said lower conveyor segment to clamp and release, respectively, a box therebetween and provide full support of its top and bottom flaps, and a rotary mechanism for rotating said carrier plate about 180° such that said upper and lower conveyor segments are inverted, said pneumatic cylinder being operated after the inversion of said segments to release the box with the then lower conveyor segment in alignment with the downstream portion of the conveyor, said rotary mechanism being operable to reverse rotate said carrier plate about 180° after release of the box to restore said upper and lower conveyor segments to their initial positions.

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,895,722

DATED : July 22, 1975

INVENTOR(S) : Darrell Edwin Pluntz

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 5, change "for" (second occurrence) to --of--.

Column 2, line 21, after "clamp" insert --a--.

Column 4, line 2, change "this" to --the--.

Column 4, line 4, change "of" (first occurrence) to --or--.

Column 4, line 9, change "drive" to --driving--.

Claim 1, line 56, change "operated" to --operable--.

Signed and Sealed this

ninth Day of *December 1975*

[SEAL]

Attest:

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Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks