Dec. 27, 1960 H. E. ENGLESON ET AL 2,966,100

CARTON ERECTING AND EXPANDING MECHANISM

Filed Nov. 8, 1957 2 Sheets-Sheet 1

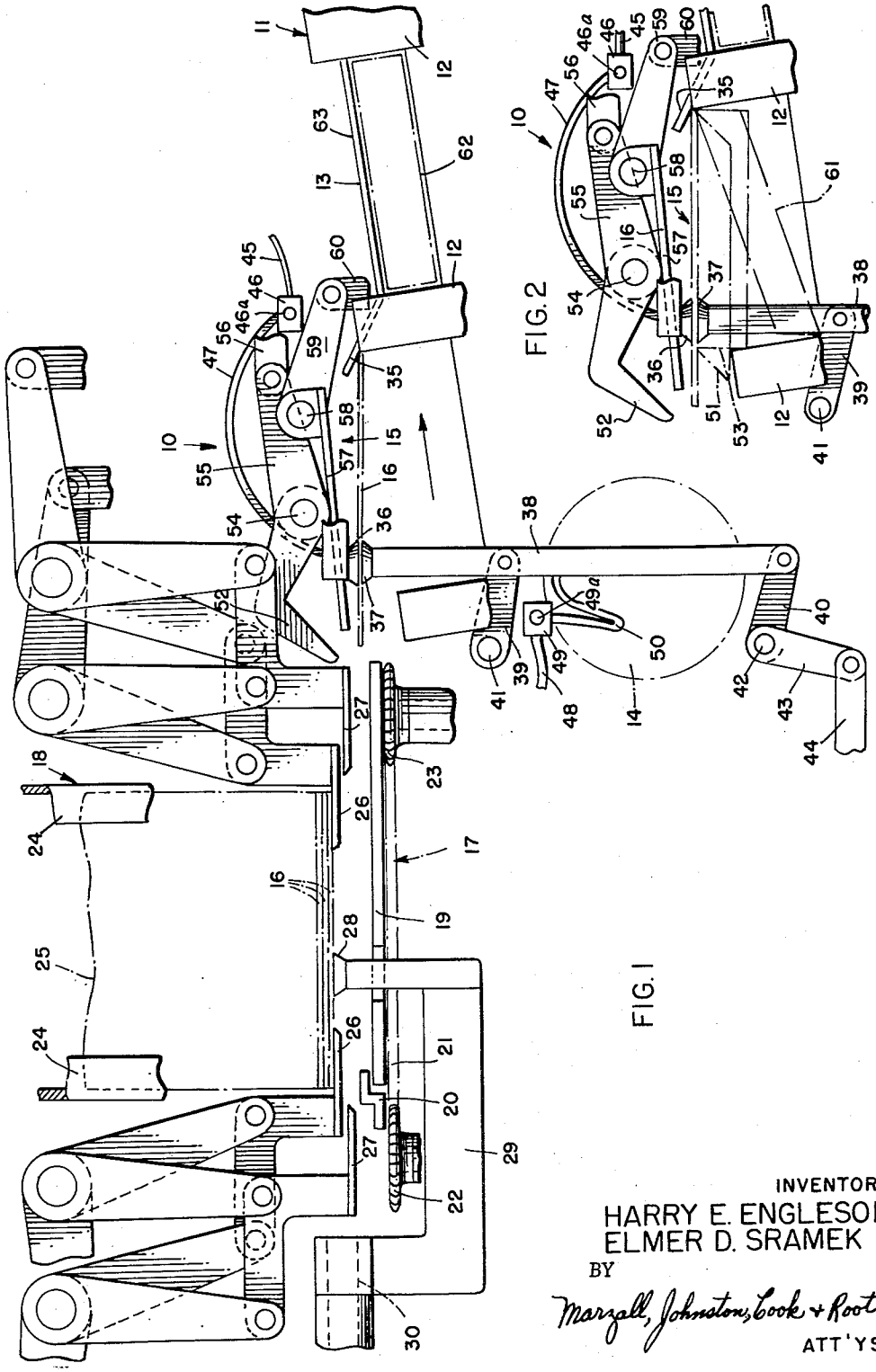


FIG. 1

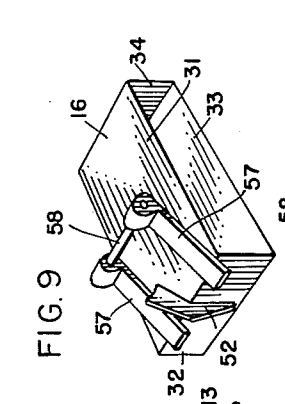
FIG. 2

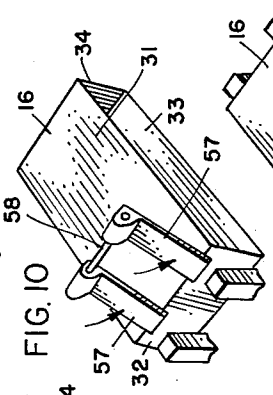
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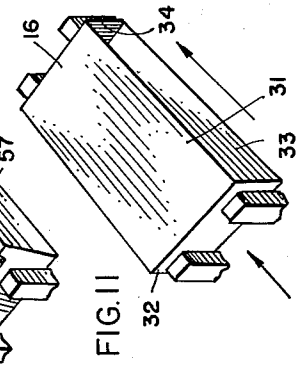
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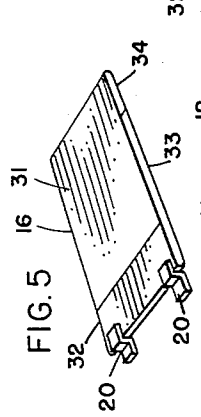
CARTON ERECTING AND EXPANDING MECHANISM

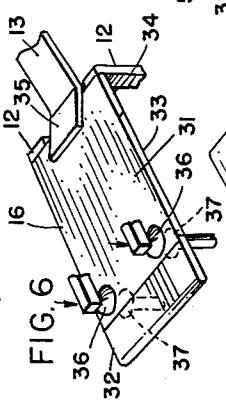
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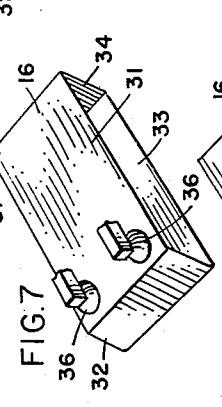


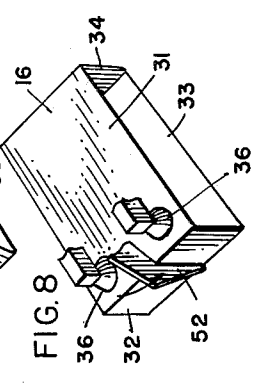


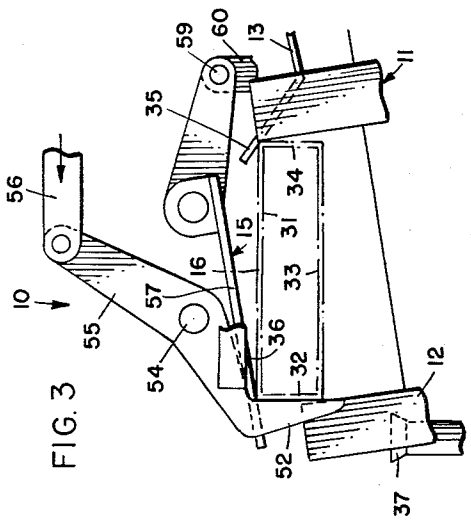


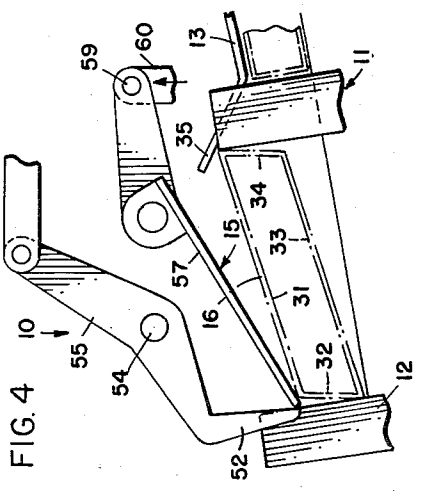












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CARTON ERECTING AND EXPANDING MECHANISM

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7 Claims. (Cl. 93—53)

This invention relates in general to packaging machines, and more particularly to an apparatus for opening or erecting cartons from the flat and inserting the cartons into buckets on an endless conveyer.

The present invention is adapted to be used in association with a packaging machine and deals with a device which opens or erects collapsible cartons in the flat and inserts the cartons into buckets of an endless conveyer. The collapsed cartons are initially removed one at a time from a magazine and delivered to an opening or erecting station wherein the device of the present invention effects certain operations on the collapsed carton. At the opening or erecting station, the erecting device includes an upper stationary vacuum cup adapted to grip and hold the top side panel of the carton at the erecting station, a lower vacuum cup adapted to engage the lower side panel of the carton and movable to substantially erect the carton, a stop against which the leading edge of the carton engages at the erecting station, and a finger pivotally mounted above the opening station for completing the opening and squaring up of the carton after it has been initially substantially opened by the movement of the lower vacuum cup. The vacuum is released in the lower vacuum cup after the carton has been substantially opened, and the lower vacuum cup continues to move out of the path of the carton which is to be then inserted into an aligned bucket of the conveyer. An inserting or transfer member is operated after the carton has been squared up to insert the trailing end of the carton into the aligned bucket. Response to the transfer member reaching a predetermined position, the vacuum in the upper vacuum cup is released. The forward or leading end of the carton is then forced into the bucket as the conveyer advances by means of an inclined guide engaging the leading end of the carton. Heretofore, many carton erecting devices utilized a blade arrangement which was quite slow in operation and which of course slowed up the overall operation of the packaging machine. Thus, in order to increase the speed of the machine, it is inherently necessary to provide faster carton erection and faster insertion of the carton into the buckets on the conveyer of the machine.

It is therefore an object of this invention to provide an improved carton erecting or opening mechanism for use on packaging machines and the like, wherein faster carton erection is obtained thereby enhancing the speed of the packaging machine.

Another object of this invention resides in the provision of a carton erecting or expanding mechanism which eliminates the necessity of inserting a blade into the carton for erection thereof wherein substantially greater speed of carton erection is obtained.

Still another object of this invention is in the provision of a device for erecting cartons and inserting the erected carton into a bucket of a bucket conveyer on a packaging machine, wherein the device is capable of operating at a greater speed than heretofore obtained thereby allowing the speed of the machine to be increased accordingly.

A further object of this invention is to provide a carton erecting or expanding mechanism adapted for use with a packaging machine which includes an upper stationary vacuum cup and a lower movable vacuum cup coacting to initiate expansion or erection of a collapsed carton,

and a pivotal finger arranged to complete the erecting and scoring up of the carton in order to allow ample time to remove the lower vacuum cup out of the path of movement of the carton so that the carton may be immediately inserted into a bucket of a conveyor.

Other objects, features, and advantages of the invention will be apparent from the following detailed disclosure, taken in conjunction with the accompanying sheets of drawings, wherein like reference numerals refer to like parts, in which:

Fig. 1 is a side elevational view of a packaging machine embodying the invention;

Fig. 2 is a detail view of the device for electing the cartons and inserting the cartons into the bucket conveyer and illustrating the various positions obtained by the carton as it is opened at the erecting station;

Fig. 3 is a view similar to Fig. 2 with the parts in different positions;

Fig. 4 is a view similar to Fig. 3 with the parts still in another position at the conclusion of another step of operation of the erecting and inserting device; and

Figs. 5, 6, 7, 8, 9, 10 and 11 are more or less diagrammatic perspective views illustrating the sequential operation performed on the collapsed carton to open the carton and insert it into the conveyer bucket.

Referring now to the drawings and especially to Fig. 1, the device of the present invention which erects cartons from the flat and inserts them into a bucket on a conveyer, generally designated by the numeral 10, is illustrated in association with an endless bucket conveyer 11 having a plurality of spaced conveying lugs 12 defining therebetween buckets or pockets 13. The bucket conveyer 11 is trained around the carton conveyer idler sprocket 14 and a drive sprocket at the other end (not shown) wherein the conveyer carries the cartons through the machine for filling and closing operations. Preferably, the conveyer will be continuously operated to bring successive buckets into alignment with an erection or opening station 15 at the erecting and inserting device 10, although the conveyer may be intermittently operated in some cases, if desired.

Collapsed cartons 16 are delivered flat to the erection station 15 by means of a pusher conveyer 17 which receives the cartons one at a time from the carton magazine 18 arranged thereabove. The pusher conveyer 17 includes a table or supporting surface 19 upon which the cartons are received and advanced therealong to the erection station 15. A pushing member 20 is mounted on an endless chain 21 trained about longitudinally spaced sprockets 22 and 23 rotatable on vertical axes.

The magazine 18 includes right angle guides 24 arranged to confine the cartons 16 into a stack 25, wherein one carton at a time may be removed from the bottom of the stack and delivered to a conveyer 17. Cartons are kept from falling out of the magazine by oppositely disposed coacting supporting blades 26, 26 and 27, 27 alternately movable by means of parallel linkage arrangements. The lowermost carton 16 in the magazine 18 is pulled down at its opposite ends by vacuum cups 28 so that the supporting blades 27 may move inwardly to support the entire stack and remove the weight partially from the blades 26 which then move outwardly and permit the lowermost carton to drop onto the conveyer table 19. The vacuum cups 28 are mounted on elongated arm arrangements 29 pivotal about longitudinally extending shafts 30.

The pushing members 20 engage the trailing edge of the collapsed carton 16 and advance it to the opening station 15 in a manner illustrated in Fig. 5 wherein the top side panel 31 and trailing end panel 32 of the carton are facing upwardly and the lower side panel 33 and the leading end panel 34 are facing downwardly. The

leading end of the carton **16** abuts a stop at the erection station **15** which prevents the carton from overshooting the station. This stop is defined by the forward lugs **12** of the bucket **13** aligned with the erection station **15** and an inclined guide plate **35**. When the collapsed carton is properly positioned at the erection station, the leading edge abuts this stop, while the rear end of the top side panel **31** is positioned beneath a pair of upper stationary vacuum cups **36** and the lower side panel **33** is positioned over a pair of transversely spaced lower vacuum cups **37** as seen in Fig. 6. The upper and lower vacuum cups are in substantial alignment with each other and are connected to a vacuum source, wherein the upper vacuum cups grip the upper side panel **31** of the collapsed carton and the lower vacuum cups grip the lower side panel **33**.

The lower vacuum cups are mounted on vertically extending arms **38** pivotally secured to a parallel linkage mechanism arranged below the erection station **15**. This parallel linkage mechanism includes upper and lower parallel links **39** and **40** pivoted at one end to the arms **38** and mounted at the other end on upper and lower rotatable shafts **41** and **42**. The shafts **41** and **42** are in direct vertical alignment and in substantially direct alignment below the trailing edge of the collapsed carton **16** when it is arranged in the erection station **15**. Operation of the parallel linkage mechanism and the lower suction cups **37** is obtained by actuation of a lever **43** secured at one end to the lower shaft **42** as is the lower parallel link **40** and pivotally secured at the other end to a reciprocable link **44**. The link **44** may be connected to any suitable reciprocable driving means which is well known in the prior art.

A source of vacuum is fed to the upper vacuum cups through a line **45**, a vacuum release valve **46**, and flexible lines **47** from any suitable source of vacuum. Similarly, the same source of vacuum may feed a vacuum to the lower suction cups **37** through a line **48**, a vacuum release valve **49** and flexible lines **50**. This manner of supplying vacuum to the suction cups is only illustrative inasmuch as any type of arrangement might be utilized. The vacuum release valves **46** and **49** are arranged to normally feed the vacuum to their respective vacuum cups, but include levers **46***a* and **49***a* which, when actuated, release the vacuum in their respective vacuum cups. Thus, when a collapsed carton is initially advanced to the erection station **15**, the suction cups may grasp their respective side panels of the carton.

Operation of the parallel linkage mechanism for the lower suction cups is commenced after the suction cups have taken proper hold of their respective side panels of the carton and the initial expansion of the carton is accomplished, wherein the carton is expanded to the shape seen in Fig. 7 and the dotted line position **51** of Fig. 2. At this position, the upper parallel link **39** engages the release lever **49***a* of the vacuum release valve **49** for the lower vacuum cups **37** and release the vacuum to these cups so that the lower suction cups may continue to move out of the path of the carton. Because of the parallel linkage mechanism, the lower vacuum cups will move through an arcuate path dictated by the parallel links **39** and **40**, but will always maintain a substantially perpendicular relationship to the collapsed carton or to the side panels of the carton.

The carton is then completely erected and squared up by downward movement of one or more rocking fingers **52** which engage the trailing edge of the carton and expand it to the position shown in Figs. 3 and 8 and the dotted line position **53** of Fig. 2. Each finger **52** rocks about the shaft **54** and is provided with an extension **55** which pivotally connects to an actuating lever **56** driven by any suitable reciprocal or equivalent driving arrangement. After the carton is squared up, it is necessary to then insert it into the aligned bucket **13** of the bucket conveyer **11**, but it is always noted that the forward or leading edge of the carton abuts and pivots at the stop defined by the forward lugs **12** of the aligned bucket and the inclined guide plate **35**.

Since the rocking finger **52** completes one erection of each carton, the lower suction cups **37** are allowed ample time to move out of the path of the carton which can then be inserted into the aligned bucket. A pair of transversely spaced transfer members or fingers **57** are mounted above the erection station for engaging the top of the carton and inserting the trailing end of the carton into the bucket. These fingers **57** are secured to a transversely extending shaft **58** mounted to rotate upon its axis. Also secured to the shaft is an actuating lever **59** having a reciprocable link **60** pivoted at its outer end which is connected to any suitable reciprocable drive arrangement. As the fingers begin to engage the top of the carton, the actuating lever **59** engages release lever **46***a* of the vacuum release valve **46** which releases the vacuum from the upper vacuum cups **36** so that the carton may then be inserted into the aligned bucket. The carton then takes the shape as seen Figs. 4 and 10 and in dotted lines in phantom **61** of Fig. 2. In this position, the trailing end panel **32**, for all practical purposes, engages substantially flat against the rear lugs of the aligned bucket, Fig. 4, so that when the conveyer **11** is advanced, the pushing forces of the lugs are transmitted substantially equally through both upper and lower side panels of the carton to effectively force the upper leading corner of the carton down along the inclined guide plates **35** to the position shown in Fig. 11 and indicated by the numeral **62** in Fig. 1. At this position, the inclined guide plate **35** merges with a longitudinally extending hold down bar **63** which maintains the cartons in the buckets as the cartons are moved along by the bucket conveyer. Since the pushing forces are transmitted through both side panels during the forcing of the leading end of the carton into the bucket, buckling of the cartons is eliminated.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention, but it is understood that this application is to be limited only by the scope of the appended claims.

The invention is claimed as follows:

1. In a machine for opening cartons from the flat, a magazine for holding collapsed cartons, means for feeding one carton at a time from the magazine to an opening station, a stop at said station for engaging the leading edge of the collapsed carton and mechanism for opening the carton, said mechanism comprising a stationary vacuum cup for holding the upper side of said carton, a parallelogram linkage mechanism pivoted below the trailing edge of the collapsed carton at the opening station and carrying an arm, all positions of said arm being parallel to one another and perpendicular to the collapsed carton, said arm being positioned below the collapsed carton, a vacuum cup on said arm for engaging the opposite side of the carton, means to actuate said linkage mechanism, and a pivotally mounted finger arranged to complete squaring up of the carton after the vacuum cups have opened same.

2. In a machine for opening cartons from the flat, a magazine for holding collapsed cartons, means for feeding one carton at a time from the magazine to an opening station, a stop at said station for engaging the leading edge of the collapsed carton and mechanism for opening the carton, said mechanism comprising an upper stationary vacuum cup for holding the top side of the collapsed carton, a parallelogram linkage mechanism pivoted below the trailing edge of the collapsed carton at the opening station and carrying an arm, all positions of said arm being parallel to one another and perpendicular to the collapsed carton, a lower vacuum cup on said arm for engaging the bottom side of the collapsed carton, means to actuate said linkage mechanism to open

the carton, means to release the vacuum in the lower suction cup when the carton is partially opened, and a finger pivotally mounted above the collapsed carton operable to complete opening and squaring up of the carton.

3. In a packaging machine including an endless conveyer having spaced buckets for supporting and moving erected cartons through the machine, means for erecting cartons from the flat and inserting them into the buckets of the conveyer one at a time, said means comprising an upper stationary vacuum cup for holding the top side panel of the carton, a stop for engaging the leading edge of a collapsed carton, a parallelogram linkage mechanism pivoted below the trailing edge of the collapsed carton and carrying an arm, all positions of said arm being parallel to one another and perpendicular to the collapsed carton, a lower vacuum cup on said arm for engaging the lower side panel of the collapsed carton, means for actuating said linkage mechanism, means responsive to the positioning of said lower vacuum cup for releasing the vacuum therein when the carton is substantially erected, a finger pivotally mounted above the erecting station operable to swing down and engage the trailing end panel of the substantially erected carton to completely erect and square up the carton, and transfer means for moving the trailing end of the carton into the aligned bucket.

4. In a packaging machine including an endless conveyer having spaced buckets for supporting and moving erected cartons through the machine, means for erecting cartons from the flat and inserting them into the buckets of the conveyer one at a time, said means comprising an upper stationary vacuum cup for holding the top side panel of the carton, a stop for engaging the leading edge of a collapsed carton, a parallelogram linkage mechanism pivoted below the trailing edge of the collapsed carton and carrying an arm, all positions of said arm being parallel to one another and perpendicular to the collapsed carton, a lower vacuum cup on said arm for engaging the lower side panel of the collapsed carton, means for actuating said linkage mechanism, means responsive to the positioning of said lower vacuum cup for releasing the vacuum therein when the carton is substantially erected, a finger pivotally mounted above the erecting station operable to swing down and engage the trailing end panel of the substantially erected carton to completely erect and square up the carton, transfer means for moving the trailing end of the carton into the aligned bucket, and means responsive to the movement of said transfer means for releasing the vacuum in the upper vacuum cup.

5. In a packaging machine including an endless conveyer having spaced buckets for supporting and moving erected cartons through the machine, means for erecting cartons from the flat and inserting them into the buckets of the conveyer one at a time, said means comprising an upper stationary vacuum cup for holding the top side panel of the carton, a stop for engaging the leading edge of a collapsed carton, a parallelogram linkage mechanism pivoted below the trailing edge of the collapsed carton and carrying an arm, all positions of said arm being parallel to one another and perpendicular to the collapsed carton, a lower vacuum cup on said arm for engaging the lower side panel of the collapsed carton, means for actuating said linkage mechanism, means responsive to the positioning of said lower vacuum cup for releasing the vacuum therein when the carton is substantially erected, a finger pivotally mounted above the erecting station operable to swing down and engage the trailing end panel of the substantially erected carton to completely erect and square up the carton, transfer means for moving the trailing end of the carton into the aligned bucket, means responsive to the movement of said transfer means for releasing the vacuum in the upper vacuum cup, and stationary guide means for inserting the leading end of the erected carton into the bucket upon advancing of the conveyer.

6. In a packaging machine including an endless conveyer having spaced lugs defining buckets adapted to receive and support erected cartons for moving same through the machine, an erecting station arranged over one end of said conveyer, the successive buckets adapted to be successively positioned in alignment with said erecting station, means for feeding one collapsed carton at a time to said erecting station, an inclined guide coacting with the leading lug of the bucket at said station to define a stop at said station for engaging the leading edge of a collapsed carton, and mechanism for erecting the collapsed carton and inserting it into the aligned bucket, said mechanism comprising an upper stationary vacuum cup for holding the top side panel of the carton during the erecting thereof, a lower vacuum cup for engaging the lower side panel of said carton, linkage means for moving said lower vacuum cup downwardly, means responsive to the positioning of said lower vacuum cup for releasing the vacuum therein when the carton is substantially erected, a finger pivotally mounted above the erecting station operable to swing downwardly and engage the trailing end panel of the carton to completely erect and square up the carton, transfer means for inserting the trailing end of the erected carton into the aligned bucket, and means responsive to the positioning of the transfer means for releasing the vacuum in the upper vacuum cup, whereby advancing of the conveyer causes said inclined guide to force the leading end of the carton into the bucket.

7. In a packaging machine including an endless conveyer having spaced lugs defining buckets adapted to receive and support erected cartons for moving same through the machine, an erecting station arranged over one end of said conveyer, the successive buckets adapted to be successively positioned in alignment with said erecting station, means for feeding on collapsed carton at a time to said erecting station, an inclined guide coacting to define with the leading lug of the bucket at said station, a stop at said station for engaging the leading edge of a collapsed carton and mechanism for erecting the collapsed carton and inserting it into the aligned bucket, said mechanism comprising an upper stationary vacuum cup for holding the top side panel of the carton during the erecting thereof, a parallelogram linkage mechanism pivoted below the trailing edge of the collapsed carton and carrying an arm, all positions of said arm being parallel to one another and perpendicular to the collapsed carton, a lower vacuum cup on said arm for engaging the lower side panel of the collapsed carton, means for actuating said linkage mechanism, means responsive to the positioning of said lower vacuum cup for releasing the vacuum therein when the carton is substantially erected, whereby continued downward movement of said lower vacuum cup takes it out of the path of said carton while the carton is being further erected and inserted into the bucket, a finger pivotally mounted above the erecting station operable to swing downwardly and engage the trailing end panel of the carton to completely erect and square up the carton, transfer means for inserting the trailing end of the erected carton into the aligned bucket, and means responsive to the positioning of the transfer means for releasing the vacuum in the upper vacuum cup, whereby advancing of the conveyer causes said inclined guide to force the leading end of the carton into the bucket.

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UNITED STATES PATENT OFFICE

CERTIFICATION OF CORRECTION

Patent No. 2,966,100 December 27, 1960

Harry E. Engleson 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 1, line 39, for "Response" read -- Responsive --; column 4, line 21, after "seen" insert -- in --; column 6, line 35, for "on" read -- one --.

Signed and sealed this 30th day of May 1961.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents