Nov. 9, 1971 C. H. KREBS 3,618,291

WRAP-AROUND PACKAGING APPARATUS

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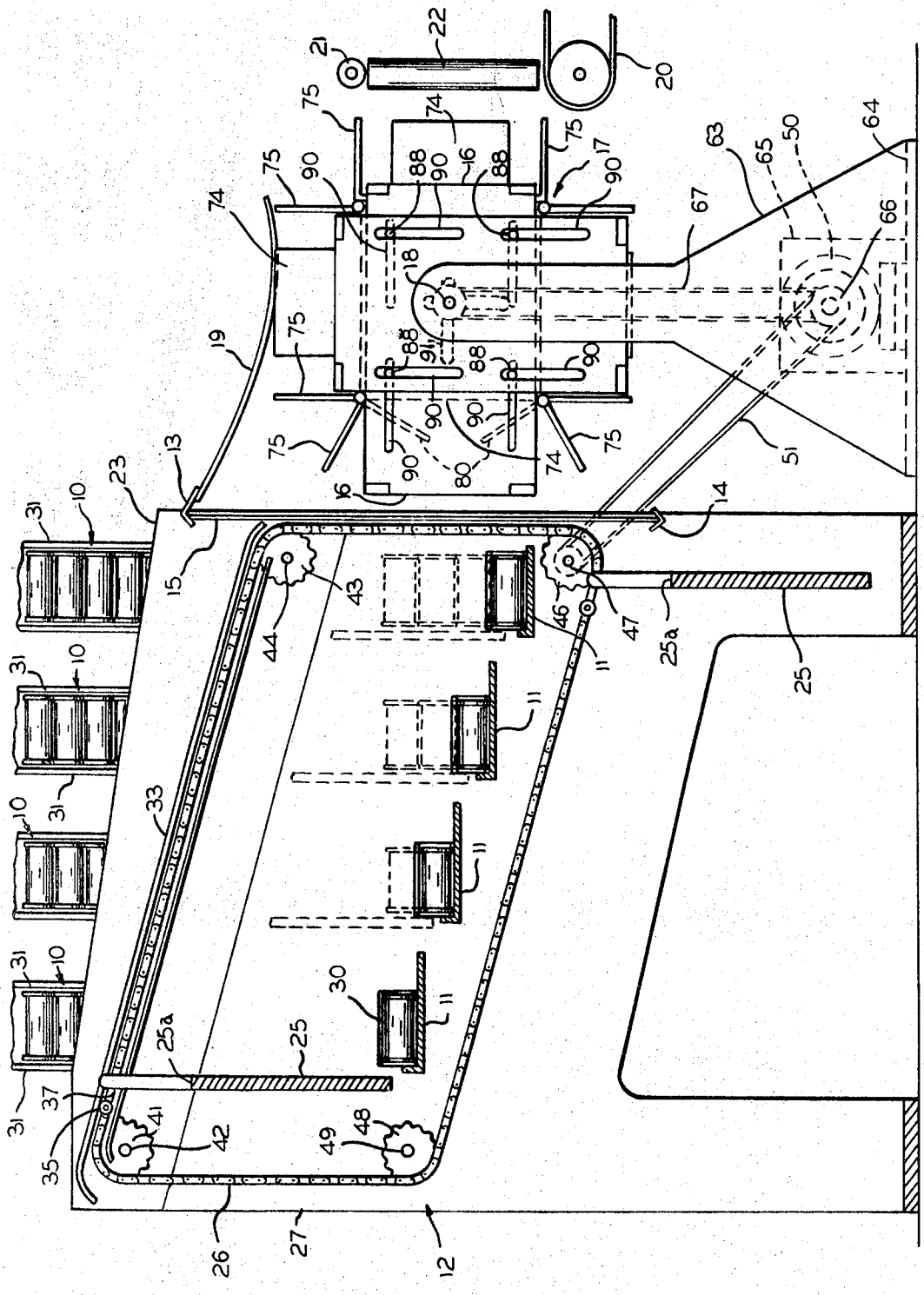


FIG. 1

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Nov. 9, 1971 C. H. KREBS 3,618,291

WRAP-AROUND PACKAGING APPARATUS

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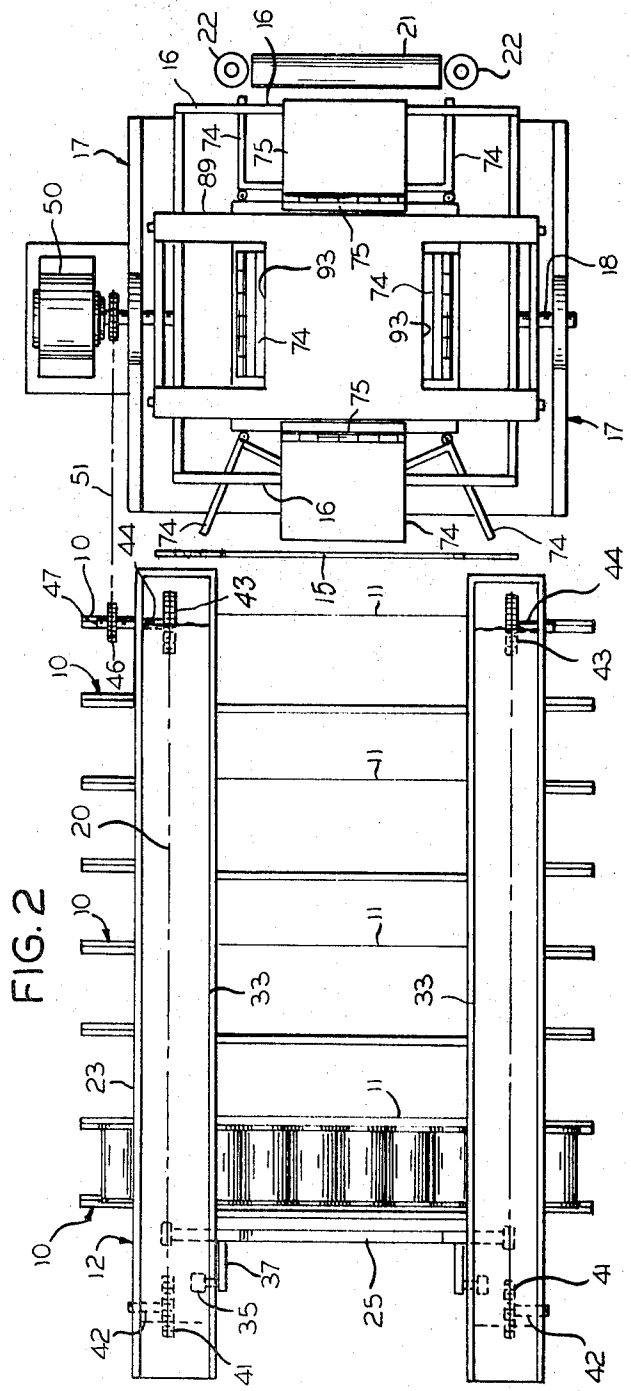


FIG. 2

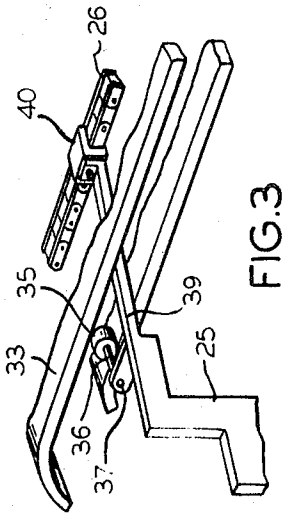


FIG. 3

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Nov. 9, 1971 C. H. KREBS 3,618,291

WRAP-AROUND PACKAGING APPARATUS

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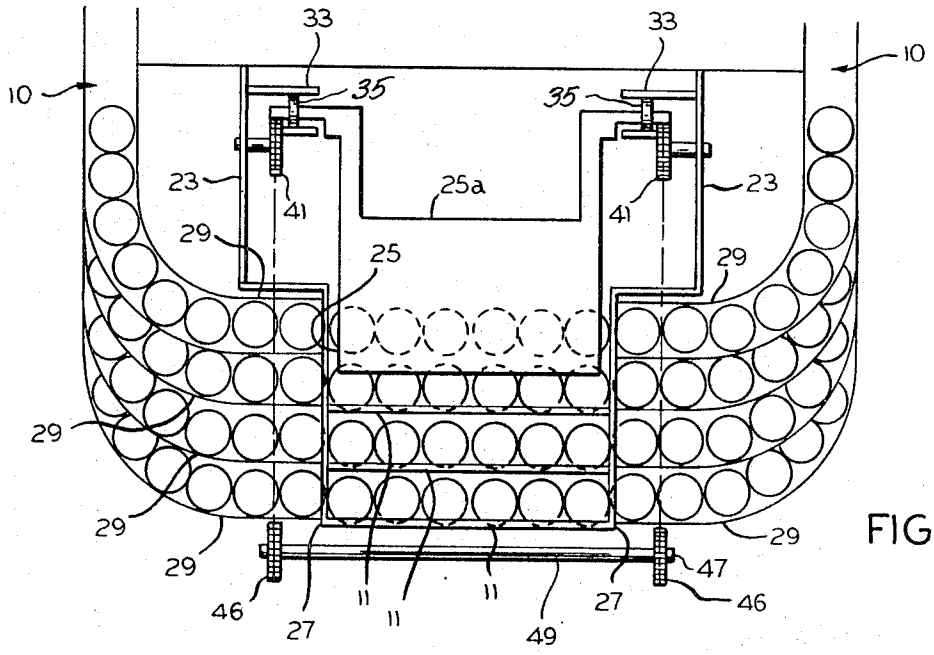


FIG.4

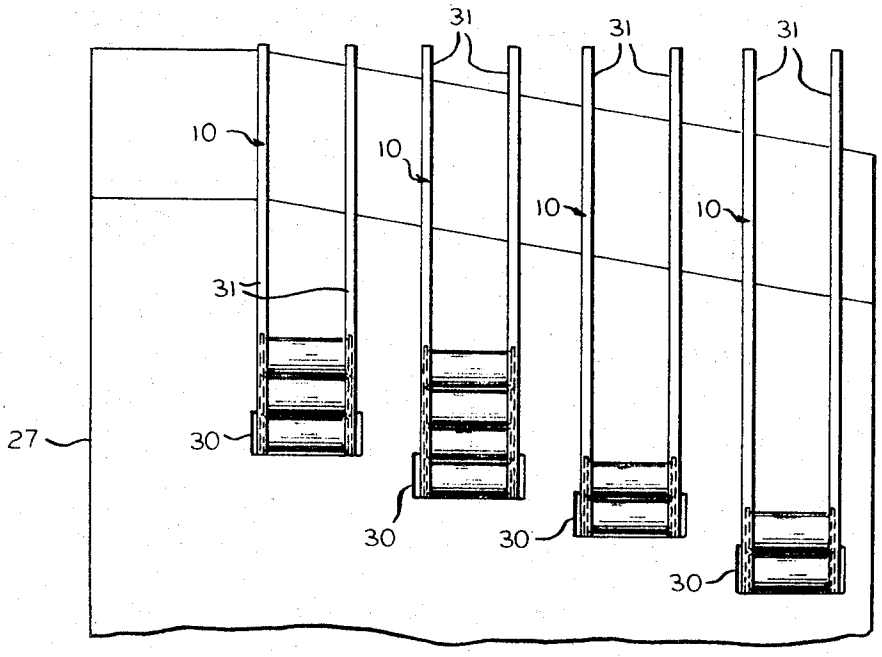


FIG.5

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Nov. 9, 1971 C. H. KREBS 3,618,291

WRAP-AROUND PACKAGING APPARATUS

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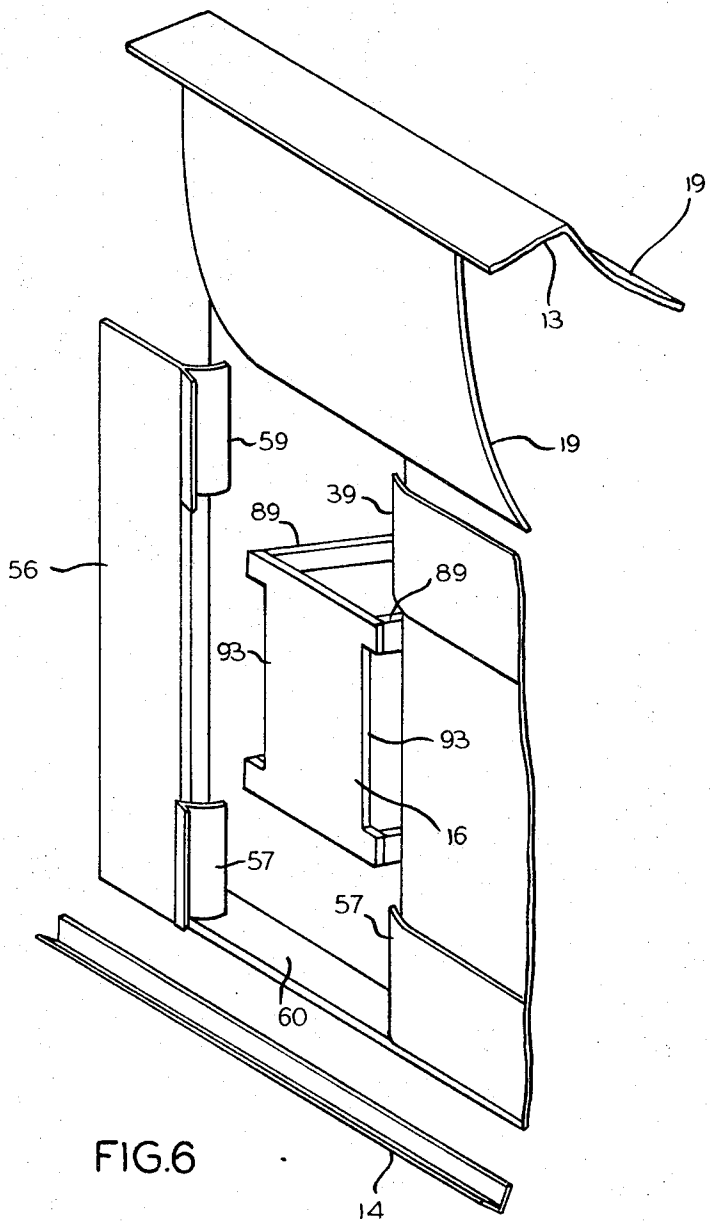


FIG.6

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Nov. 9, 1971 C. H. KREBS 3,618,291

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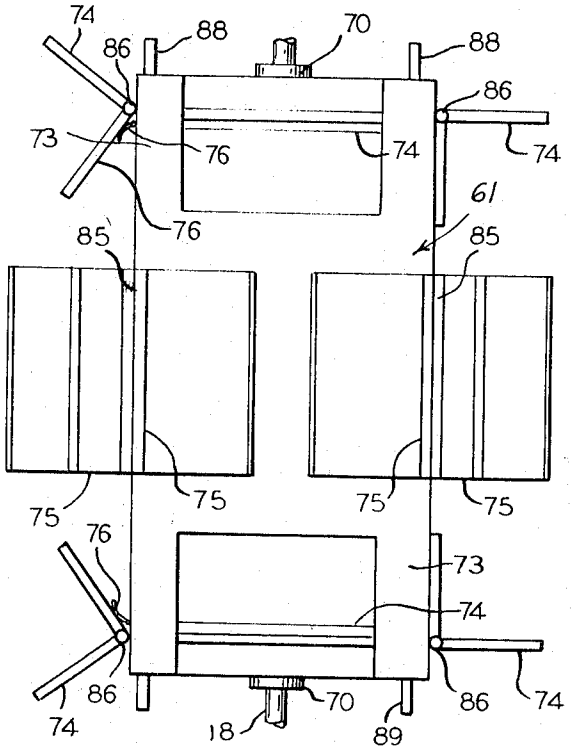


FIG.8

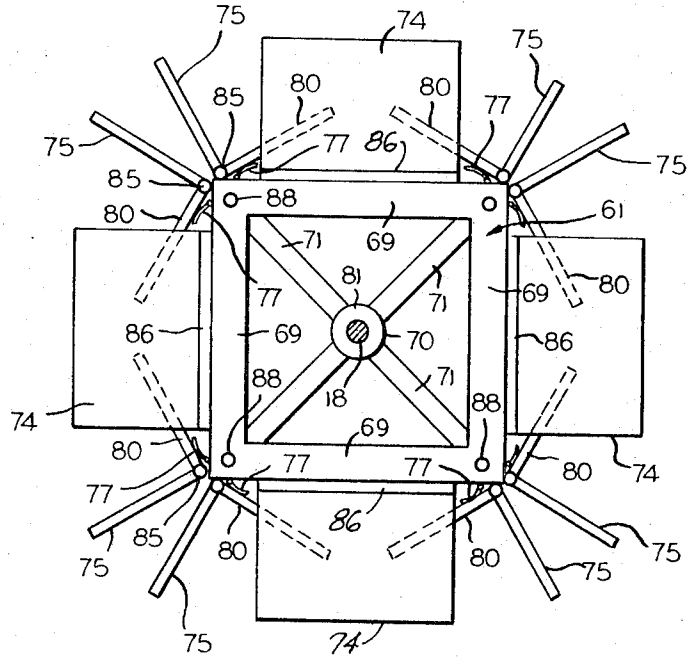


FIG.7

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Nov. 9, 1971 C. H. KREBS 3,618,291

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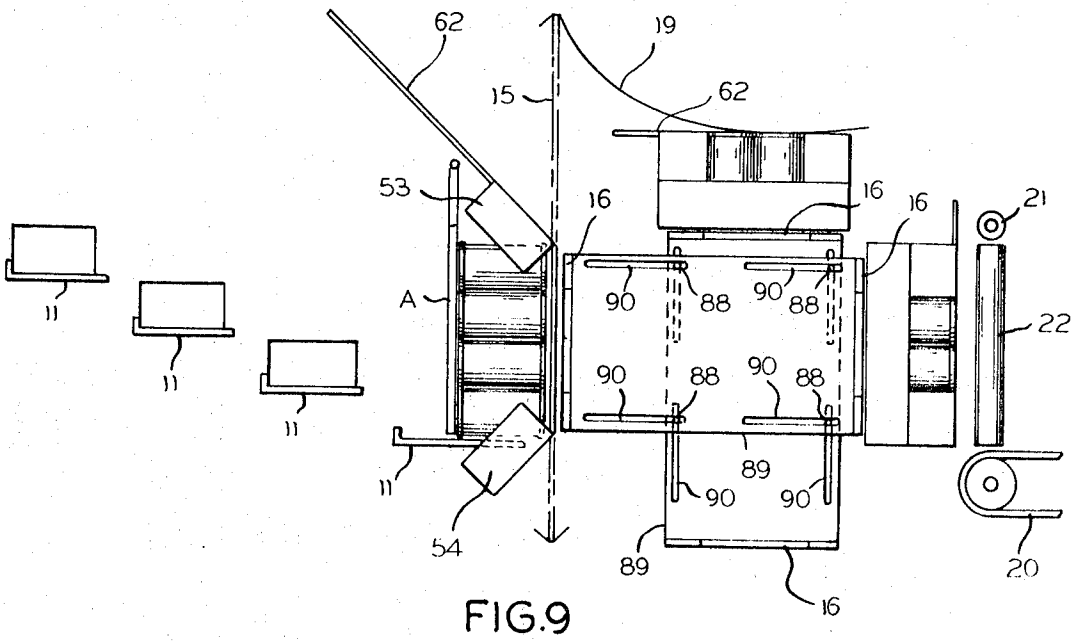


FIG.9

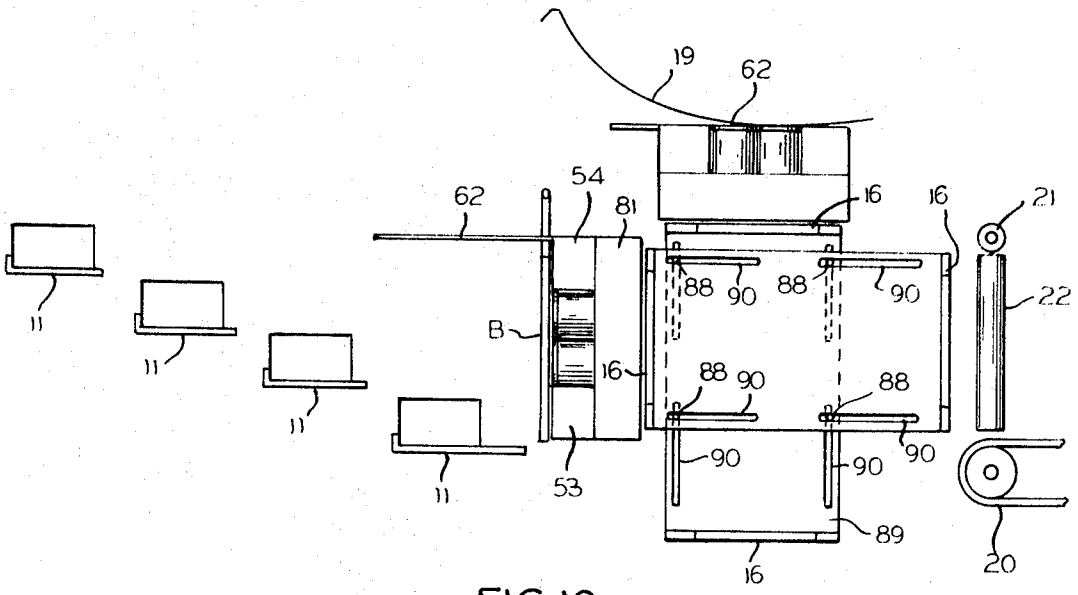


FIG.10

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Nov. 9, 1971 C. H. KREBS 3,618,291

WRAP-AROUND PACKAGING APPARATUS

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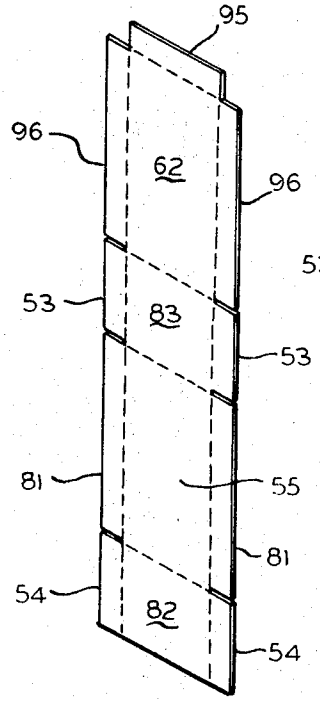


FIG.11

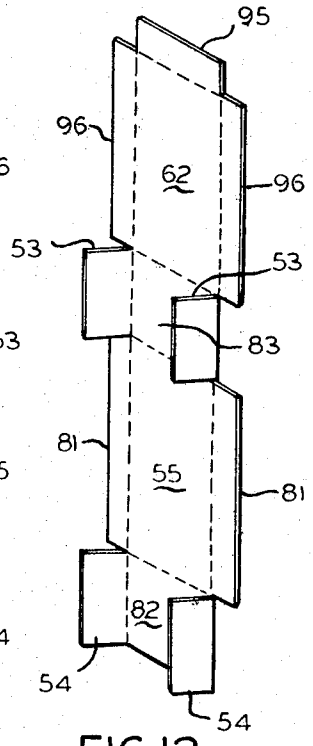


FIG.12

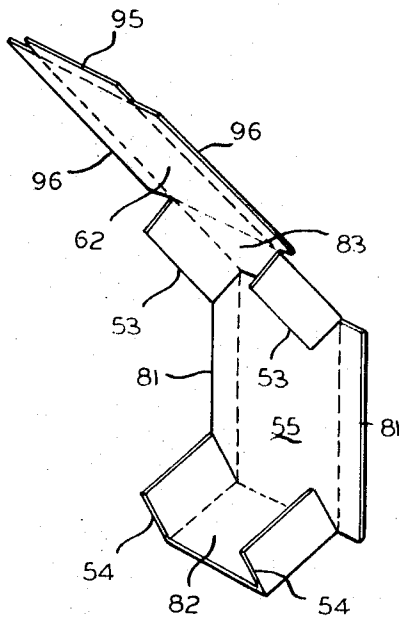


FIG.13

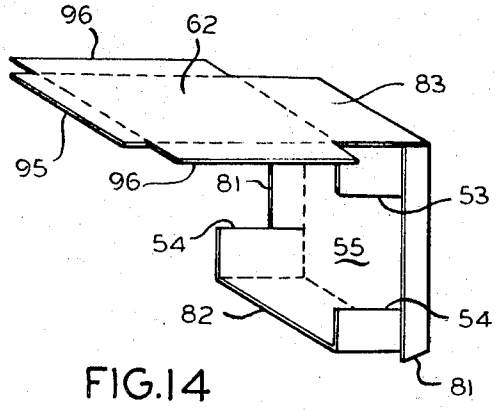


FIG.14

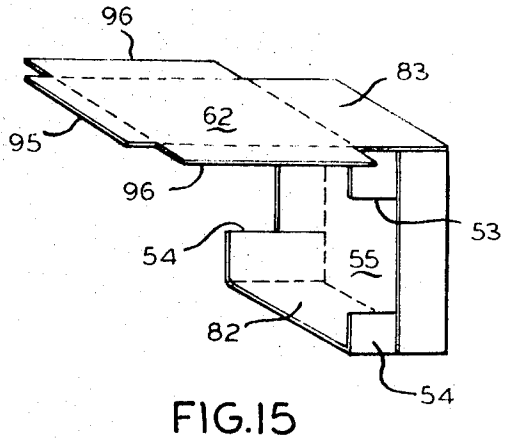


FIG.15

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WRAP-AROUND PACKAGING APPARATUS

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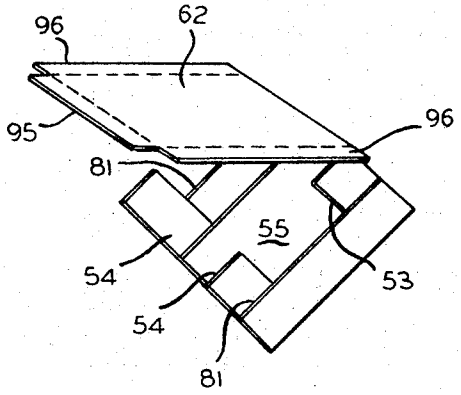


FIG.16

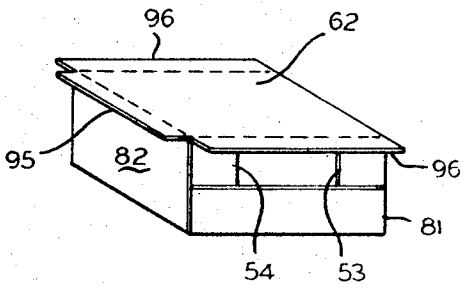


FIG.17

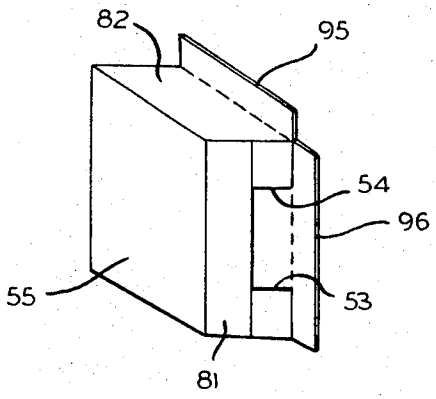


FIG.18

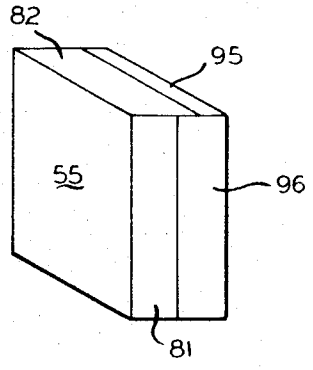


FIG.19

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United States Patent Office 3,618,291
Patented Nov. 9, 1971

3,618,291

WRAP-AROUND PACKAGING APPARATUS

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Filed Dec. 8, 1969, Ser. No. 883,033
Int. Cl. B65b *11/38, 35/50;* B65g *57/11*
U.S. Cl. 53—159 21 Claims

ABSTRACT OF THE DISCLOSURE

Wrap-around packaging apparatus including an accumulator station for articles to be packaged, such as cans, a series of gravity chutes to supply cans to tiered shelves in the accumulator station. A conveyor having a pusher flight depending therefrom has a downwardly inclined run conforming to the elevations of the tiered shelves and drives the flight in a downwardly inclined direction to stack the cans on the rearwardmost shelf on top of those on the next forwardly spaced shelf and pushes the stacked cans into a blank carried by a blank guide at the front of the accumulator station. A rotatable packaging unit is disposed in front of the blank guide and has diametrically opposed back-up members backing up a blank and articles to be stacked as pushed against said back-up member. Folders are carried by the packaging unit and are actuated by the back-up member to fold the blank about the article. The packaging unit is rotated in steps of 90° with a dwell at each step, and positions the package into a horizontal position where the lid is folded over the top of the package and then into a vertical position where the back-up member actuated by the pusher ejects the package past folding plows, folding and sealing the lid to the side and front of the package.

SUMMARY AND OBJECTS OF INVENTION

A principal object of the present invention is to improve upon the packaging of cans and the like by providing mechanism to supply the cans to a flat blank and force the cans and blank to a wrapping unit in a continuous operation.

Another object of the invention is to improve upon the apparatus heretofore used in the packaging of cans by providing a continuous motion apparatus maintaining a continuous supply of cans, stacking the cans for packaging in a simplified manner and effecting the packaging of the cans by the wrapping of a flat corrugated blank about the cans in a more facile manner than formerly.

A still further object of the invention is to improve upon the apparatus for packaging cans and the like by providing a new and improved apparatus for stacking, supplying and packaging cans, arranged with a view towards utmost efficiency in construction and operation.

Still another object of the invention is to provide an improved form of packaging unit for cans and the like by arranging the unit to wrap a flat slit blank about the cans as the unit is rotatably moved in steps and by utilizing the initial force for wrapping the blank about the cans to effect the ejection of cans from the unit.

Still another object of the invention is to provide a simple and compact packaging apparatus for cans and the like in which delivery of the cans to the apparatus is by gravity and the operation of stacking and packaging the cans is a continuous substantially straight line operation.

Still another object of the invention is to provide an improved form of packaging apparatus for cans materially increasing the packaging speed of the cans by utilizing

gravity and a continuous motion to stack and package the cans.

Other objects, features and advantages of the invention will be readily apparent from the following description of a preferred embodiment thereof, taken in conjunction with the accompanying drawings, although variations and modifications may be effected without departing from the spirit and scope of the novel concepts of the disclosure.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a digrammatic view in side elevation of a packaging apparatus constructed in accordance with the principles of the present invention with certain parts of the apparatus removed and certain other parts shown in longitudinal section.

FIG. 2 is a diagrammatic plan view of the apparatus shown in FIG. 1 with the blank guide and certain other parts removed in order to simplify the illustration of the apparatus.

FIG. 3 is a partial fragmentary perspective view illustrating the conveyor and pusher construction for stacking the cans and pushing the cans into a blank, and showing the means for retaining the pusher into a vertical pushing position during the stacking and pushing operation thereof.

FIG. 4 is a fragmentary diagrammatic end view of the can supply chutes and accumulator with certain parts shown in transverse section.

FIG. 5 is a fragmentary diagrammatic side view illustrating the arrangement of the can supply chutes delivering cans to the accumulator by gravity.

FIG. 6 is a diagrammatic perspective view illustrating the blank guide and folding plows for certain initial folding operations of the blank, and a flexible folder, for folding the lid of the blank in position arranged for packaging a fewer number of cans than the apparatus of FIG. 1.

FIG. 7 is a diagrammatic fragmentary end view of the rotary packaging unit shown in FIGS. 1 and 2, with certain parts removed and certain other parts shown in vertical section.

FIG. 8 is a top plan view of the packaging unit shown in FIG. 7, with certain parts removed and certain other parts broken away.

FIG. 9 is a diagrammatic view illustrating the pushing of the cans in the blank guide and rotary packaging unit, and the ejection of packaged cans from the unit.

FIG. 10 is a view somewhat similar to FIG. 9, but showing the package in a partially folded condition; and

FIGS. 11, 12, 13, 14, 15, 16, 17, 18 and 19 are perspective views, illustrating the progressive steps of folding the carton blank about a series of articles and the closure of the blank about the articles, with the articles being packaged, not shown for the purposes of simplicity.

DESCRIPTION OF PREFERRED EMBBODIMENT OF INVENTION

In the embodiment of the invention illustrated in FIGS. 1 and 2 of the drawings, a can accumulating and packaging apparatus is diagrammatically shown as including a series of can supply chutes **10**, maintaining a continuous supply of cans by gravity, to a series of tiered shelves **11** of an accumulator **12**.

Horizontally extending and vertically spaced blank guides **13** and **14** are spaced at the forward end of the accumulator **12** and guide and hold flat slit and creased corrugated board blank **15** in position to have a group of cans of a preselected number pushed thereinto into engagement with a backing member **16** of a rotatable can packaging unit **17**. The rotatable can packaging unit **17** is

rotatably driven in steps of 90° by a suitable intermittent drive mechanism, to hold the backing member **16** in position to back-up a blank and group of cans and to accommodate retractable movement of said backing member by pushing the blank and cans thereinto, to move a diametrically opposed backing member **16** to eject the packaged cans from the wrapping unit, and effect the closing of the flaps of the lid of the package. Upon completion of this operation, the unit rotates a step of 90° to effect closing of the lid of the package over the packaged cans and then rotates another step of 90° to complete the wrapping of the package, as the package is ejected to a delivery station **20** along a transverse upper folding roller **21** and horizontally spaced vertically extending folding rollers **22**, positioned forwardly of the packaging unit along each side of the path of travel of the package, as shown in FIG. 2 of the drawings.

The accumulator **12** includes the tiered or stepped shelves **11, 11** spaced downwardly and forwardly of each other, as they extend toward the front of the accumulator and spaced apart distances substantially less than the length of the cans, when on the shelves **11**. The accumulator also includes two pushers **25** hanging down from laterally spaced conveyor chains **26**, the top material progressing run of which extends in an inclined path inclined downwardly toward the forward end of the accumulator and generally conforming to a line extending along the forward edges of the tiered shelves **11, 11**. The endless chains **26** are shown as traveling in a parallelogram pattern although they need not necessarily travel in such a pattern, as long as the upper runs of the chains are inclined to conform to the vertical and longitudinal spacing of the tiered shelves **11, 11**.

Cans are supplied to the tiered shelves **11, 11** by the gravity chutes **10** extending along the outsides of side plates **27** for the accumulator.

As shown in FIG. 4, the gravity chutes have curved lower end portions converging into horizontal delivery chute portions **29** opening through slots **30** in the side walls **27** of the accumulator. The slots **30** open to opposite ends of the tiered shelves **11** to accommodate cans to be supplied to said shelves by gravity. The bottoms of the slots or openings **30** are spaced above the top surfaces of the tiered shelves **11** a slight distance, to prevent cans from rolling back into the gravity chutes, particularly where the chutes may be empty or partially empty. The gravity chutes **10** are shown diagrammatically as formed from a plurality of angle irons **31**, providing open chutes, for retaining the cans thereto to be released as a pusher **25** pushes a row of cans on one tiered shelf **11** on top of a row of cans on a second tiered shelf **11**. While only two angles are shown for each chute (FIGS. 1, 2 and 5), it should be understood that the chutes may be formed from four spaced angles. The chutes may be supplied with cans by conventional conveyors and of themselves are no part of the present invention, so need not herein be described further.

As shown in FIGS. 1 and 2, the endless conveyor chains **26** each have a cam track **33** spaced inwardly of said top run and registering therewith and engaged by a follower roller **35** suitably journalled on a shaft **36** extending outwardly of an arm **37**. The cam tracks **33** are suitably secured to outwardly stepped portions **23** of the side plates **27**. Said cam tracks extend along the downwardly inclined top runs of the chains **22** to the down-running runs thereof. The arm **37** in turn extends rearwardly of a reduced arm portion **39** of the hang-down flight **25**. The reduced arm portion **39** of the hang-down flight **25** extends through the cam track **33** and is slidably guided thereby and is pivotally connected at its outer end to an attachment **40** on the conveyor chain **26**, it being understood that arms **39** extend from each side of the hang-down flights **25** and are connected with the parallel spaced conveyor chains **26** in a similar manner. The cam tracks **33**, arms **37** and followers **35** thus retain

the hang-down flights **25** in a vertical position to serve as a pusher during travel thereof to the forward end of the accumulator to push a row of cans from the top shelf **11** onto a row of cans on the next forwardly spaced lower shelf **11**, and so on until four rows of cans are stacked on the forwardmost shelf **11**. The pusher **25**, still retained in its vertical pushing position, then serves to push the stacked rows of cans into the carton blank **15** and push the blank into engagement with an associated backing member backing up the blank and retractably moving said backing member to effect the wrapping of the carton blank around the cans. As one backing member is retracted it will extend the opposite backing member **16** to deliver a packaged group of cans to the delivery station **20** and fold down the side and end flaps of the lid, as passing to the delivery station.

The chains **26** are trained about upper idler sprockets **41** on stub shafts **42**, and downwardly of said idler sprockets in parallel relation with respect to the cam track **33**, about forward idler sprockets **43**, on stub shafts **44**. From thence, the chains **26** extend vertically downwardly to and about drive sprockets **46**, on a drive shaft **47** (FIG. 1). The drive shaft **47** extends across the accumulator beneath the forwardmost tiered shelf **11** for driving the opposite conveyor chain **26**, so the two conveyor chains **26** will be driven together at the same rates of speed. From thence, the chains **26** are shown as inclined upwardly to and about idler sprockets **48** on idler shafts **49** (FIG. 1) upwardly from said idler sprockets to and about the idler sprockets **41**. As shown in FIG. 1, two hang-down pusher flights **25** are provided so one flight will come into position to effect the stacking and initial packaging operation as the opposite flight is returning into position to effect a next succeeding stacking and packaging operation. The drive sprockets **46** and drive shaft **47** are diagrammatically shown in FIG. 1 as driven from a motor and speed reducer **50** of a conventional construction, through a chain and sprocket drive **51**. The number of pusher flights, however, may be varied to suit conditions.

Referring now in particular to FIG. 6 showing the blank guides **13** and **14** and the folding plows for folding intermediate side flaps **53** and lower flaps **54** of the carton blank backwardly in the direction of the carton blanks, as the stacked rows of cans are pushed into a central portion **55** of the carton blank, which will be the bottom of the carton when the packaging operation is completed. The portion **55** of the carton blank is backed up by the backing member **16** and retractably moves said backing member as stacked rows of cans are pushed into the package blank by the pusher **25**.

FIG. 6 diagrammatically shows a frame structure **56**, which may be mounted between the side plates **27** and which carries the bottom blank guide **14**. As shown in this figure, folding plows **57** extend upwardly of the blank guide **14** and serve to fold the flaps **54** inwardly as the blank is pushed by the cans against the backing member **16**. Vertically spaced folding plows **59** are provided to fold the intermediate side flaps **53** inwardly upon inward folding movement of the bottom flaps **54**. The lower blank guide **14** is relatively shallow to accommodate release of the blank to move over a ledge portion **60** of the frame structure **56** upon inward movement of the cans and blank against the backing member **16**. The blank guide **14** opens to one side of the machine to accommodate the supply of blanks **15** thereto. Blanks may be supplied by a suitable supply means, supplying the blanks in vertical positions in any well-known manner. The blank supply means is no part of the present invention, so need not herein be shown or described further.

The top blank guide **13** has the flexible drag folder **19** secured thereto and extending forwardly and downwardly therefrom into engagement with the rotatable packaging unit **17**, to fold a top lid portion **62** of the blank over

the top of the package as said packaging unit **17** rotates to bring the package from the vertically extending position shown in FIGS. 1 and 15, in which it is initially folded and loaded with cans by operation of the pusher **25**, into its horizontal position, by turning movement of said packaging unit **17**, as shown in FIGS. 16 and 17 of the drawings.

The packaging unit **17** includes a rotatable frame **61**, shown as being rectangular in end and side elevation, to form an elongated hexahedron. Said frame is mounted on and rotatably driven by the transverse shaft **18** in steps of 90°. The transverse shaft **18** is journalled at its opposite ends in laterally spaced standards **63** extending upwardly from the base **64** and is rotatably driven through an intermittent drive mechanism **65** which may be in the form of a Geneva drive mechanism driving a shaft **66**, coaxial with the drive shaft driven by the motor and speed reducer **50**, and serving to drive the chain and sprocket drive **51** and the intermittent drive mechanism **65**. The intermittent drive mechanism may be of any conventional form and is no part of the present invention except insofar as it serves to rotates the packaging unit **17** with a dwell after each 90° of rotation thereof, so need not herein be shown or described further. A conventional chain and sprocket drive **67** may connect a shaft **66** of the intermittent drive mechanism **64** with the shaft **18**.

The frame **61** as shown in FIGS. 7 and 8 includes a plurality of end frame members **69**, suitably connected together at their ends to form an open rectangular frame and connected to a hub **70** through radial connectors **71**. Said hub **70** may be keyed or otherwise secured to the shaft **18**. The hub **70** and radial connectors **71** form a spider connecting the end frame members **69** to the shaft **18**, to be driven therefrom. The end frame members **69** at oppostie ends of the frame are suitably connected together by parallel spaced plates **73**, to form a rectangular box-like unit, forming mountings for a series of side flap folders **74**, and end flap folders **75**.

As shown in FIGS. 7 and 8, the side flap folders **74** and end flap folders **75** are in the general form of angles, but may be of various other forms. Said side and end flap folders are biased outwardly to the positions shown in FIG. 7 by suitable springs **76** and **77** respectively, shown as leaf springs. Each folder **75** is shown as having a folding leg and an actuating leg **80** extending inwardly of the folding leg towards the center of the frame and engaged along its inner side by a biasing spring **77**. The inner ends of the actuating legs are engaged by the inner side of the backing member **16** and actuated thereby.

The folders **75, 75** are hinged adjacent the corners of the frame **61** by hinge members **85** as diagrammatically illustrated in FIG. 7, the hinge members **85** for each folder are separate, so one set of folders **75** is hinged to the corners of one plate **73**, while the other set of folders is hinged to corners of the next adjacent right angled plate **73**, it being understood that the flap folders **74** and **75** are initially inclined outwardly as the carton blank and articles being packaged are backed up by the backing member **16** and that the backing member is moved toward the associated plate **73** by the cans and carton blank pushed thereinto. As the backing member **16** continues its retractable movement, it moves the folders **75** inwardly with the folding surfaces thereof extending perpendicular to the associated plate **75**. The folders will then stay in this position, as the folding unit is turned 90°, to position the top of the carton to be folded over the carton as illustrated in FIGS. 9, 16 and 17, FIG. 16 illustrating movement of the carton from its vertical to its horizontal position. Folding of the top of the carton blank over the carton and article packaged is attained by the flexible folder **19**, in effect wrapping the blank over the carton.

The side folders **74, 74** are similar in construction to the end folders **75** and are pivoted to opposite end portions of the plates **73** on hinge members **86** extending perpendicularly to the hinge members **85** in position to fold the sides of the carton **81, 81** inwardly along the flaps **53** and **54**. Said side folders are biased into outwardly extending positions by the leaf springs **76** and are moved inwardly to fold side flaps **81, 81** of the carton blank, at right angles to the bottom **55** of the blank, by retractable movement of the associated backing member **16**.

As shown in FIGS. 7 and 8, two folders **75** are mounted at each corner of the unit and extend therealong for a portion of the length thereof. One folder **75** comes into operation to fold or wrap two end portions **82** and **83** of the carton blank about the stacked cans to be packaged, first at angles of generally 45° relative to the bottom **55** of the carton, and then at right angles relative to the bottom of the carton, as shown in FIGS. 9, 10, 13 and 14.

During the folding operation, the side folders **74, 74** come into operation to fold side flaps **81** of the carton blank over the previously folded flaps **53** and **54**, as shown in FIGS. 12 and 14. Operation of the flap folders **74, 74** may be delayed to come into operation shortly after the folders **75, 75**, to bring the side flaps **81** into engagement with the outside of the flaps **53** and **54**, as the carton blank is folded into the position shown in FIGS. 14 and 15. This can be atttained by varying the length of the right angled actuating legs for the folders, to cause the top and bottom folders to move in faster than the side folders. Outward movement of all the folders may be limited in a suitable manner (not shown) to assure that the folders are inclined outwardly in the proper position and to avoid restraining inward movement of the backing member.

Adjacent each corner of the rectangular frame formed by the end frame members **69** is a guide shaft **88** extending parallel to the shaft **18** and outwardly from said end frame member. The guide shafts **88** are in horizontal and vertical alignment and form slidable supports and guides for right angled slides **89, 89**. As shown in FIGS. 9 and 10, the slides **89** are provided with slots **90** guided along the guide shafts **88**. The slides **89, 89** each have a slot **91** formed therein guiding said slides for movement along the shaft **18**. It will be noted from FIGS. 9 and 10 of the drawings that the slides **89, 89** move horizontally during the packaging operation, while two of the slides are guided on the same guide shaft and extend vertically during the initial folding operation. The slides **89, 89** are connected together at their opposite ends by the backing members **16**. Thus, during the folding operation, the backing member **16**, backing up the carton blank **15**, will retractably move towards the frame **61** while the opposite backing member **16** will extensibly move relative to said frame, to eject the package and effect the folding and sealing of the side and end flaps of the top of the package along the sides and ends of the package by opertaion of the folding rollers **21** and **22**.

The backing members **16** may each be in the form of a plate having recessed portions **93** (FIG. 6), to accommodate movement of the side flap folders **74, 74**, to fold the side flaps **81, 81** along the flaps **53** and **54** to be sealed to said flaps.

The folding plows **21** and **22** extend across the top and along opposite sides of the blank, and are mounted at the delivery station **20** on a suitable support structure, which may be connected with the standard **63** and base **64**, to be in a stationary position during the packaging operation, to effect closing of the flaps about the package, as the package is ejected by the backing member **16**.

In carrying out the packaging of a preselected group of articles in accordance with the principles of the present invention, assuming cans are to be packaged and are in the chutes **10** and supplied by gravity to the tiered shelves, the conveyor chains **26** are first started in operation, to move the cams on the rearwardmost shelf along the cans on the forwardly spaced shelf **11** and then to move the two rows of stacked cans onto the cans on the next forwardly spaced shelf **11**, providing three stacked rows of cans. The three rows of cans are then moved by the pusher **25** along the tops of the cans on the lowermost shelf **11**,

the pusher **25** continuing its forward movement pushes the cans into a carton blank **15** in the carton guides **13** and **14**.

Continued movement of the pusher **25** from a position A (FIG. 9) stacking four rows of cans on top of each other, to a position B (FIG. 10) on the downrunning runs of the chains **26, 26**, will have pushed the rows of cans into engagement with the portion **55** of the blank which will be the bottom of the sealed carton and against the backing member **16**.

As the pusher **25** and the cans pick up the blank in the blank guides **13** and **14**, and the pusher **25**, cans and blank move to position B, the flaps **53** and **54** of the blank will have been folded inwardly by the folding plows **57** and **59**. The plate or ledge **60** may also serve as a plow and fold or commence to fold the bottom of the blank upwardly along the bottom of the stack of cans to be packaged.

At position B, the cans on the blank will have moved to the position shown in FIG. 10 of the drawings, and during this movement from position A to position B the top and bottom portions of the blank will have first been moved through angles of substantially 45° relative to the portion **55** of the blank and will then have moved to positions of 90° relative to the portion **55** blank as shown in FIGS. 9 and 13 and 10 and 14. During this operation, the side folding flaps **74** actuated by the backing member **16** will have come into engagement with the side flaps **81** and have closed the side flaps about the flaps **53** and **54**, as illustrated in FIGS. 14 and 15.

Timing of the pusher is such that during downward movement of the pusher along the downrunning runs of the laterally spaced endless chains **26**, the top section **62** of the blank will move downwardly over the top of the pusher flight **25** between the side plates **27, 27** of the accumulator into a recessed portion **25**[a] of the pusher flight. When the top or lid section **62** of the blank is in the horizontal position shown in FIG. 10, said top section of the carton blank will be in a horizontal position over the pusher **25** in the recessed portion **25**[a] thereof.

As the backing member **16** is completely retracted, and the carton is in the position shown in FIGS. 10 and 15, the frame **61** will be driven to rotatably move in a clockwise direction 90°, to move the carton loaded with articles being packaged from the position shown in FIG. 10 to the position shown in FIG. 16 to the position shown in FIGS. 9 and 17. During this movement of the packaging unit, the flexible top folder **16** will have folded the top portion **62** of the blank over the top of the partially formed carton loaded with cans and the backing member **16**, which was the bottom backing member, will be moved into position to back up another carton blank, to initiate a folding operation thereof and effect the ejection of a carton along the folding roller **21** and **22** to close a top end flap **95** of the top or lid portion **62** of the carton along the front end **82** of the carton and to close side flaps **96, 96** along opposite sides by the articles being packaged. During this operation the carton may be completely closed and sealed and ejected to the delivery station **20**, which may be in the form of a conveyor carrying the carton to a compressor (not shown).

The folding and closing operation may then continue in the manner described to effect the high speed stacking and pushing of the stacked cans into the carton blank, and wrapping the blank about the cans in a substantially continuous operation, with no interruptions.

I claim as my invention:

1. A wrap-around packaging apparatus for stacked rows of articles, such as beverage cans, comprising:

an accumulator station for articles to be packaged,

a blank guide in front of said accumulator station, holding a flat blank to be wrapped around the articles to be packaged,

a rotatable packaging unit in front of said blank guide and including a frame supported for rotation about an axis generally parallel to the plane of the blank,

a first backing member mounted on said frame in position to back up said carton blank as a group of articles is pushed thereinto,

slide means guided along said frame for extensible and retractable movement relative thereto,

means supporting said first backing member on one end of said slide means,

a second backing member diametrically opposed to said first backing member, and supported on the opposite side of said slide means from said first backing member,

said first backing member moving inwardly of said frame by the blank and a group of articles moving into the blank to wrap said blank about the group of articles, and moving the opposite backing member to eject a blank wrapped around the articles to form a complete package,

side and end flap folders movably mounted on said frame for folding the blank about the sides and ends of the group of articles as moving into said blank and means moving said side and end flap folders inwardly toward the group of articles for folding the blank along the sides and ends of the group of articles moving into the blank as said backing member is moved inwardly by the blank.

2. A packaging apparatus in accordance with claim **1**, wherein a folding member is disposed above said frame and slides, to fold the top portion of a blank wrapped about the group of articles over the top of the group of articles by rotation of said frame and backing members.

3. The apparatus of claim **2**, including a delivery station diametrically opposed to said blank guide and the blank guided therein, and including side and top folding means, folding the top and end flaps of the top of the blank into position for sealing by, the operation of ejecting the partially packaged articles from said frame.

4. A packaging apparatus in accordance with claim **1**, wherein the side and end flap folders are pivoted to said frame and extend along the top, bottom and sides thereof and along opposite sides of said backing member, and have arms extending inwardly therefrom adapted to be engaged by said backing members upon inward movement of said backing member by the pushing of a blank and group of articles thereagainst, to fold the top, front and end sides of the blank, as said slides and backing member are retracted.

5. A packaging apparatus in accordance with claim **1**, wherein the ammumulator station includes a series of tired shelves, the first shelf of the tier being adjacent said blank guide and the other shelves of the tier of shelves being successively spaced vertically and rearwardly of the first shelf,

an endless conveyor extending about said shelves and driven in a continuous path and having a top run extending angularly downwardly relative to the upper shelf of the tiered shelves to beyond a lower shelf to a position adjacent said blank guide, and including

at least one flight hanging down from said top run of said conveyor and retained for angular movement relative to said top run in a vertical position along said shelves and moved by said top run pushing a row of articles from the top shelf onto a row of articles on a next succeeding lower shelf and to push the stacked row of articles onto a row of articles on the third shelf, and from the third shelf to the first shelf, to provide sufficient stacked rows of articles to make up a preselected group of articles, and then pushing the stacked rows of articles into said blank, and pushing said blank and stacked rows of articles against said backing member, to retractably move said backing member and effect a wrapping operation of the blank about the stacked rows of articles.

6. A packaging apparatus in accordance with claim 5, wherein cam means control the vertical position of said pusher during angular downward movement of the top run of said conveyor.

7. A packaging apparatus in accordance with claim 6, wherein the accumulator includes a pair of parallel spaced side frame members having article openings therein in registry with said tiered shelves, and wherein gravity chutes lead to said openings and supply articles to said openings and shelves by gravity.

8. A packaging apparatus in accordance with claim 7, wherein said article openings are spaced a sufficient distance above said tiered shelves to prevent articles on said shelves from rolling backwardly through said openings.

9. A packaging apparatus in accordance with claim 7, wherein the conveyor is provided with two hang down pushers positioned therealong to stack one group of articles and push the stacked rows of articles into a blank and retract the backing member, as the other hang down pusher moves into position to effect a second stacking and pushing operation.

10. A packaging apparatus in accordance with claim 9, wherein cam means control the vertical positions of said pushers during the pushing operation thereof, and wherein the article openings in the side plates are spaced a sufficient distance above the tiered shelves to prevent articles on said shelves from rolling from said shelves through said openings.

11. A packaging apparatus in accordance with claim 7, including folding plows at said blank guide, spaced vertically along opposite sides thereof for folding bottom and intermediate flaps of the blank inwardly into parallel relation with respect to each other, as the associated pusher pushes the stacked rows of articles into said blank and pushes the stacked rows of articles and blank guide to said backing member.

12. A packaging apparatus in accordance with claim 11, wherein a flexible folding member is mounted on the top of said blank guide and extends downwardly over said frame to fold the top of a blank over a group of articles packaged by rotation of said frame and backing members towards a delivery station.

13. A packaging apparatus in accordance with claim 11, wherein additional folding means are provided in advance of the delivery position of said frame for folding leading outer side flaps of the blank against the articles being packaged and plowing a glued flap downwardly over the package, to complete the closure of the package.

14. The packaging apparatus in accordance with claim 13, wherein the folding means in advance of the delivery position comprise rollers spaced above and extending along opposite sides of the package to complete the folding and sealing thereof.

15. A packaging apparatus in accordance with claim 14, wherein side, end and bottom folders are pivoted to said frame at right angles with respect to each other and have arms extending inwardly toward each other and engaged by said backing member upon retractable movement thereof to fold the bottom, the sides of the blank and the bottom side and top side into position along the stacked rows of articles.

16. The packaging apparatus of claim 15, wherein spring means bias the side, bottom and top folding members outwardly of the blank and into engagement with said backing member whereby inward movement of said backing member moves said folders inwardly toward each other to effect an operation of folding the bottom, end and top sides of the blank along the stacked articles.

17. In an apparatus for wrapping a carton blank about stacked rows of articles,

a support,

a rotatably folding unit including a generally rectangular frame mounted on said support for rotation about a horizontal axis and having opposite end walls and side walls,

means rotatably driving said folding unit relative to said support in steps of 90°,

side and end flap folders movably mounted on said side walls for movement toward and from the blank as the stacked articles are supplied thereto and extending along the tops, bottoms and sides of said side walls for a portion of the length thereof for folding side, bottom and top flaps of the carton blank about a stack of articles,

slide members guided along opposite end walls of said frame for rectilinear slidable movement relative thereto,

two of said slide members along opposite end walls of said frame extending at right angles relative to two other of said slide members,

backing members mounted on opposite ends of said slide members for movement towards and from said side walls, whereby one backing member is retractably moved by the pushing of stacked rows of articles into a blank and against said backing member and effects extensible movement of the opposite backing member, to effect the ejection of the package from said folding unit.

18. The apparatus for packaging stacked rows of articles in accordance with claim 17,

wherein a blank guide is provided rearwardly of said rotatable folding unit,

wherein folding plows are provided along the outgoing side of the blank guide, to fold bottom and intermediate flaps of the blank inwardly, and

wherein folding means are disposed forwardly of said folding unit to fold the flaps of the lid of the blank inwardly and complete the packaging operation, upon ejection of the package formed about the rows of articles.

19. The packaging apparatus of claim 17,

wherein side and end flap folders movably mounted on said side walls and extending along the tops, bottoms and sides of said side walls, for folding the sides, top and bottom of the blank about the stacked rows of articles comprise,

top, bottom and side folders pivoted to said side walls and extending at right angles with respect to each other, and forwardly of said side walls,

means biasing said folders angularly relative to said frame out of the path of the carton blank coming into said folding unit, and

means connected with said folders and engaged by the associated backing member for moving said folders angular inwardly of each other together as the blank and rows of stacked articles are pushed into engagement with said backing member to retractably move said backing member.

20. A packaging apparatus of claim 19,

wherein a blank holder is provided in advance of said rotatable folding unit, a delivery station is spaced forwardly of said rotatable folding unit,

wherein at least one pusher is provided to push the series of stacked rows of articles into said blank and into engagement with said backing member,

wherein plows extend along opposite sides of said blank holder to fold certain flaps of the blank inwardly by operation of said pusher and the rows of stacked articles, and

wherein other folding means are spaced forwardly of said rotatable folding unit, to complete the folding operation of the blank by the ejection of the blank folded about the stacked articles from said folding unit, effected by retractable movement of one of said backing members and extensible movement of the opposite of said backing members, to effect the initial and final folding operation.

21. The apparatus for packaging articles in accordance with claim 20,

wherein a flexible folder extends downwardly and forwardly of said blank guide over the rotatable folding unit and folds the top cover of the blank over the top row of the rows of stacked articles by rotation of said folding unit relative to said flexible folder, and

wherein the other folding means spaced forwardly of said rotatable folding unit comprise,

folding rollers extending along opposite sides of the path of travel of the carton as delivered the extensibly movable backing member, and

a top folding roller extending along the top of the path of travel of the carton.

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53—207, 225; 214—6 M

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,618,291 Dated Nov. 9, 1971

Inventor(s) Charles H. Krebs

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 67, change "blank" to --blanks--.

Column 5, line 22, change "rotates" to --rotate--;
line 70, change "article" to --articles--.

Column 6, line 21, change "outside" to --outsides--.

Column 8, line 43, change "members" to --member--;
line 49, change "ammumulator" to --accumulator--.

Column 10, line 39, after "wherein", insert --the--.

Signed and sealed this 18th day of July 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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