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DEVICE FOR FEEDING AND FOLDING THE TRAILING TOP FLAP OF A CONTAINER FOR CLOSING THE CONTAINER

Filed Sept. 21, 1971 7 Sheets-Sheet 1

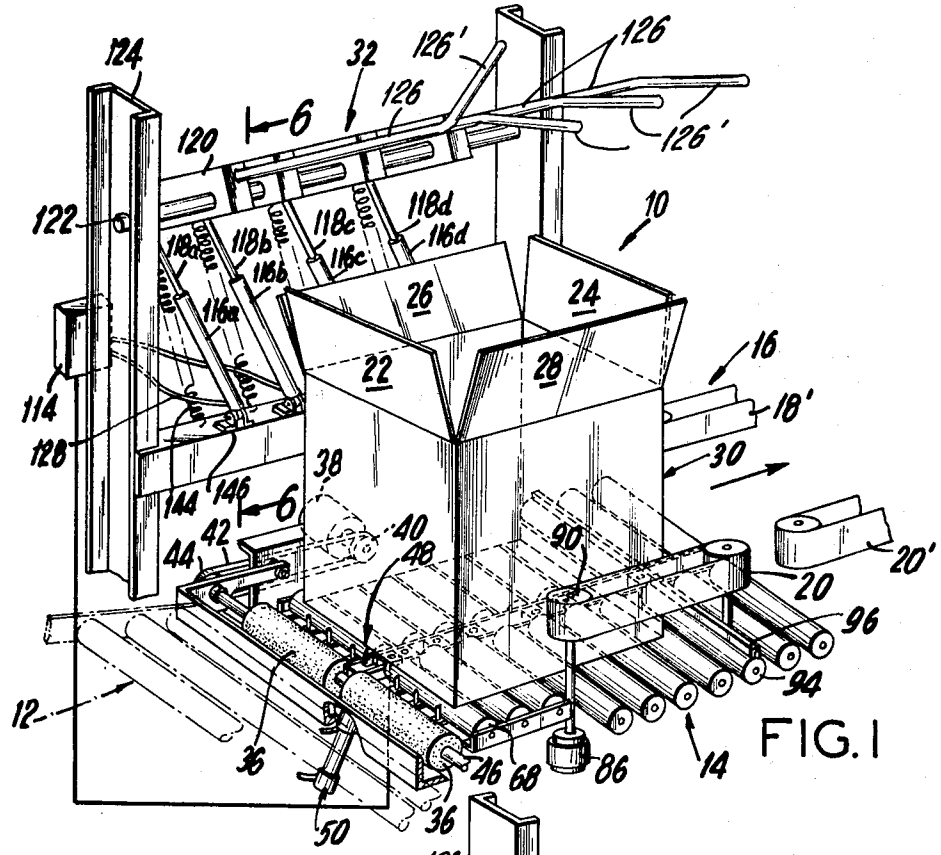


FIG. 1

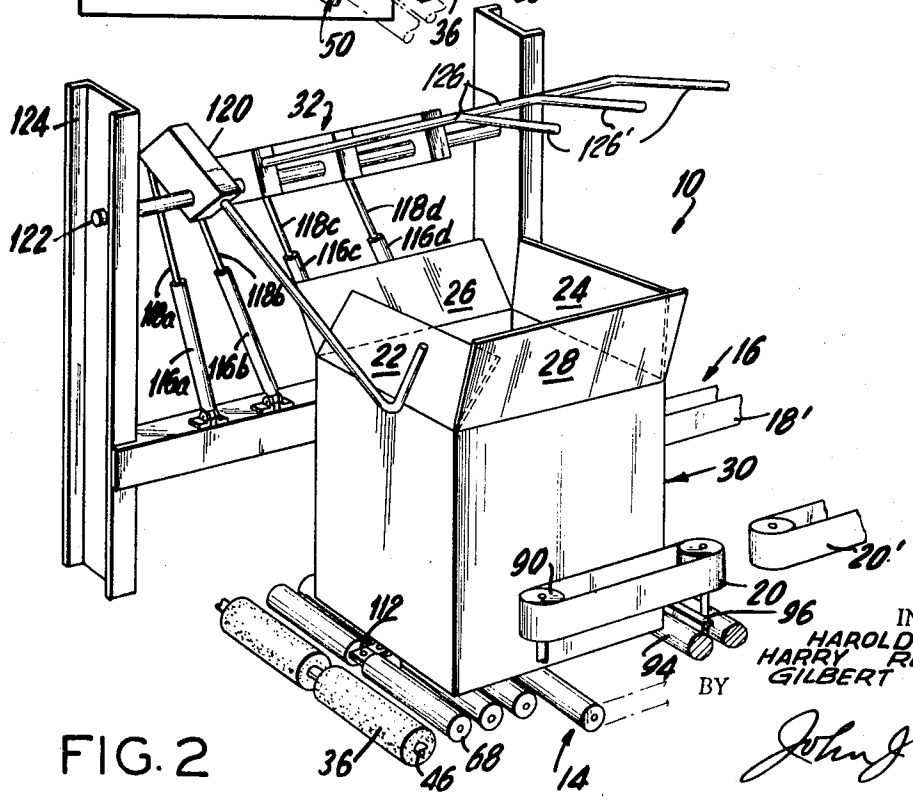


FIG. 2

INVENTORS
HAROLD FEIGEL
HARRY REIZENSTEIN
GILBERT BLOCH

BY

John J. McGlew

ATTORNEY

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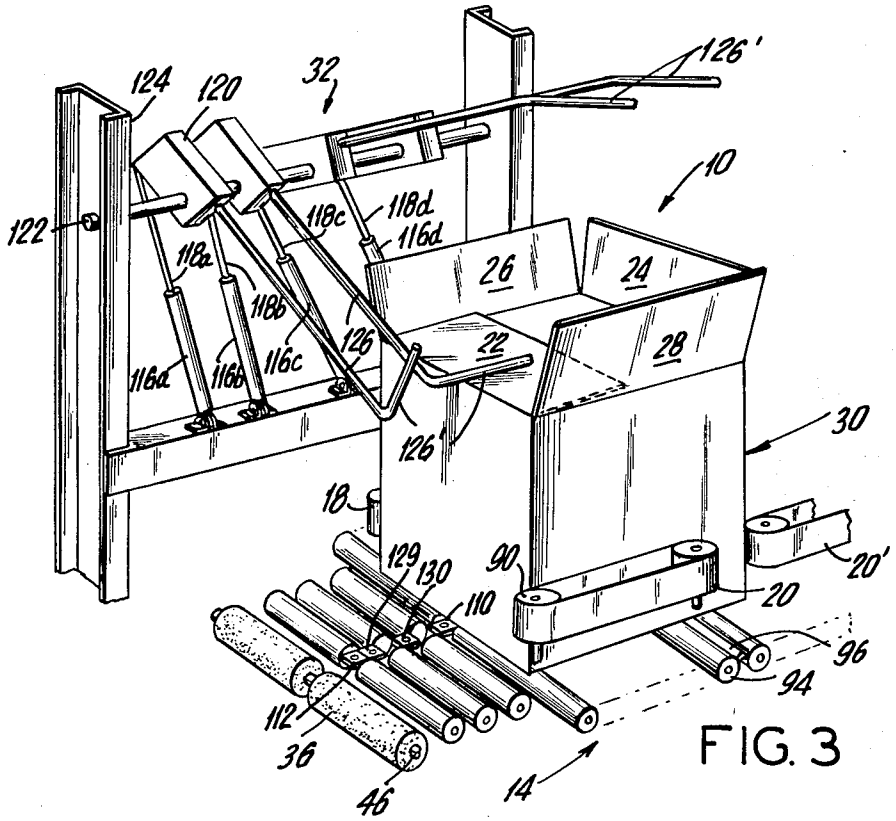


FIG. 3

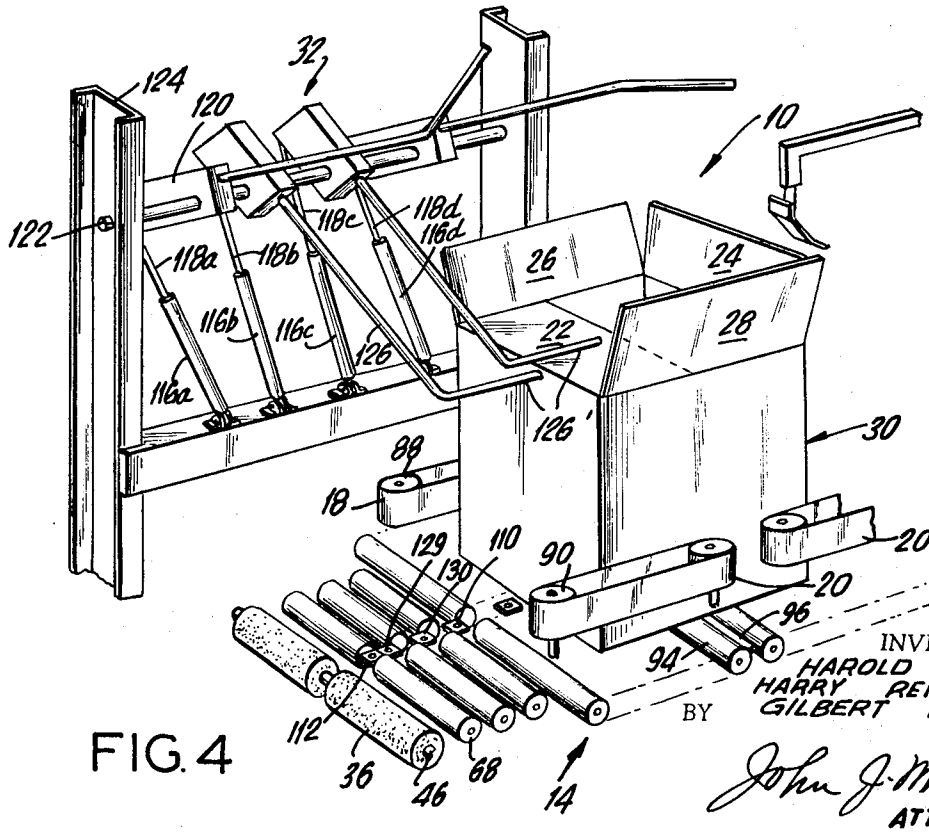


FIG. 4

INVENTORS
HAROLD FEIGEL
HARRY REIZENSTEIN
GILBERT BLOCH
BY
John J. McGlew
ATTORNEY

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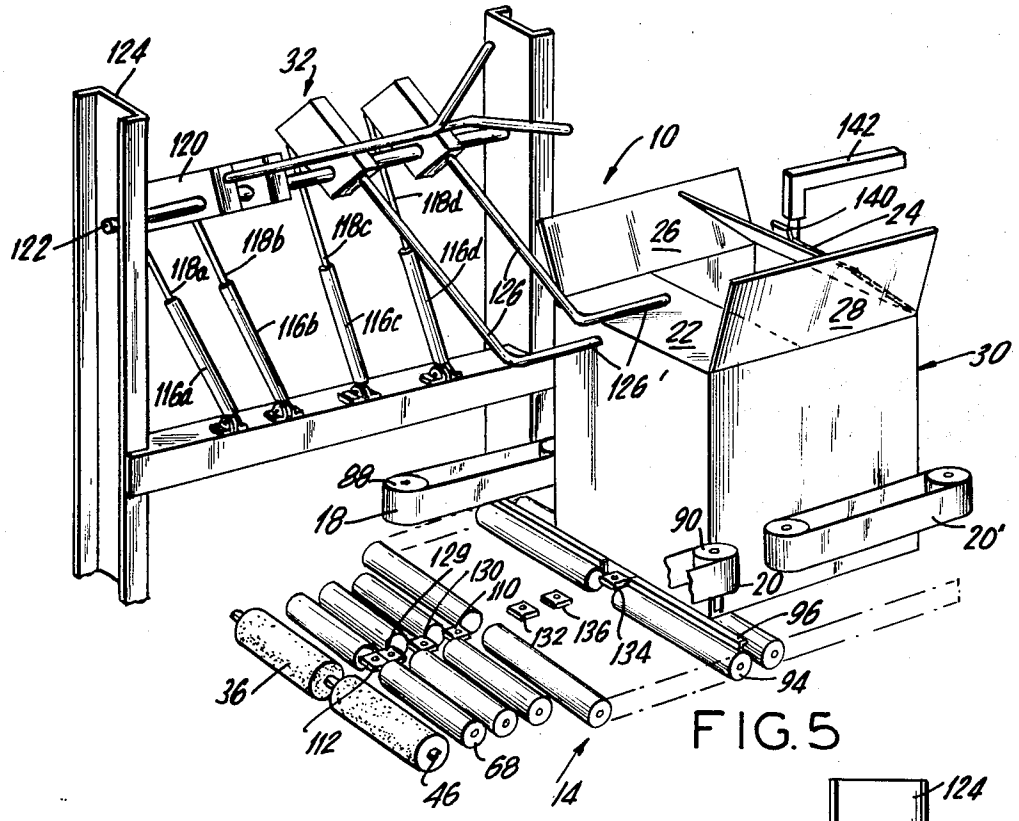


FIG. 5

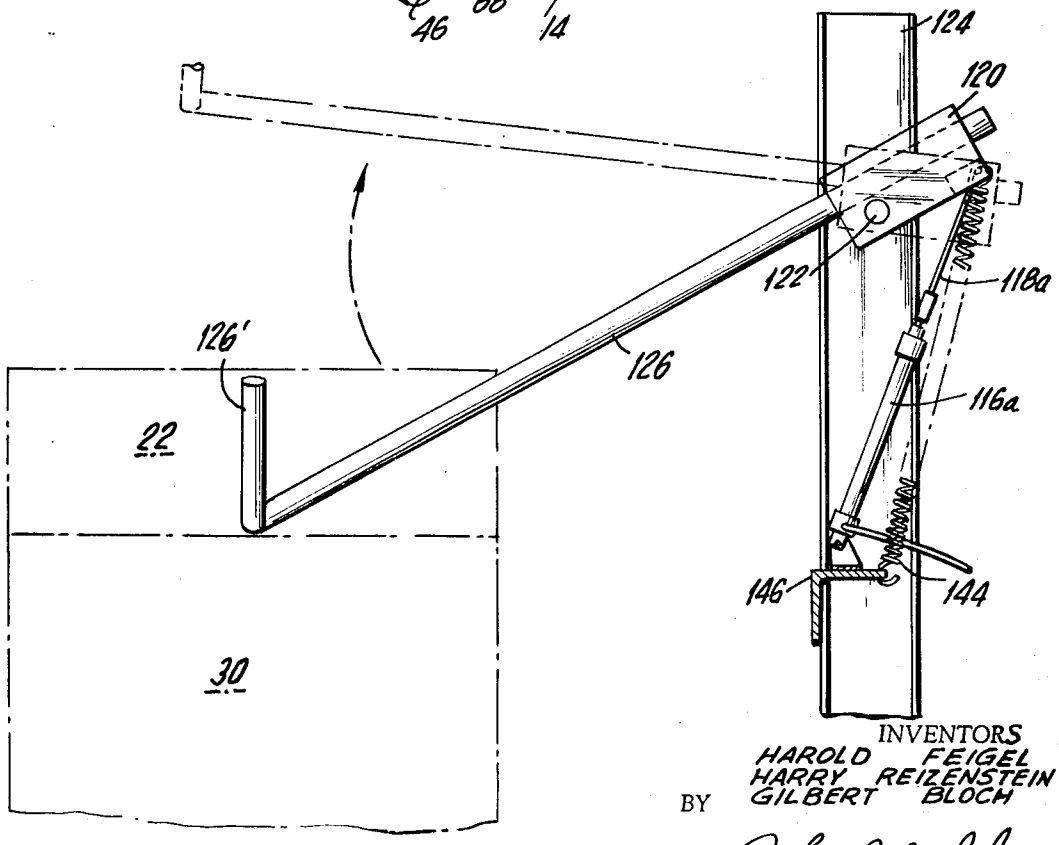


FIG. 6

INVENTORS
HAROLD FEIGEL
HARRY REIZENSTEIN
BY GILBERT BLOCH
John J. McGlew
ATTORNEY

Feb. 6, 1973 H. J. FEIGEL ET AL 3,714,757

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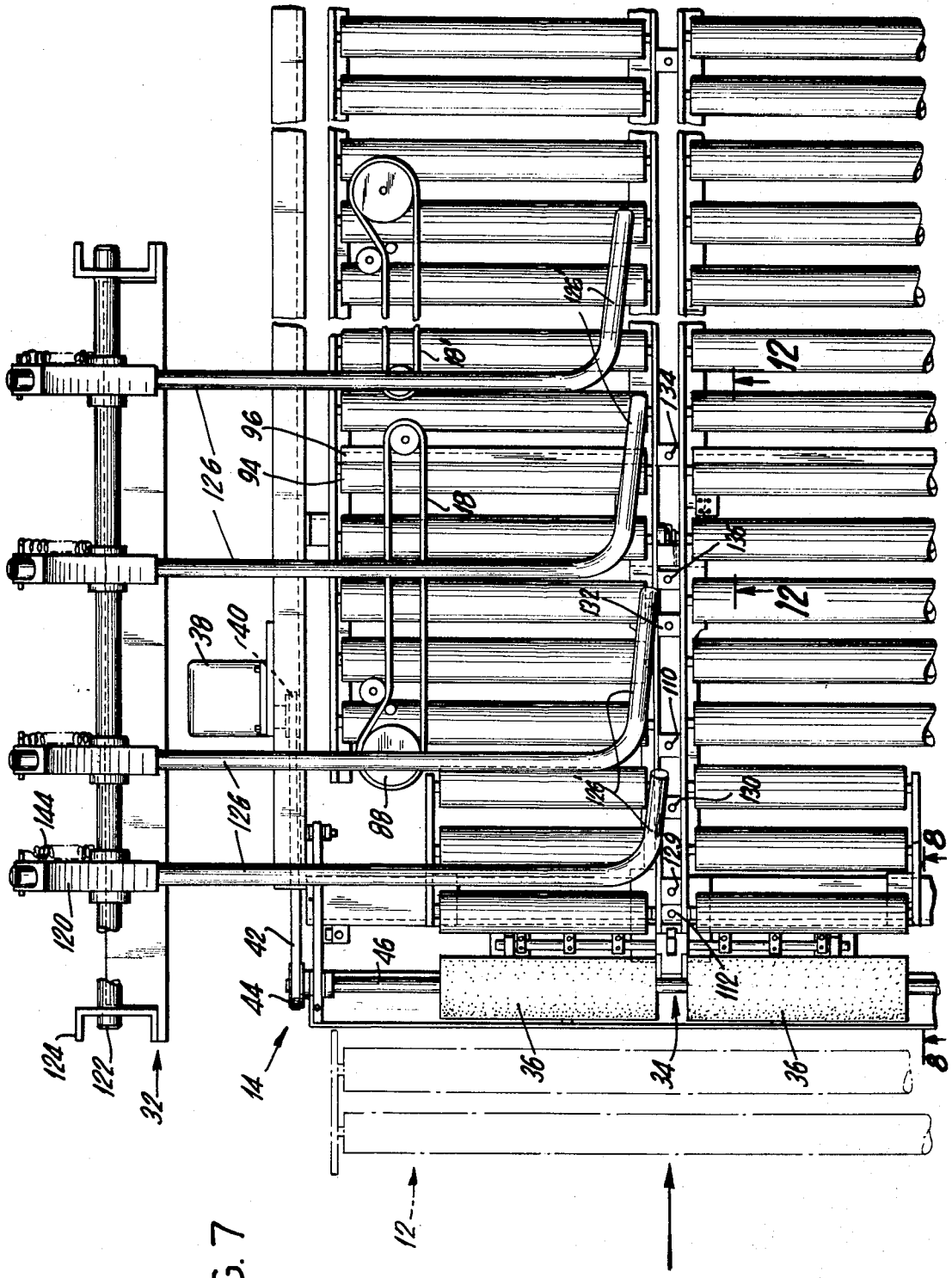


FIG. 7

INVENTORS
HAROLD HARRY GILBERT FEIGEL REIZENSTEIN BLOCH

BY John J. McGlew
ATTORNEY

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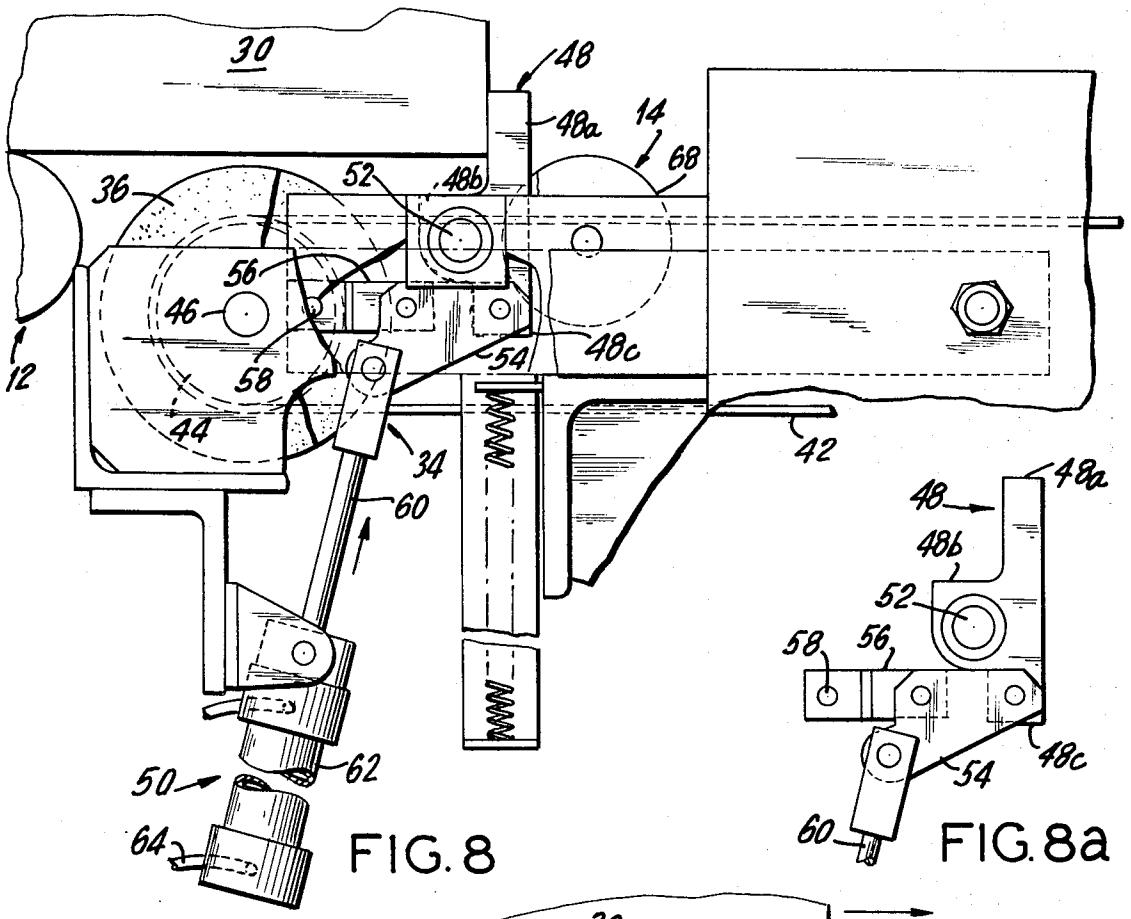


FIG. 8

FIG. 8a

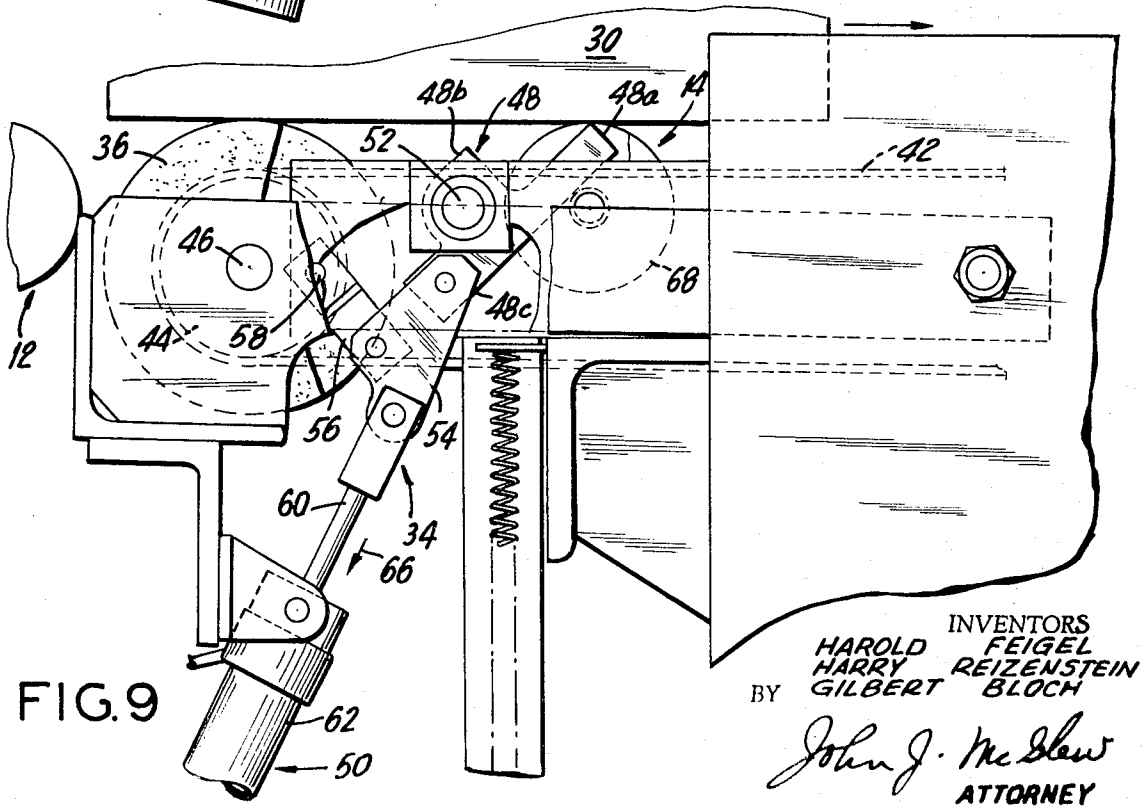


FIG. 9

INVENTORS
HAROLD FEIGEL
HARRY REIZENSTEIN
GILBERT BLOCH
BY John J. McGlew
ATTORNEY

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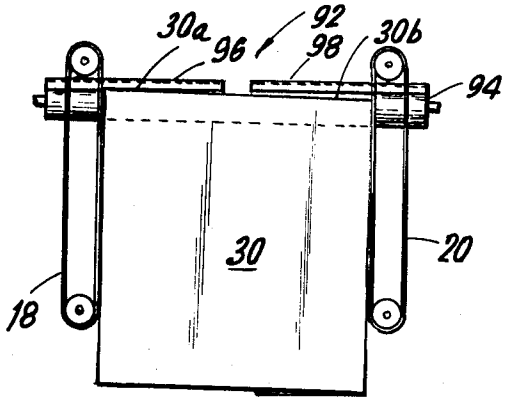


FIG. 10

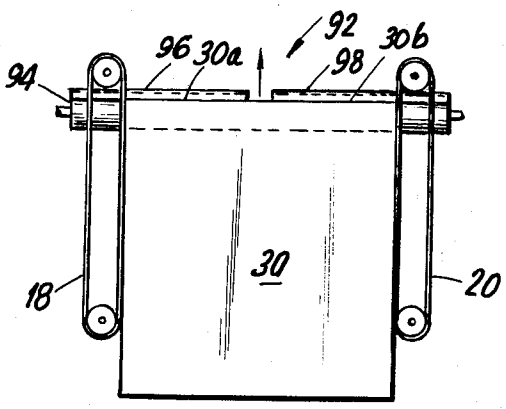


FIG. 11

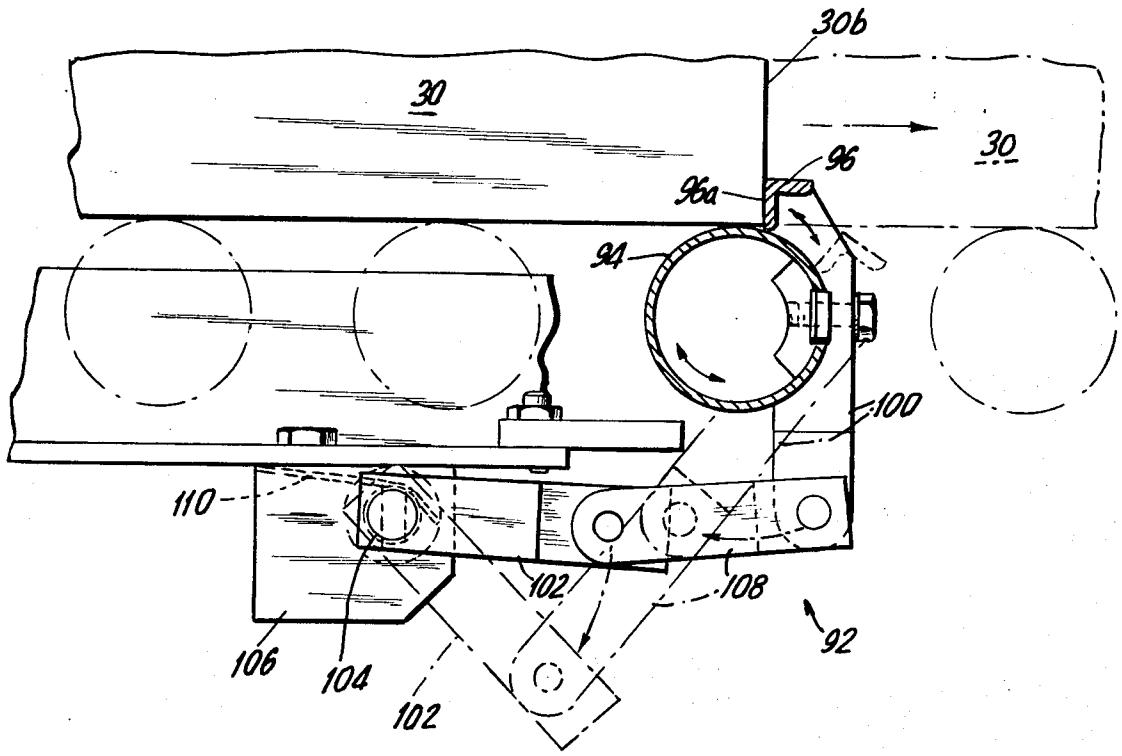


FIG. 12

INVENTORS
HAROLD FEIGEL
HARRY REIZENSTEIN
BY GILBERT BLOCH
John J. McGlew
ATTORNEY

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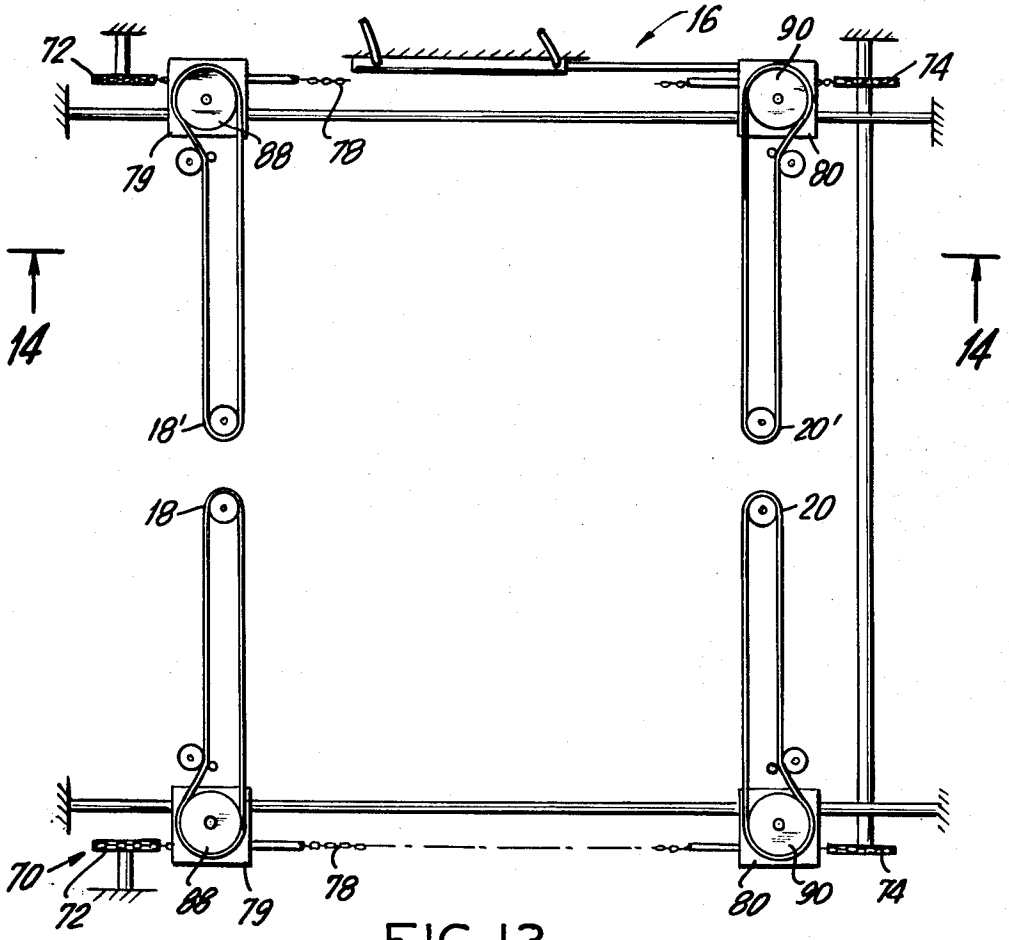


FIG. 13

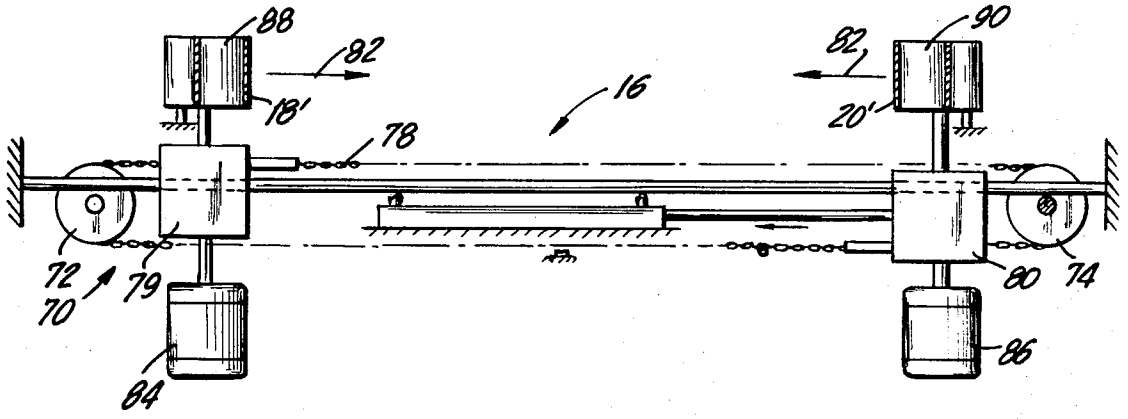


FIG. 14

INVENTORS
HAROLD FEIGEL
HARRY REIZENSTEIN
BY GILBERT BLOCH
John J. McGlew
ATTORNEY

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Patented Feb. 6, 1973

3,714,757

DEVICE FOR FEEDING AND FOLDING THE TRAILING TOP FLAP OF A CONTAINER FOR CLOSING THE CONTAINER

Harold J. Feigel, Teaneck, N.J., Harry S. Reizenstein, Bayside, N.Y., and Gilbert Bloch, Woodcliff Lake, N.J., assignors to FMC Corporation, Horsham, Pa.

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Int. Cl. B65b 7/20
U.S. Cl. 53—75 16 Claims

ABSTRACT OF THE DISCLOSURE

A device for feeding and closing a top trailing end flap of a container comprises a roller conveyor over which the container is adapted to be passed. The roller conveyor includes an inclined section leading to a top flap closure station which extends substantially horizontally. At the beginning of the horizontal section, there is a rotatable driven roller which engages and feeds the container only after a stop member is moved out of the way to permit passage of the container through the closing section. The stop member is moved downwardly out of the way only after a container, which has been previously closed, is moved to the end of the folding section. The stop returns upwardly to block the next container until the one being folded is completed. The device includes means for straightening the container and feeding it by engaging both sides thereof while the top flaps are folded. An apparatus for folding the trailing or rear end flap includes a plurality of rod members which are carried on blocks on a common support rod. Each block is connected to a fluid pressure piston-and-cylinder combination which is actuated in accordance with the position of the container to move the folding rod member downwardly to engage the trailing top end flap. As the container is moved over the conveyor, electric eye control means are connected to the respective fluid pressure cylinders for each rod member to cause the rod members to move downwardly in succession to engage and successively depress the rear flap until it is fully closed and to hold it downwardly until other means are operable to close the side flaps and other end flap.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates in general to the devices for closing containers and, in particular, to a new and useful device for feeding, aligning and subsequently folding the top trailing flap of a container as it is advanced along a conveyor.

Description of the prior art

Prior to the present invention, many devices have been known for folding the top flaps of a container after it has been filled with materials subsequent to its being seal-closed for shipment. A disadvantage of the known devices is that they do not operate with sufficient rapidity or the flaps are not folded in an even and precise manner so that the container is not properly sealed and, in some instances, the flaps become open again.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided a new and useful device for first feeding a container between side engagement elements after the container is first aligned in respect to the element so that the container is held squarely on a conveyor as it is being fed. With the inventive arrangement, the container is held in a precise feeding position and advanced in timed relationship to the operation of bar members which come downwardly from above the container and engage and successively deflect the top edge of the rear flaps downwardly to a fully folded position at which it is held until the other flaps are folded. The preferred embodiment of the invention includes means for preventing the feed of the new container during the time in which the rear flap of a container in the conveyor is being folded. The device includes an upstanding stop which blocks the infeeding of a container but which is depressible upon the arrival of the previous container at a position in which the rear flap is fully folded. The depressed stop rides under the container being treated and will only ride upwardly again after the container moves beyond the operation stage. The conveyor advantageously includes a driving roll located at the front of the rollers which are arranged in a row along the feed path. The driving roll does not contact the container which arrives at the horizontal conveyor from an inclined conveyor until the stop member is moved downwardly out of place so as to permit the container to move to a plane at which its bottom edge frictionally engages the driving roller.

The inventive construction includes an endless band on each side of the container which is driven by rollers having a vertical axis and which is moved into engagement with a side of the container from each side of the conveyor. The endless conveyors for engaging and driving the container from the side ensure that the container is held on the conveyor and that the container may be fed properly without being askew during its folding. In order to ensure that the container is arranged squarely on the conveyor in the first instance, the device includes means for retarding the movement of the container when it is offset so that the feeding belt on an opposite side will advance the container until it is squared, and then both conveyor belts will engage and move the container ahead.

Accordingly, it is an object of the invention to provide an improved device for successively folding the rear upright flap of a container into a horizontal closed position during its movement over a conveyor.

A further object of the invention is to provide means for blocking the entrance of the conveyor to the folding mechanism as the folding operation is begun.

A still further object of the invention is to provide means for squaring the container for precise feeding through a folding apparatus which includes a plurality of successively operated folding rods which engage the flap and successively move it downwardly to a closed position.

A further object of the invention is to provide a method of folding a trailing flap of a container which comprises straightening the container so that it is aligned at a feeding station, engaging each side of the container and feeding it straight through the feeding station in an aligned position, and during the feeding, successively folding the trailing flap downwardly by successively engaging the flap with members arranged along the length of the feeding path.

A further object of the invention is to provide a device for folding the flaps of a container which is simple in design, rugged in construction, and economical to manufacture.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its uses, reference should be had to the accompanying drawing and descriptive matter in which there is illustrated a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a partial top rear perspective view of a device for folding the top trailing end flap of a container as it is fed constructed in accordance with the invention;

FIGS. 2, 3, 4 and 5 are views similar to FIG. 1, showing the container in various advanced stages of operation;

FIG. 6 is a partial sectional view taken along the line 6—6 of FIG. 1;

FIG. 7 is a partial top plan view of the device shown in FIG. 1;

FIG. 8 is a section taken along the line 8—8 of FIG. 7;

FIG. 8*a* is an enlarged elevation of the toggle mechanism shown in FIG. 8;

FIG. 9 is a view similar to FIG. 8 showing the parts in an advanced stage of operation;

FIG. 10 is a schematic top plan view indicating the manner in which the container feed is operated to correct the position of the container;

FIG. 11 is a view similar to FIG. 10 with the container moved back into a correct position;

FIG. 12 is a section taken along the line 12—12 of FIG. 7;

FIG. 13 is a schematic plan view of the side feed mechanism indicating the manner in which it is moved inwardly and outwardly; and

FIG. 14 is a section taken along the line 14—14 of FIG. 13.

GENERAL DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing in particular, the invention embodied therein comprises, a container closing device, generally designated **10**, which includes an inclined roller conveyor portion, generally designated **12**, and a horizontal roller conveyor portion **14**. Associated with the horizontal roller conveyor is a container side feeding mechanism, generally designated **16**, which includes endless belts **18** and **20** on respective opposite sides which engage the side of the container and hold it on the roller conveyor and in a proper alignment while the container is operated upon by various closure elements to close all of the top flaps **22**, **24**, **26** and **28** of a container, generally designated **30**, as it is fed. Of the various elements for closing the top flaps, the present invention is concerned principally with trailing or rear top flap closure means, generally designated **32**, which is arranged on one side of the horizontal conveyor portion **14**.

In accordance with one feature of the invention, container arresting means, generally designated **34** (FIGS. 1, 8 and 9), are located between a first rotatable drive roller, generally designated **36**, of the horizontal conveyor portion **14**, and the remaining rollers which are not driven. The drive roller is continuously rotated by a motor **38** driving through a pulley **40**, belt **42** and pulley **44**, which is affixed to a shaft **46** of the drive roller **36**, as shown in FIG. 1.

As best indicated in FIGS. 8, 8*a* and 9, a container or box such as a container **30** moves downwardly by gravity along the rollers of the inclined roller conveyor **12** until it moves against a stop member **48** of the container arresting means, generally designated **34**, as shown in FIG. 8. In this position of the container **30**, it does not contact the drive roller **36** so that it is not in frictional engagement therewith and therefore it is not driven. The stop member **48** comprises a lever having a stop arm portion **48***a* which extends upwardly for engagement with the container which is moved out of the path of the container by an operating device **50** after a previously closed container is moved off the horizontal conveyor portion **14**. The stop member **48** also includes an intermediate hub portion **48***b* which is rotatable on a fixed pivot **52** which

is mounted in a side frame of a horizontal conveyor portion **14**. An opposite arm portion **48***c* is connected to a toggle central piece **54** which is also pivotally connected to a toggle arm **56** which in turn is pivoted on a fixed pivot **58**. The central toggle piece **54** is pivoted to a piston rod **60** of the actuating device **50** which includes a fluid cylinder **62**, in which the piston secured to the rod **60** is pivotal. When the actuating device **50** is actuated through an electrical connection **64** upon response to a signal generator by the container which moves through the horizontal conveyor **14**. It moves the piston rod in the direction of the arrow **66** to withdraw the central toggle member **54** downwardly and to cause the pivoting of the stop member **48** so that the forward arm portion **48***a* is moved out of the position blocking the container **30**. This permits the container **30** to move forwardly enough to rest on the first roller **68** of the horizontal container portion **14**. In this position as shown in FIG. 9, a portion of the container **30** rests on a drive roller **36** which causes the container to move forwardly into the horizontal conveyor.

When the container is in position on the horizontal conveyor as shown in FIG. 1, the side feeding conveyor belts **18**, **18'** and **20**, **20'** are moved inwardly by a lateral shifting mechanism generally designated **70** (FIG. 14) until the endless conveyor belts **18** and **20** and **18'** and **20'** engage the sides of the container **30** as the container is moved into alignment therewith. The lateral shifting mechanism **70** includes two laterally spaced guide pulleys **72** and **74** one of which is driven by an automatically controlled motor to cause movement of an endless chain **78** which is guarded around the pulleys to be moved. The chain is connected to mounting blocks **79** and **80** respectively for each endless conveyor belt system which are shifted by corresponding amounts in the same directions, for example, inwardly as indicated by the arrows **82**. Each mounting block **79** and **80** provides a mounting bearing for the drive shaft of separate motors **84** and **86** for driving drive pulleys **88** and **90** of the respective endless drive belts **18** and **20**. The endless belts **18** and **20** engage the respective sides of the container **30** and are oriented to accurately drive the container in even amounts over the roller conveyor **14** and to urge the container **30** downwardly onto the rollers as it is advanced.

As seen in FIGS. 10 to 12, a further feature of the invention is the provision of container feed alignment means generally designated **92** which comprises a roller **94** of the roller conveyor **14** which is provided with an upstanding angle stop member **96** and **98** at each side with a front face **96***a* and **98***a* respectively which is arranged precisely normal to the feed direction. When a container **30** arrives on the conveyor **14** in a position in which it is askew so that a front edge **30***a* on one side is ahead of a front edge **30***b* on the opposite side, the edge **30***a* will strike the angle member **96** and cause the roller **94** to rotate so that the angle member moves downwardly. This rotation is carried out only after some delay and against the force of biasing means in the form of a toggle mechanism, which includes a lever portion **100** affixed to the roller **94** and a lever portion **102** rotatable on a pivot **104** on a bracket **106** and an intermediate toggle link **108**, pivoted at its respective ends to the respective levers **102** and **100**. A torsion spring **110** held by the bracket **106** biases the toggle linkages so that rotation of the roller **94** from the position indicated in FIG. 12 to the dotted line position shown in that figure is inhibited.

Once the edge **30***a* contacts the angle member **96** the conveyor **18** slips in respect to its driving contact with the container **30** and the other belt **20** continues to drive until the container moves up to the angle member **98** and deflects it downwardly also. At this stage both of the conveyor belts **18** and **20** again engage the container and feed it in a straightened condition.

As shown in FIG. 7 after the container starts feeding through the conveyor the front of the container moves over a scanning element, which is a photoelectric cell **110**. The cell **110** is covered by the front edge of the container to actuate drive means associated with the lateral shifting mechanism for the side feeding conveyors **18** and **20** to cause rotation of the pulley **72** and **74** to begin shifting movement of the conveyors in the directions of the arrows **82**, shown in FIG. 14, to engage and feed the container **30**. The container **30** is moved until the rear thereof moves off a scanner **112** which is connected to a transducer or actuator **114** (FIG. 1) which is connected to each one of a plurality of fluid pressure cylinders **116***a*, **116***b* etc. of the rear top flat closure means generally designated **32**. Each fluid cylinder **116** includes a movable piston therein which is connected to a rod **118***a* which in turn is connected as indicated in FIG. 6 to a block member **120** which is pivotal on a pivot member or rod **122** supported in a side frame **124**. A trailing flap contacting element **126** is adjustably positionable in the block **120** and it extends outwardly therefrom in a direction toward the roller conveyor **14**. Each arm **126** includes an offset portion **126'** which extends generally forwardly in the direction of container feed. The actuator **112** causes pivotal movement of the block by admission of pressure through a line **128** (FIG. 1) to the associated fluid cylinder **116***a* to cause the first arm to move downwardly from the position shown in FIG. 1 to the position shown in FIG. 2 and begin folding the rear or trailing flap **22**.

When the container passes an actuator or scanner **129**, the side conveyors **18** and **20** are maintained in the closed feeding position. When it passes an actuator or a scanner **130** it again actuates the actuator member **114** (FIG. 1) to move the next arm or rod **118***b* downwardly to continue the folding action on the trailing top flap **22**. Actuator **132** causes downward movement of the arm **118***c* to provide a still further folding action on the rear top flap **22**. A last actuator or scanner **134** (FIG. 7) causes the downward movement of the arm **118***d* which completes the folding of the flap **22** and holds it in a folded condition until the remaining flaps **24**, **26** and **28** are folded. In the meantime, an actuator **136** triggers a mechanism (not shown) for positioning a deflecting member **140** carried on an elevator **142** (FIG. 5) so that it will contact and fold inwardly the forward top flap **24**. The complete closing device includes means for folding the side flaps **26** and **28** which are not shown.

Each block **120** for the rear flap contacting arms **126** is biased by a spring **144** as shown in FIG. 6 which is engaged between the block in a fixed bracket **146** to an upward position clearing the top of the trackway **14**.

The invention provides a device for accurately positioning and aligning the container **30** so that it may be fed along a feed path while it is engaged in succession by a plurality of arms for deflecting the trailing rear flap of the top of the container downwardly into a closed position as the container is fed very rapidly. The device affords a very accurate and quick operating means for closing a trailing flap at the top of a container so that it will arrive in position so that the front flap and the side flaps may be folded quickly and accurately thereafter. The mechanism is accurate and ensures the precise positioning of the flap when it is closed and it permits the rapid transmission of the container into association with the next operating devices for closing the remaining flaps. Once a container is in the conveyor **14** in a position for operation thereof by the closing mechanism, it is ensured that no other container will feed into the device until the container being operated upon moves out and in this way it is ensured that containers will be accessively fed without requiring operator attention along and down an inclined conveyor into association with the closing apparatus and the closing apparatus will operate on the containers in succession as rapidly and accurately as possible to completely close them.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. A device for feeding and closing a top trailing end flap of a container, comprising a means for moving a container along a defined feed path, a plurality of closure arm members located along said feed path, and means responsive to movement of said container along said feed path to move each arm in succession into engagement with the trailing top flap to progressively move it downwardly into a closed position.

2. A device, according to claim **1**, wherein said means for moving said container along a defined trackway comprises a roller conveyor over which the container is movable, mounting means for said closure arms permitting independent movement thereof downwardly over said roller conveyor to contact the top rear flap and successively to apply a downward enclosing pressure thereto, said means for moving each arm in succession comprising an actuator for each arm located along said conveyor.

3. A device, according to claim **2**, including stop means at the entrance to said roller conveyor for stopping each new container which arrives and means responsive to the movement of a previous container along said roller conveyor by a predetermined amount to move said stop means to permit movement of the new container into said roller conveyor.

4. A device, according to claim **1**, including side feed means for the container comprising first and second endless belts engageable with the container from opposite sides thereof, means for rotating said belts to cause said belts to frictionally engage the sides of the container and means for moving said belts inwardly and outwardly to adjust to the width of the container being fed.

5. A device, according to claim **4**, including container feed straightening means located along said roller conveyor and engageable with said container to hold said container to effect even feeding thereof.

6. A device, according to claim **5**, wherein said feed straightening means includes a member on each side of said container along the feed path thereof and positioned to contact the leading side of the container and if a side is fed prior to the other side to hold the container while the feed of the other side is advanced to bring the container into alignment.

7. A container closing device comprising, a generally horizontal roller conveyor, an inclined roller conveyor connected to one end of said horizontal roller conveyor, container stop means at the location between said inclined conveyor and said horizontal roller conveyor, side feed means on each side of said conveyor for engaging each respective side of said container and for feeding the container over said roller conveyor, and straightening means located over said roller conveyor engageable with either side of said container in accordance with which side is first moved thereagainst and retarding said side feed means on the side of the container which first contacts said means until the other side is fed into alignment therewith by said side feed means on said other side.

8. A device, according to claim **7**, including a plurality of closure members located along said roller conveyor for successively contacting the rear flap of a container fed thereon and for moving it progressively into a horizontal closed position.

9. A device, according to claim **8**, including a plurality of actuator elements located along said roller conveyor in a number corresponding to the number of said closure members and being actuatable by movement of said container along said conveyor to actuate each of said closure members in succession upon advance movement of said container.

10. A device, according to claim 9, wherein said actuator elements comprise a plurality of rod members pivotally mounted alongside said conveyor, a fluid pressure operated piston and cylinder combination associated with each of said rod members for pivoting said rod member to move it between an upper position above the container on the conveyor and in a downwardly position in engagement with the rear flap.

11. A device, according to claim 10, wherein said actuator comprises photocell means located in said roller conveyor underlying the container movable thereon and being actuatable by the movement of the container thereover and including spring means biasing said rod member to an upward position.

12. A device, according to claim 8, including first and second endless conveyors engageable with said container from each side and comprising said side engagement means for feeding said container, an individual motor connected to each of said conveyors for rotating said conveyor belts at a continuous driving speed, said belts being frictionally engageable with the respective sides of the container, and a drive roller at the entrance end of said roller conveyor and means for rotating said drive roller continuously.

13. A device, according to claim 12, wherein said stop means holds said container so that it does not engage said drive roller, and means connected to said stop means to move it out of a locking location for said container to permit said container to move downwardly into engagement with said drive roller and so that it is advanced by said drive roller into said roller conveyor.

14. A device, according to claim 13, wherein said stop means comprises a toggle lever having an upstanding finger forming a blocking edge in the path of movement of said conveyor and fluid pressure operating piston and cylinder means connected to said toggle lever for moving said lever to a downward position to cause the finger to move downwardly below the roller conveyor and permit movement of the container thereover.

15. A device, according to claim 7, including a roller member of said roller conveyor having two spaced angle portions thereon extending upwardly in a position adjacent each side to contact any leading side of the container, spring means biasing said roller against movement, said container being movable along said roller conveyor to contact with its leading edge a first one of said angle members, the first contacted said angle member holding said leading side until the opposite side is fed by said side feed means to advance the opposite side into alignment with the first side.

16. A device, according to claim 15, wherein said roller angle member comprises a lever arm and a toggle linkage connected to said lever arm, and means biasing said toggle linkage in a direction to prevent rotation of said roller, said toggle linkage being openable upon predetermined force on said roller to permit rotation of said roller to a position at which said angle member does not block a container.

References Cited

UNITED STATES PATENTS

3,085,376	4/1963	Ferguson et al.	53—75
3,374,604	3/1968	Roesner et al.	53—75

TRAVIS S. McGEHEE, Assistant Examiner

U.S. Cl. X.R.

53—374