United States Patent [19]

Rejsa

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[54] **APPARATUS FOR FEEDING FLATTENED, TUBULAR CONTAINER BLANKS**

[75] Inventor: **Jack J. Rejsa,** Minneapolis, Minn.

[73] Assignee: **The Pillsbury Company,** Minneapolis, Minn.

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[21] Appl. No.: **202,290**

[52] **U.S. Cl.** ..... **93/58.1,** 93/53 R, 271/1, 271/10, 271/131

[51] **Int. Cl.** **B31b 1/06**

[58] **Field of Search** ..... 271/1, 18, 44 R, 271/23, 10; 270/83, 84, 76, 77; 93/53 R, 39 R, 58.1; 53/186

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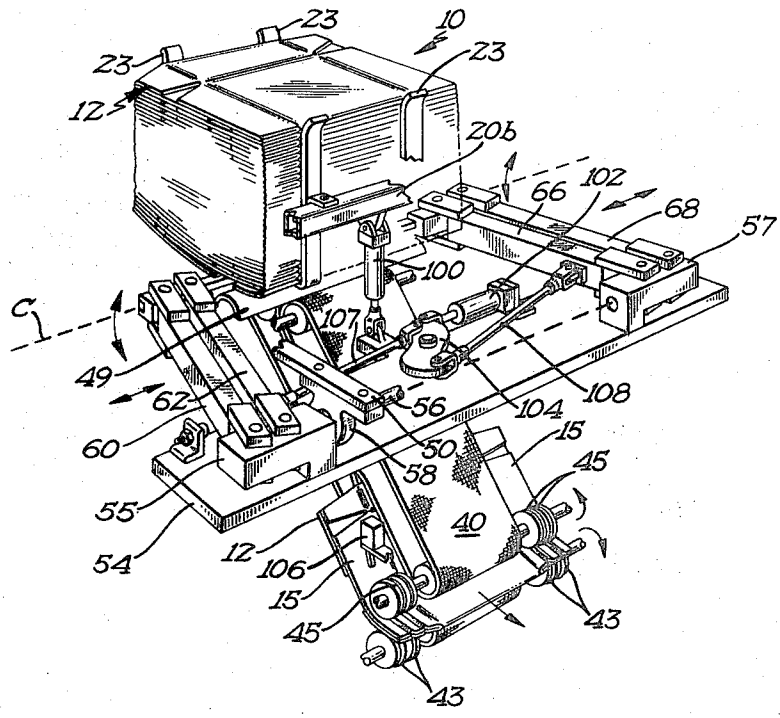
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Primary Examiner—Evon C. Blunk
Assistant Examiner—Bruce H. Stoner, Jr.
Attorney—Ronald E. Lund et al.

[57] **ABSTRACT**

A pair of cooperating, rotating conveying elements are located adjacent to a storage station in which the tubular containers are temporarily stored. The tubular blanks in the storage station are oriented normal to the feed axis of the conveyor with the center of each blank approximately aligned with the conveyor feed axis. A pair of coaxial feeding blades located in the plane of the feed axis extend into the open ends of the blank. The blank when in the storage station is oriented with its open ends spaced along the common axis of the feeding blades. In operation, the feeding blades are moved centrally on their common axis so that their pointed ends extend almost to the center of the tube. The blades are then moved along the conveyor feed axis until the score line of one corner of the blank is driven into the nip of the conveyor. The blades then are raised to their original position and moved apart along their common axis until their tips are withdrawn far enough to clear aligned portions of the blank.

5 Claims, 13 Drawing Figures



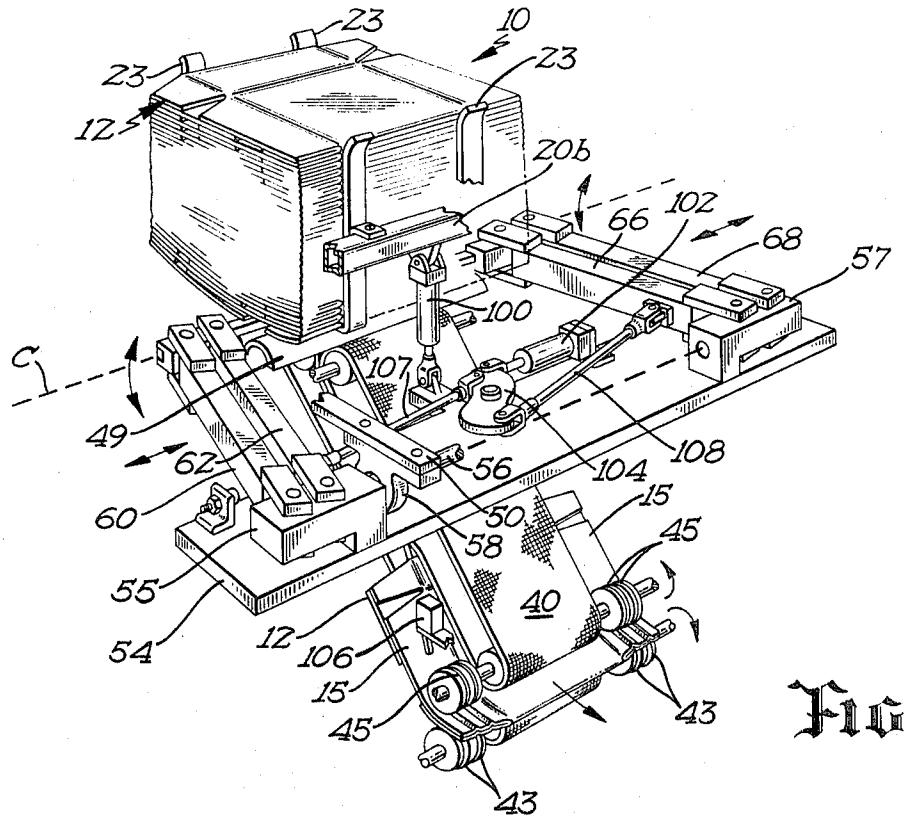


Fig 1

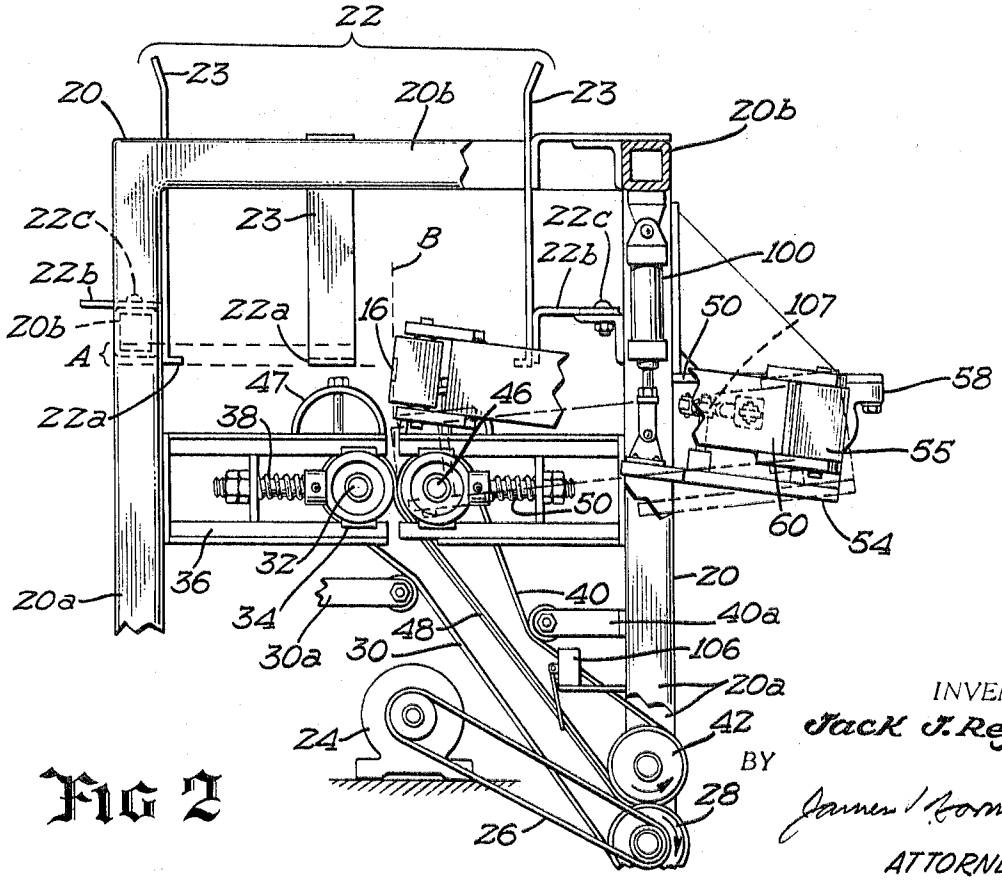


Fig 2

INVENTOR.
Jack T. Rejsa
BY
James A. Gormon
ATTORNEY

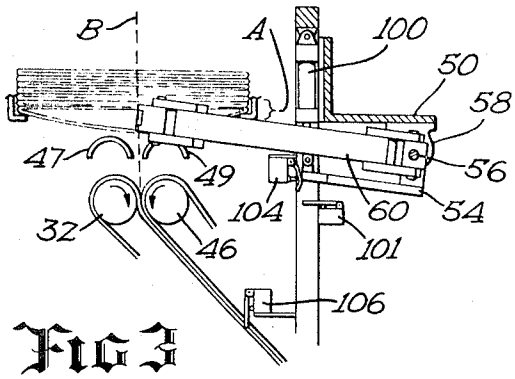


Fig 3

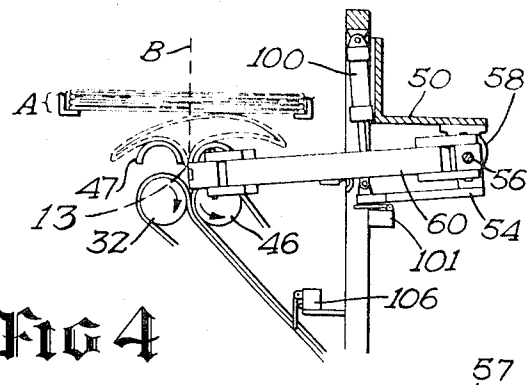


Fig 4

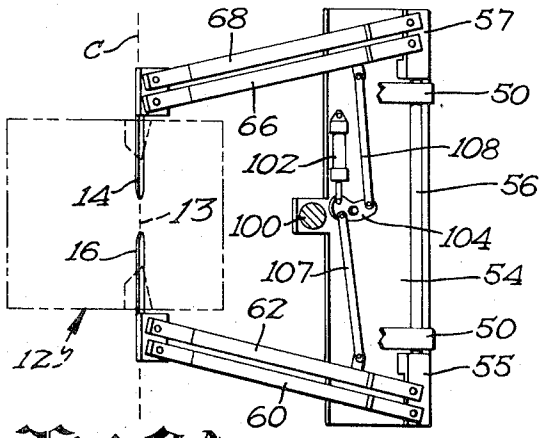


Fig 3A

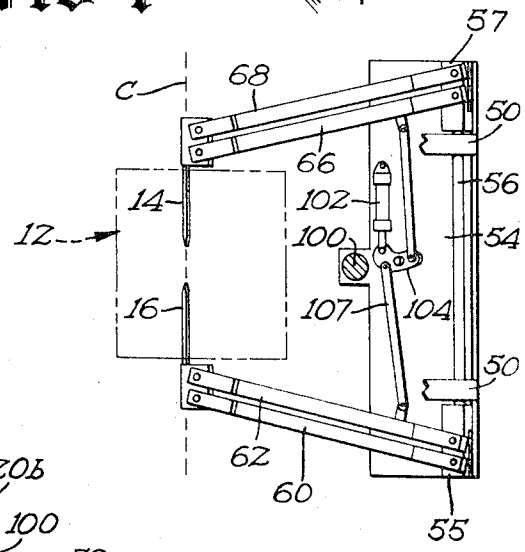


Fig 4A

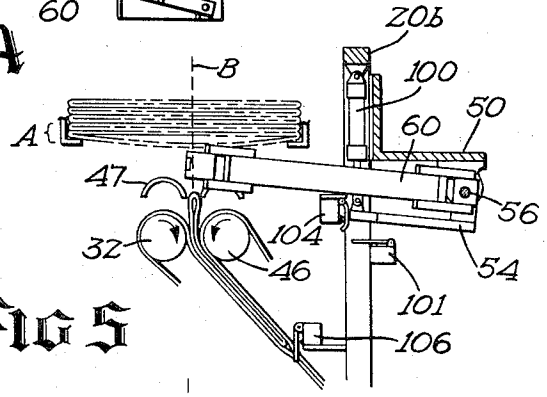


Fig 5

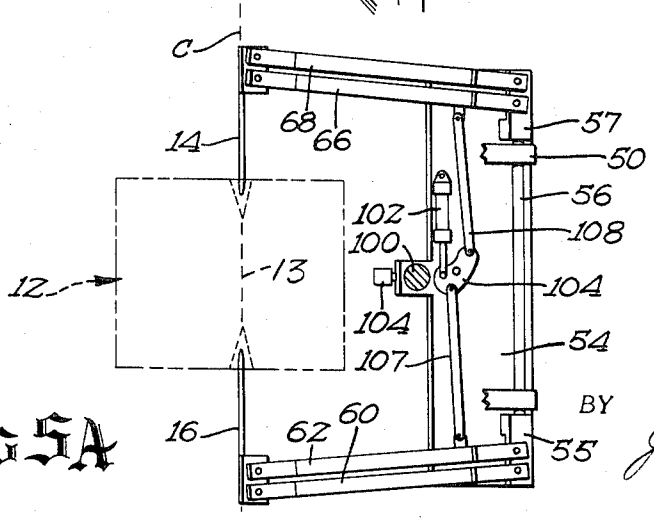


Fig 5A

INVENTOR.
Jack T. Rejsa
BY
James V. Harmon
ATTORNEY

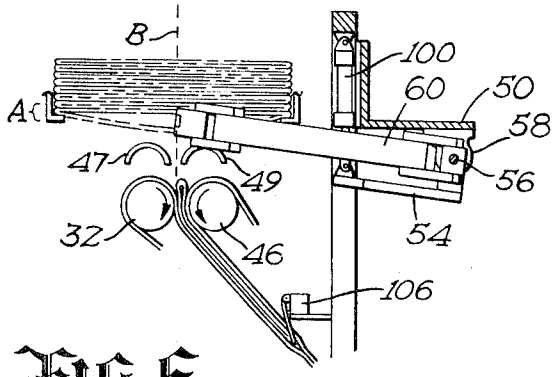


Fig 6

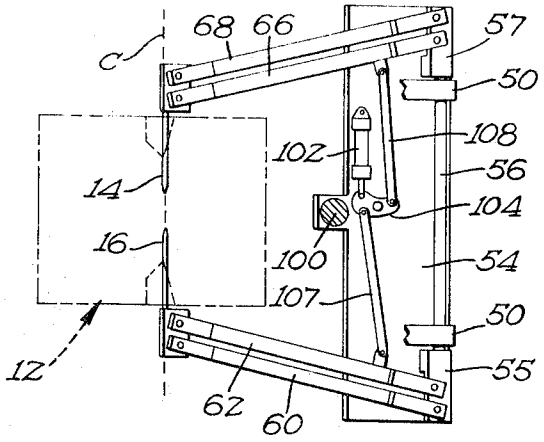


Fig 6A

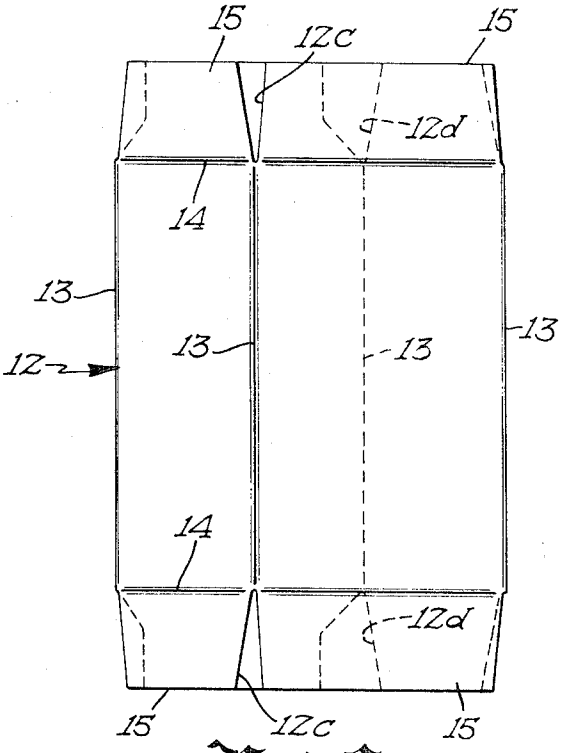


Fig 8

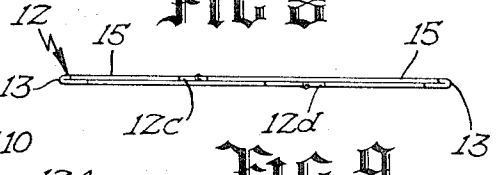


Fig 9

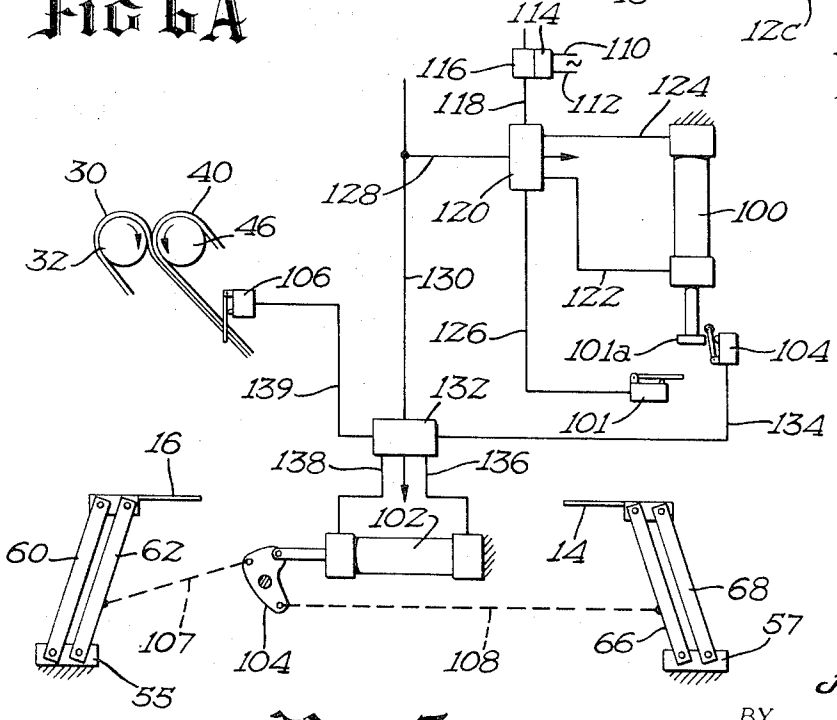


Fig 7

INVENTOR.
Jack T. Rejsa
BY
James V. Harmon
ATTORNEY

APPARATUS FOR FEEDING FLATTENED, TUBULAR CONTAINER BLANKS

FIELD OF THE INVENTION

The present invention relates to packaging equipment and more particularly to an apparatus for feeding flattened tubular containers or blanks to further handling equipment.

THE PRIOR ART

Flattened tubular containers such as cartons, paper balers and the like have long been in use without a satisfactory system for folding them open prior to filling. This problem is particularly acute in the case of paper balers formed from heavy kraft paper that is folded into a tube and provided with longitudinal and transverse score lines defining the edges of the container and flaps at the ends which after the baler has been filled with cartons, boxes, cans or the like, are folded over one another to seal the ends of the filled baler. Balers of this kind have sometimes been referred to as a Bax (a registered trademark of the St. Regis Paper Company) since they have characteristics of both a box and a bag. At the present time, containers of this kind are fed to the filling machines manually and are opened by hand prior to being inserted in the filling machine.

OBJECTS OF THE INVENTION

The present invention has as its major objective replacing personnel use for opening paper tubular containers and feeding them to the filling machines. The machine should be capable of (a) reliably opening the tube and placing one open tube at the inlet of the filling machine each time an additional container is called for at a rate of at least thirty containers per minute, (b) eliminating carton loading jams, (c) providing carton size versatility with the ability to accommodate at least two different size containers which differ in all their dimensions and (d) the provision of a feeding apparatus which can be moved from place to place and easily positioned adjacent to a carton loading machine which it is used to feed.

SUMMARY OF THE INVENTION

The invention is used for feeding and opening flattened tubular containers, e.g., flattened prescored tubes of kraft paper which when opened form a paper carton. Several of the tubes are preferably placed in a stack above a storage location. A conveying assembly is located adjacent to the storage location. The blank in the storage location is preferably oriented normal to the feed axis of the conveyor with its center approximately aligned with the feed axis of the conveyor. At least one feeding blade positioned in the plane of the feed axis extends into the one open end of the blank. The tube when in the storage position is oriented with its open ends positioned relative to one another on the common axis of the feeding blades. In operation, the feeding blades are moved centrally along their common axis so that their pointed ends extend almost to the center of the tube. The blades are then moved along the feed axis until a score line of one corner of the container located near the center of one of the flattened walls of the blank is driven into engagement with the conveyor. The blades then are raised to their original position and moved away from one another until their tips are withdrawn far enough to clear aligned portions of the blank while the conveyor transports the blank to a remote point.

The blades are mounted upon a support which allows them to travel along the same axis and maintain the same spacing from the center of the container at all times. For this purpose a parallelogram linkage assembly is preferred. Connecting rods are provided for locating the parallelogram links relative to one another and an actuator, e.g., a pneumatic cylinder is provided for simultaneously extending or retracting the connecting rods to in turn extend or retract the blades.

BRIEF DESCRIPTION OF THE DRAWINGS.

FIG. 1 is a perspective view of the blank feeding structure of the present invention.

FIG. 2 is a side view of the blank feeding structure.

FIGS. 3, 4, 5 and 6 are side views of the blank feeding structure during various phases of operation of the device.

FIGS. 3A, 4A, 5A, and 6A are plan views of the blank feeding structure corresponding to FIGS. 3, 4, 5 and 6 respectively, during various phases of operation of the device.

FIG. 7 is schematic representation of the electrical and hydraulic control circuitry of the device.

FIGS. 8 and 9 are plan and edge views, respectively, of the tubular container blanks of a type this device is capable of feeding.

DETAILED DESCRIPTION OF THE INVENTION

A broad general arrangement of the functional assemblies that make up the apparatus will be described with particular reference to FIGS. 1 and 2.

A pair of cooperating, rotating conveying belts designated generally 30 and 40 define a conveyor and are located adjacent to a storage station A in which tubular containers 12 are temporarily stored. The containers 12 are oriented in station A normal to the feed axis B of the conveyor with one of the corner score lines 13 located near the center of each flattened container 12 and on the lower surface thereof approximately aligned with the feed axis B. Feeding blades 14 and 16 extend into the open ends of the blank 12 and are located in the plane of the feed axis B. In operation, the feeding blades 14 and 16 are first moved toward one another along their common axis C so that their pointed ends extend almost to the center of the tubular blank. The blades are then moved along the feed axis B until the score line of one corner of the blank is driven into the nip between the conveyor belts. The blades then are raised to their original position and moved apart along axis C until their tips are withdrawn far enough to clear portions of the blank which are in alignment with the blades.

The tubular blanks 12 best shown in FIGS. 8 and 9 are in flattened condition and include longitudinally extending fold lines 13 to define panels as well as transversely extending fold lines 14 to define end flaps which are separated by notches 12*c* and 12*d*.

The apparatus includes the usual supporting framework 20 composed of a plurality of vertically disposed posts 20*a* connected by horizontally disposed crossmembers 20*b* some of which are shown in FIG. 2.

A hopper 22 is defined by a plurality of vertically disposed bars 23 having inwardly turned lower ends 22*a* that function as stops to define the storage location A. The hopper bars are provided with horizontally dis-

posed laterally extending wings **22***b* which can be moved laterally on the frame for lateral adjustment either toward or away from each other by the provision of elongated slots in the wings for mounting bolts **22***c* only some of which are shown. The hopper guide bars **23** on the sides of the hopper (only one of which is shown in FIG. **2**) are also mounted for adjustable movement toward or away from the center of the stack of tubular containers. In this way, the apparatus is suited for handling tubular containers of many sizes. Since the fold line defined by the score **13** can be considered to remain in a fixed location, only the walls of the hopper need to be adjusted in order to accommodate containers of various sizes. Thus, when a larger side container is to be used, the walls of the hopper are adjusted appropriately with the score line **13** remaining in the same location on the lower side of the stack.

The feed conveyors will now be described with reference to FIGS. **1** and **2.** An electric drive motor **24** suitably mounted on the framework **20** is connected by a roller chain **26** to a roll **28** which supports the lower end of a feed belt **30** that extends upwardly and toward the left seen in FIG. **2** and is entrained at its upper end over a roll **32** mounted for rotation in journal **34** which is yieldably biased toward the right by spring **38** within a track **36** supported on the framework. A mating belt **40** is entrained over rolls **42** and **46** and is driven through its engagement at **48** with belt **30.** Roll **46** is journaled in a bearing **47** that is yieldably biased toward roll **32** by a spring **50.** The belts **30** and **40** are tightened by suitable belt tighteners **30***a* and **40***a* respectively. During operation the belts run continuously in given feed directions.

As shown in FIG. **1,** the rolls **28** and **42** (FIG. **2**) are provided with forming rolls at their outward ends which include two circumferentially extending mating ridges **43** and grooves **45** which serve to provide corrugations in the flaps **15** to thereby stiffen them and prevent them from drooping and curling.

The construction and actuation of the feed blades **14** and **16** will be described, especially with reference to FIG. **2.** Two supporting plates **50** are rigidly secured to the right side of the framework. A blade arm support bracket **54** is connected by two mounting blocks **55** and **57** to each end of pivot shaft **56** which itself extends through bearings **58** that are secured to the supporting plates **50** (only one of which is shown in FIG. **2**). Movement of the bracket **54** on shaft **56** is controlled by a feed cylinder **100** connected at its upward end to the framework and at its lower end to the central portion of the bracket **54** to articulate the plate about the horizontal transversely extending axis of the shaft **56** between dotted and solid line positions of FIG. **2.** A pair of guides in the form of half cylinders **47** and **49** are mounted parallel to and placed slightly above the rolls **32** and **46** to help feed the container into the nip between the rolls when the blades **14** and **16** descend along the axis B.

Parallelogram links **60** and **62** are pivotally secured to the mounting block **55** on the left side of plate **54** as seen in FIG. **1.** Similar parallelogram link members **66** and **68** are pivoted to the block **57** which is affixed to the right hand side of plate **54.** As can be best seen by comparison of FIGS. **1** and **3A,** the blade **16** is pivotally secured to the free ends of the arms **60** and **62,** and the blade **14** is pivotally secured to the ends of links **66** and **68** so that the blades are coaxial and maintain a common transverse blade insertion axis C at all times. Insertion of the blades is controlled by a cylinder **102** which is connected to a crank **104** having two throws that are secured respectively to connecting rods **107** and **108** so that the extension of cylinder **102** will turn crank **104** in a counterclockwise direction thereby moving the parallelogram links outwardly and withdrawing the blades **14** and **16** to their retracted position.

A preferred form of control will now be described in connection with FIG. **7.**

The cycle of operation is started by means of an electrical pulse through conductors **110** and **112** to the solenoid **114** of a solenoid operated pneumatic valve **116.** The pulse can, for example, be supplied periodically by the turning of a shaft on one of the packing machines (not shown) to which the tubes are fed. The consequent opening of valve **116** will exhaust fluid from line **118** to valve **120** which is connected by lines **122** and **124** to the cylinder **100** as well by line **126** to a limit valve **101.** The cylinders **100** and **102** are operated by compressed air supplied through line **128** and a line **130** which is connected to a valve **132** that communicates through a line **134** with the limit valve **104** through lines **136** and **138** with the cylinder **102** and through the line **139** to the limit valve **106.** The valves **120** and **132** are typically internally pressurized pilot operated valves. Exhausting the pilot ends (**118, 126,** and **134, 139**) shifts the valve spool to change the cylinder direction.

The cycle of operation can best be understood by comparison of FIGS. **3** through **5A** and **7.** It will be assumed first that an electrical signal is supplied through conductors **110** and **112** to the solenoid operated valve of **116.** This will cause the compressed air supplied through line **128** to pass through line **124** thereby extending the feed cylinder **100** and causing the blades to descend from the position of FIGS. **3–3A** to the position in FIGS. **4** and **4A** along the feed axis B thereby forcing the corner score line **13** near the center of the flattened container in the feed station A between the pair of semi-cylindrical guides **47** and **49** and into the nip of the belts **30** and **40.**

At the end of the downstroke of the feed cylinder **100** the valve **101** is engaged by the projection **101***a* on the cylinder **100** thereby shifting valve **120** and allowing the feed cylinder **100** to be retracted.

Near the end of the upstroke of cylinder **100,** projection **101***a* engages the valve **104** which shifts valve **132** thereby causing the air in line **130** to feed through line **136** extending the opening cylinder **102** and withdrawing the blades **14** and **16** to the retracted position of FIGS. **5** and **5A.** When the forward end of the container engages and actuates the valve **106** the valve **132** is shifted so as to feed air through line **138** causing the cylinder **102** to be retracted thereby reinserting the blades **14** and **16** into the lowermost container in the stack. As the trailing end of the container passing between belts **30** and **40** comes to the blades **14** and **16,** the blades pass through the openings **12***c*. This is possible because the blades are withdrawn far enough to clear the inward ends of the notches **12***c* although they are not completely retracted from beyond the side edges of the tubes when in their outermost position as shown in FIG. **5A.** The stack of containers rest upon the blades in such a position that the tips of the blades extend upwardly through the wider slots **12***d* on the lower surface of the tube, but when the blades are in-

serted, because their tips are pointed, the blades pass into the center of the bottom tube.

When the containers are released by the conveyor belts 30 and 40, they will open by popping up to define a rectangular tube opened at its ends because the fold lines 13 have been reverse folded. In this way, the container will right itself and stay erect ready to receive cans, boxes or other articles which are to be inserted through one end. The flaps are then folded down upon one another conventionally at each end of the container and bonded together with suitable fasteners or adhesives. The apparatus for filling or sealing the ends of the tubes can comprise any commercially available equipment for this purpose such as the filling equipment known as the Bax equipment sold by the St. Regis Paper Company.

What is claimed is:

1. An apparatus for feeding flattened tubular containers having a corner score comprising in combination a supporting framework, a feed conveyor mounted on the framework, said feed conveyor comprising at least a pair of adjacent mating rotatable elements driven to feed material placed therebetween in a given feed direction along a feed axis extending between adjacent portions of the rotatable elements, a storage station mounted adjacent to the rotatable elements in a position to temporarily store at least one of the containers with one said corner score portion thereof in alignment with the feed axis, at least one feeding blade mounted for movement along an axis parallel to a nip between rotatable conveyor elements and extending through the feed axis, a first actuating means for moving the blade toward and away from the center of the container along its own axis to insert the blade into the container at the storage station through its open end, a second actuation means connected to the blade for moving the blade along the feed axis for lowering the blade briefly to force the adjacent portion of the tube into the nip between the rotatable elements of the conveyor and thereafter returning the blade along the feed axis away from the rolls and retracting the blade outwardly so that the container as it is advanced by the feed conveyor will clear the end of the blade.

2. The apparatus of claim 1 wherein the storage station is oriented and positioned relative to the rotatable elements so that the corner score is in substantially alignment with a line located between the rotatable elements.

3. The apparatus of claim 1 wherein the containers have laterally extending end flaps and said apparatus includes cooperating creasing rolls positioned to engage the laterally extending flaps of the tubular containers, said creasing rolls including cooperating circumferentially extending ridges and grooves for forming a crease in the flaps that pass therebetween to stiffen the flaps.

4. An apparatus for feeding flattened tubular containers comprising a supporting framework, a feed conveyor including at least two adjacent rotatable elements driven to feed material placed therebetween in a given feed direction, a storage station mounted adjacent to the rotatable elements for holding the tubular containers, a feeding means mounted for movement on the framework to insert a portion of the tubular container into the nip between adjacent portions of the rotatable elements and at least one feeding blade mounted for movement along an axis parallel said nip between rotatable conveyor elements extending through a plane between the adjacent mating rotatable elements, a pair of parallel related parallelogram links, each pivotally connected at one end thereof to the blade and at the other to the supporting framework, first actuating means connected to the parallelogram links for moving the blade toward the center of the storage location and a second actuating means operatively connected to the links for moving the blade along the feed axis.

5. An apparatus for feeding flattened tubular containers having a corner score comprising in combination a supporting framework, a feed conveyor mounted on the framework, said feed conveyor comprising at least a pair of adjacent mating rotatable elements driven to feed material placed therebetween in a given feed direction along a feed axis extending between adjacent portions of the rotatable elements, a storage station mounted adjacent to the rotatable elements in a position to temporarily store at least one of the containers with one said corner score portion thereof in alignment with the feed axis, at least one feeding blade mounted for movement along an axis parallel to a nip between rotatable conveyor elements extending through the feed axis, a first actuating means for moving the blade toward and away from the center of the container along its own axis, a second actuation means connected to the blade for moving the blade along the feed axis whereby the blade can be inserted into the containers into the storage station through their open end and lowered briefly to force the adjacent portion of the tube into the nip between the rotatable elements of the conveyor and thereafter returning the blade along the feed axis away from the rolls and retracting the blade outwardly so that the container as it is advanced by the feed conveyor will clear the end of the blade, a first sensor operatively associated with the second actuator to sense the return of the second actuator to its retracted position and operatively connected to the first actuator to move the blade out when the second actuator is retracted, a second sensor for detecting the movement of the second actuator to its extended position and being operatively connected therewith to return the second actuator to its retracted position when actuated, a third sensor positioned on the framework to engage the containers after said containers have been moved from the storage location and operatively connected to the first actuator to move the blade toward the center of the container and a fourth sensor operatively connected to the second actuator for moving the blades downwardly when a demand signal is received by the fourth sensor to thereby drive the container into engagement with the rotatable elements.

* * * * *