United States Patent [19]

Ganz

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[45] **Nov. 19, 1974**

[54] **PACKAGING MACHINE**

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[21] Appl. No.: **360,155**

[52] **U.S. Cl.** ..... **93/53 SD,** 53/186, 93/44, 93/53 R

[51] **Int. Cl.** **B31b 1/76**

[58] **Field of Search** ..... 93/53 SD, 53 R, 53 AC, 93/44, 51.1, 55; 53/186

[56] **References Cited**

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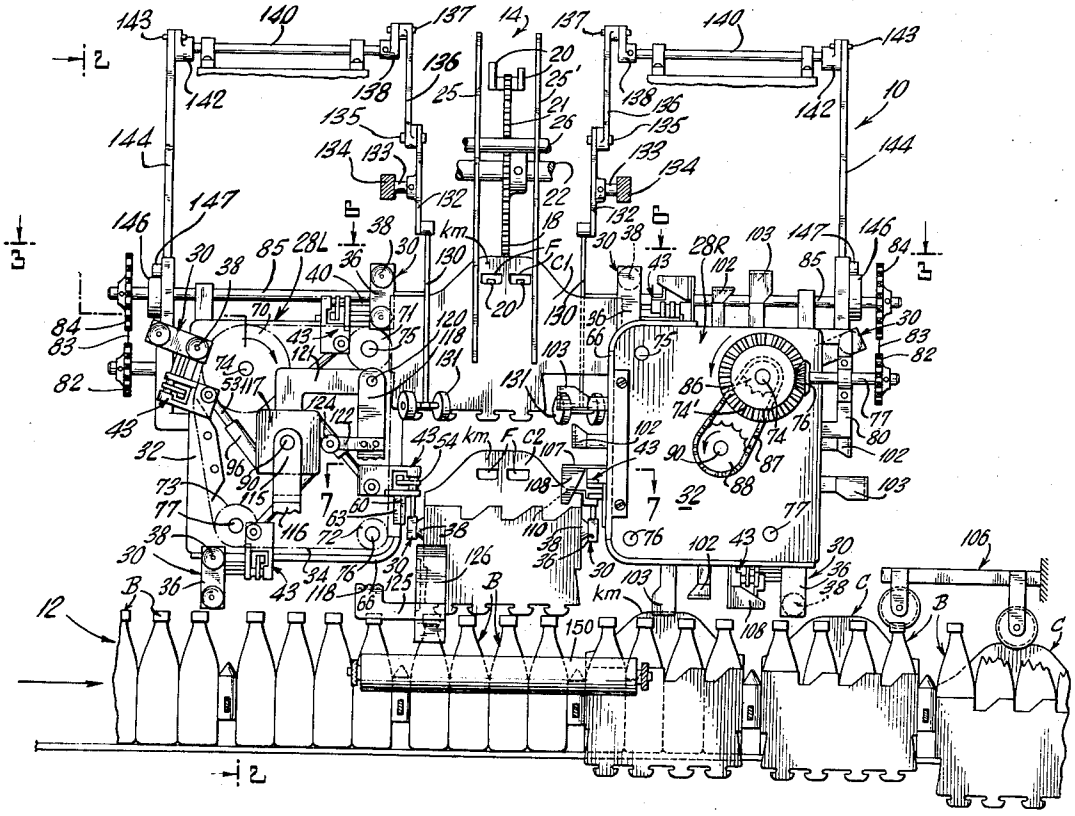
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Primary Examiner—Roy Lake
Assistant Examiner—James F. Coan
Attorney, Agent, or Firm—Guy A. Greenawalt

[57] **ABSTRACT**

An apparatus for automatically opening collapsed, cellular bottle carriers or cartons which are formed of paperboard or similar foldable material and which are adapted to be loaded through an open bottom which is thereafter closed by folding a pair of bottom wall forming panels into bottom closing position and connecting overlapping margins thereof, which opening apparatus is supported in a frame disposed above a bottle carrying and grouping conveyor and comprises an endless traveling conveyor for advancing successive carriers in flattened condition, which conveyor is mounted for operating in a vertical plane normal to the plane in which the bottle conveyor is operating and which delivers the carriers to pairs of vacuum head assemblies carried on traveling chains at opposite sides of the delivery conveyor and which cooperate to grip the exterior faces of the end wall panels of the collapsed carriers and swing the end panels so as to open up each carrier as the carriers advance down a vertical path between the vacuum head assemblies and which release the opened up carriers at the bottom of the vertical path for deposit on groups of bottles of the proper number to fill the cells therein.

30 Claims, 15 Drawing Figures



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SHEET 1 OF 8

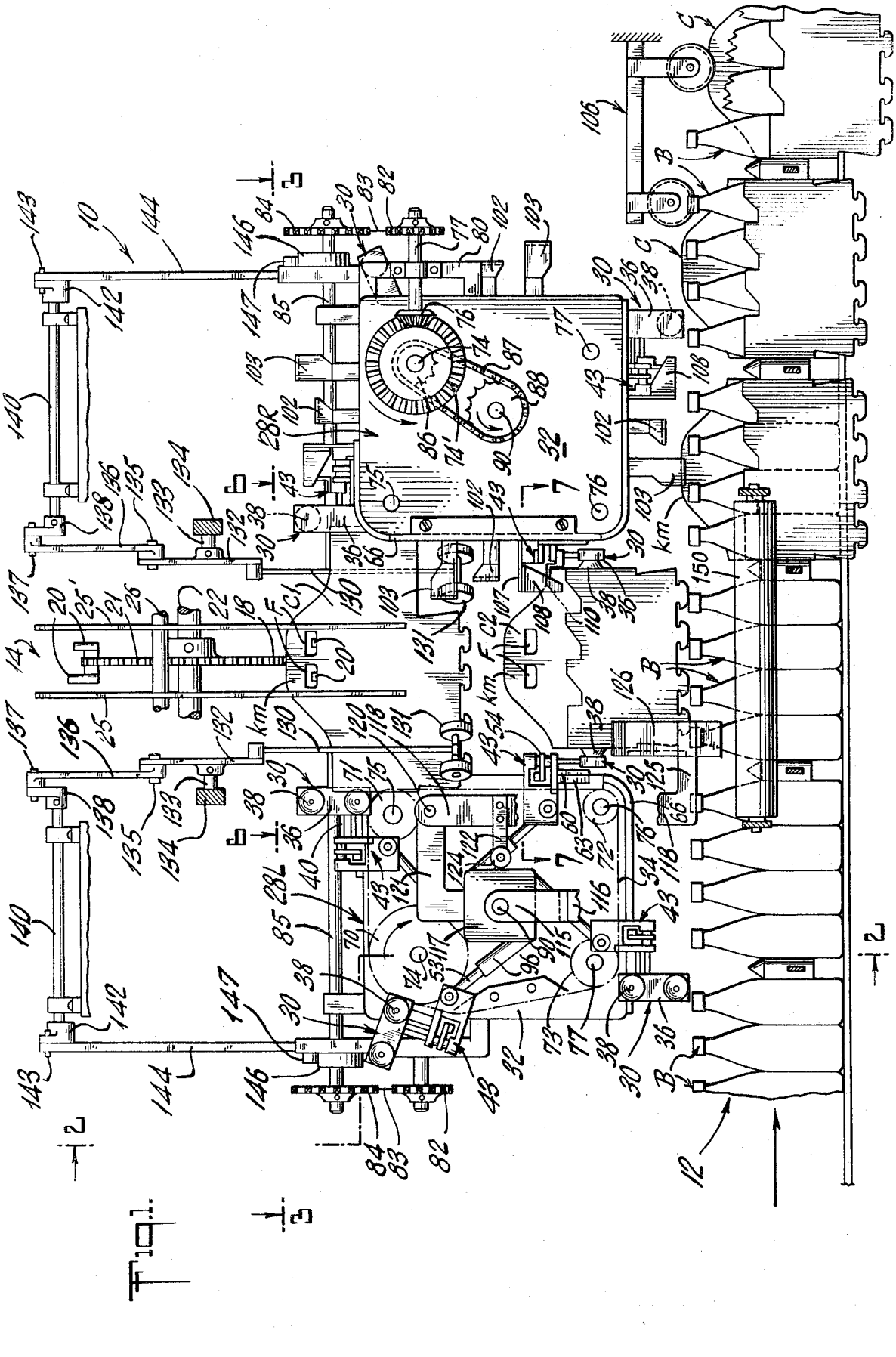


FIG. 1

Fig. 2.

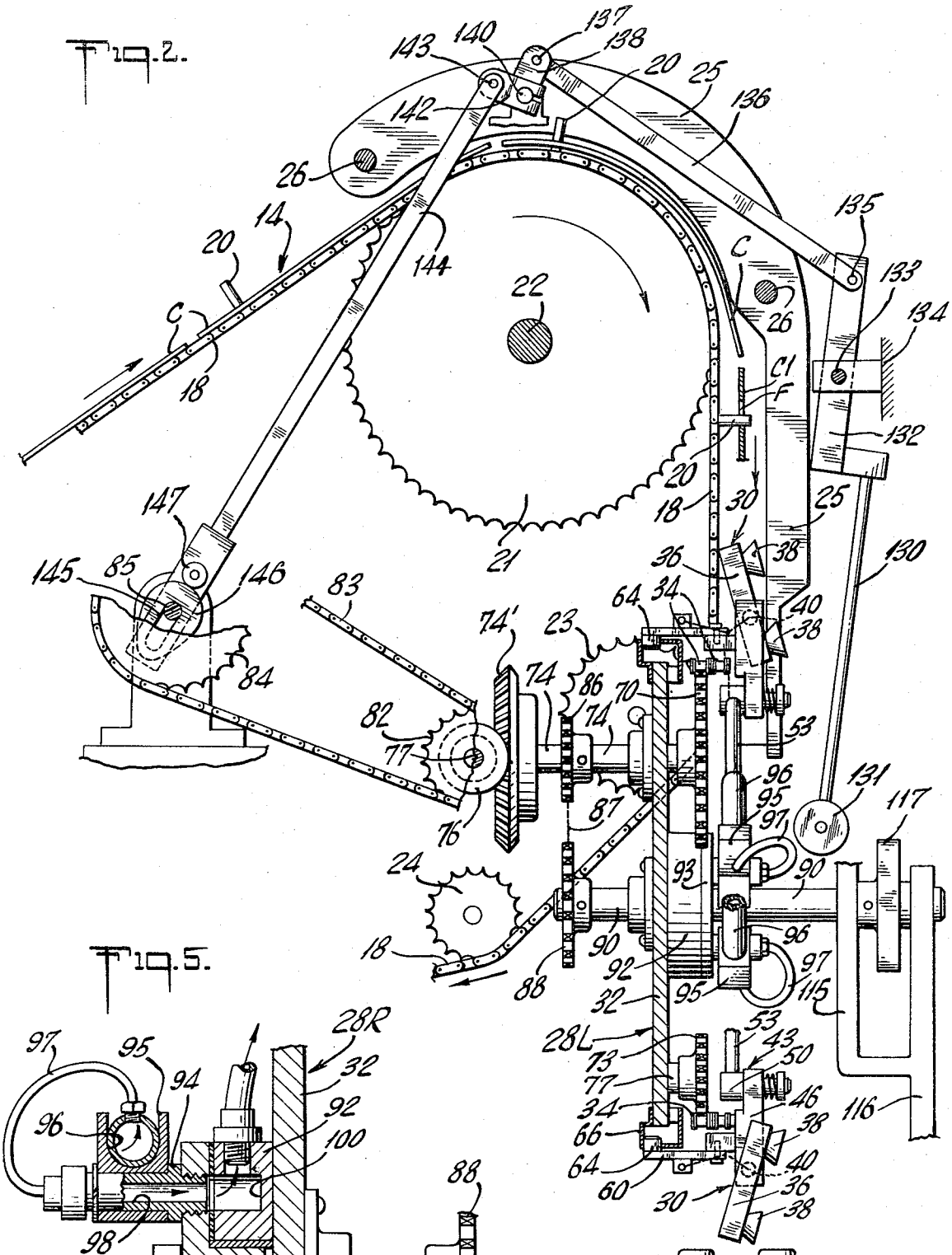

137
140
143
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136
142
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14
144
135
C
133
20
22
26
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C1
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F
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20
18
30
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147
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38
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130
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74'
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77
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131
117
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95
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76
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93
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18
96
90
92
97
88
95
115
32
53
28L
43
73
50
77
46
34
116
38
66
64
40
60
36
30
38
B
12

Fig. 5.

97
95
28R
94
32
96
92
100
88
98
90
90
93

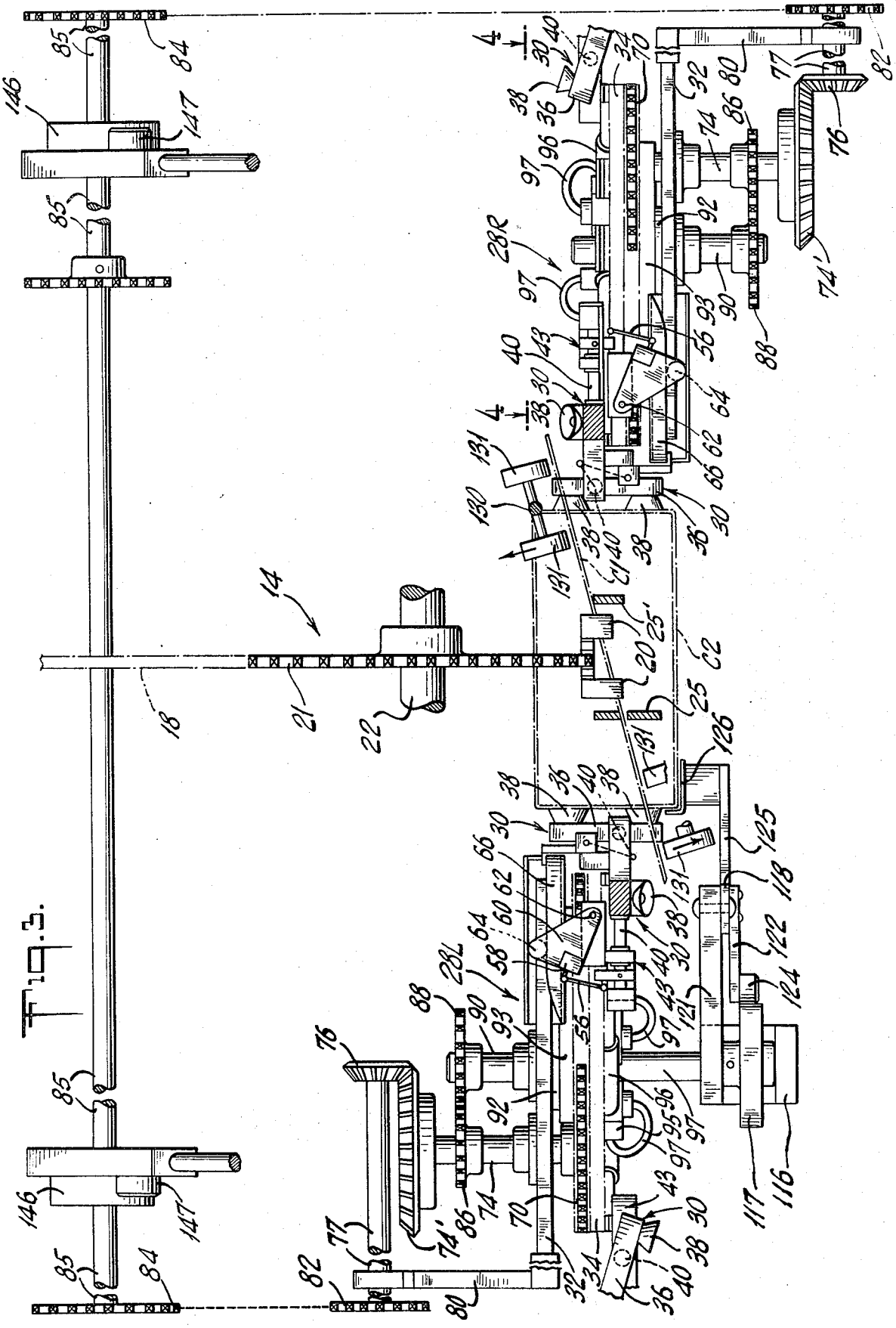
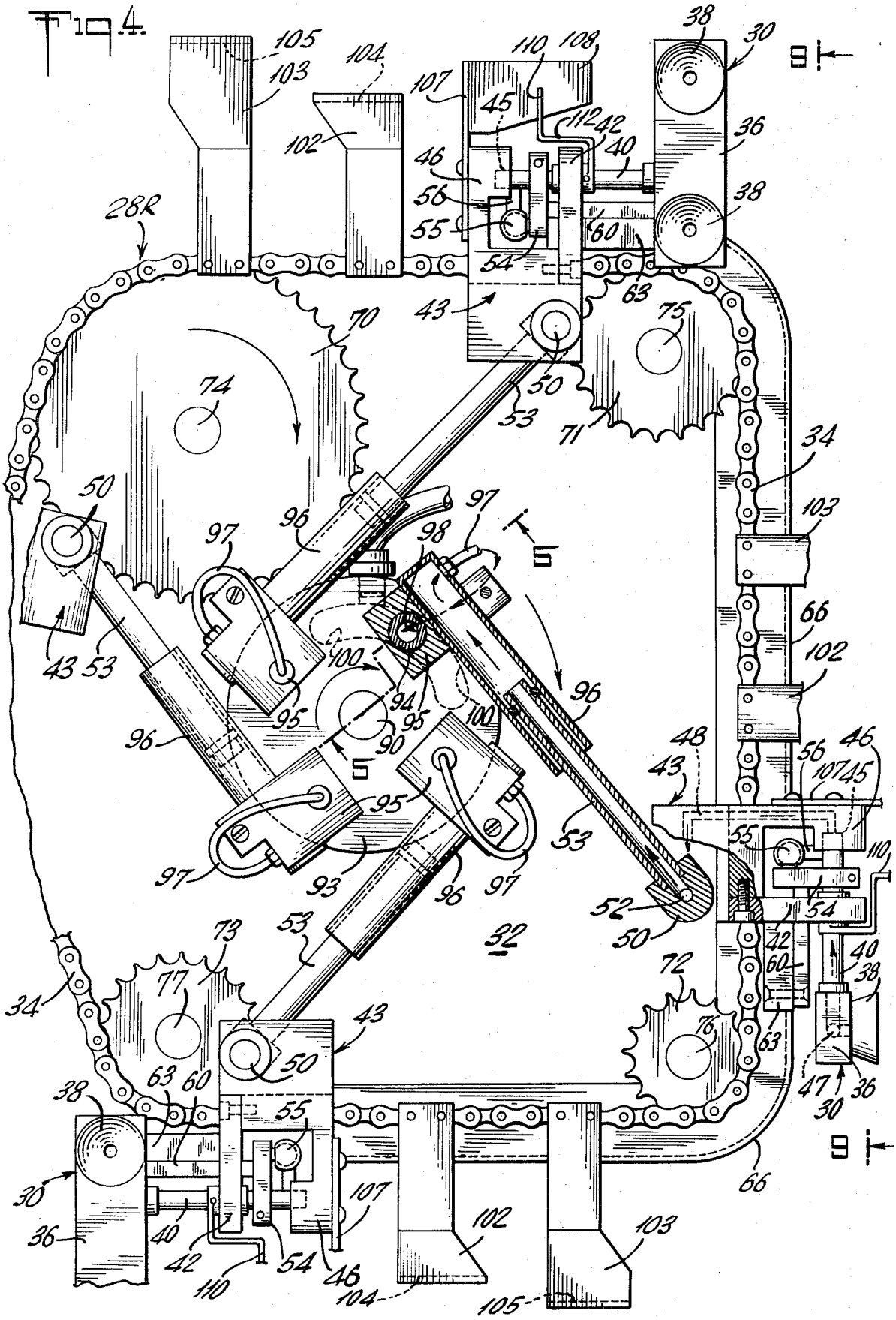


Fig. 3.

Fig. 4.


105
103
104
102
107
110
108
45
112
42
40
38
30
36
46
56
55
60
54
28R
43
63
75
70
74
50
53
71
34
97
96
98
5
400
94
95
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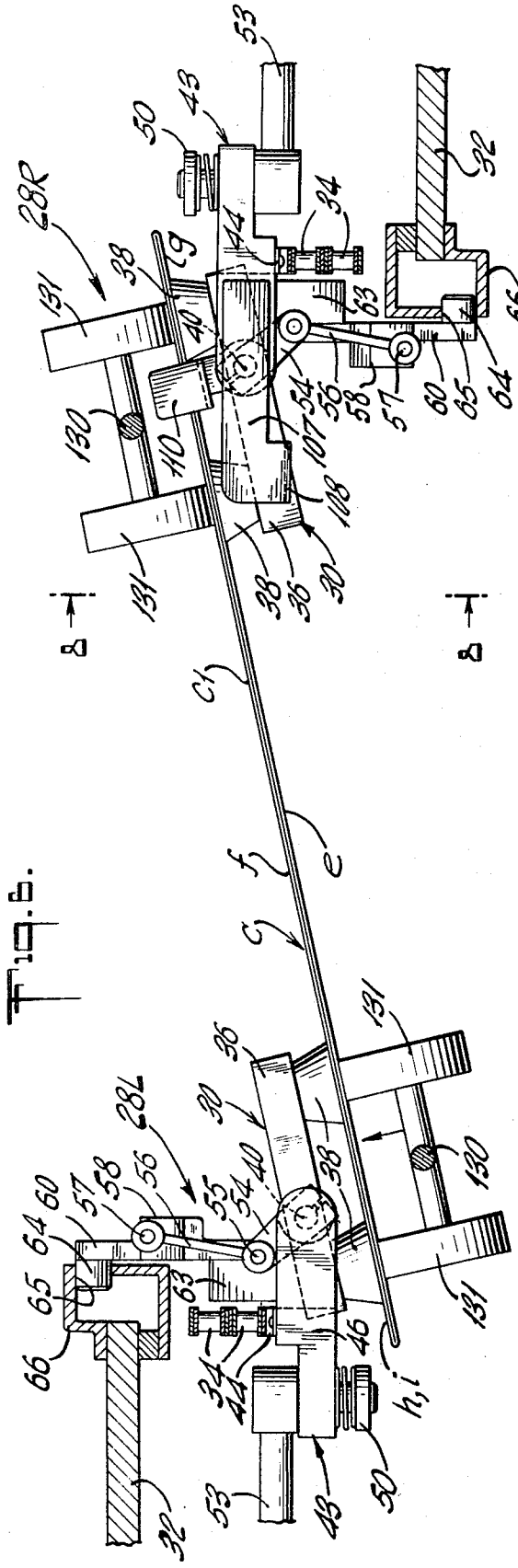


Fig. 6.

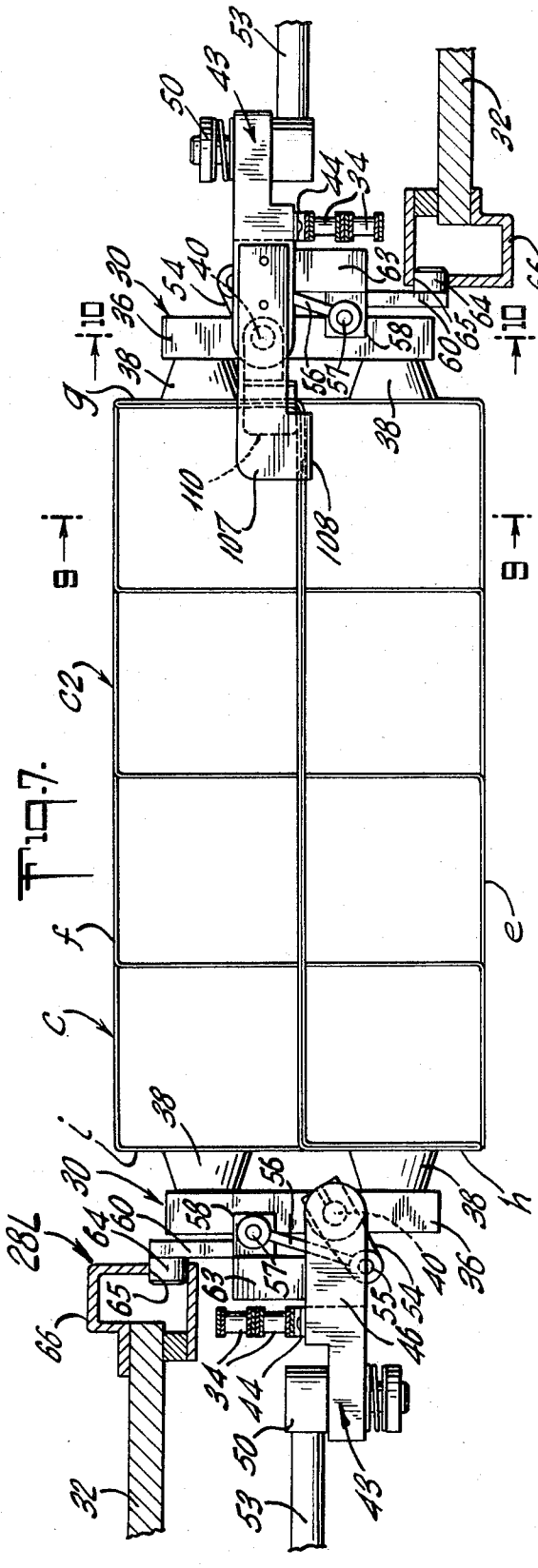


Fig. 7.

Fig. 8.

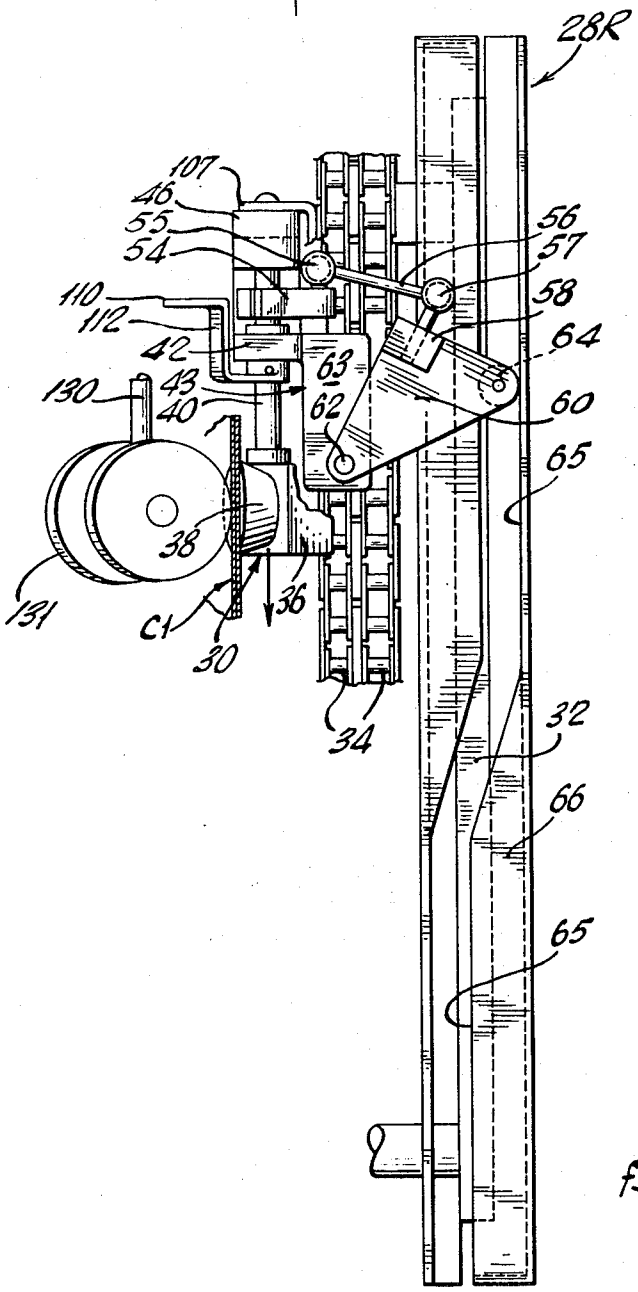

28R
107
46
55
54
110
112
42
43
40
130
131
C1
30
36
38
63
62
60
64
56
57
58
65
32
34
66

Fig. 9.

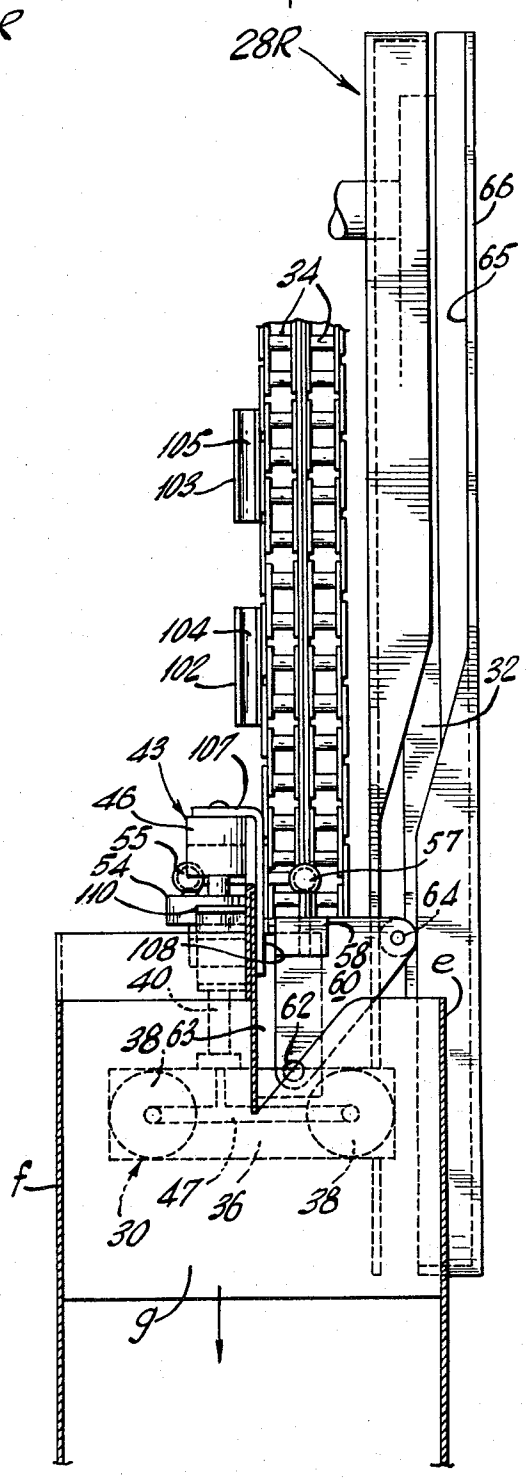

28R
66
65
34
105
103
104
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43
107
46
55
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e
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62
38
63
f
47
36
38
30
g

Fig. 10.

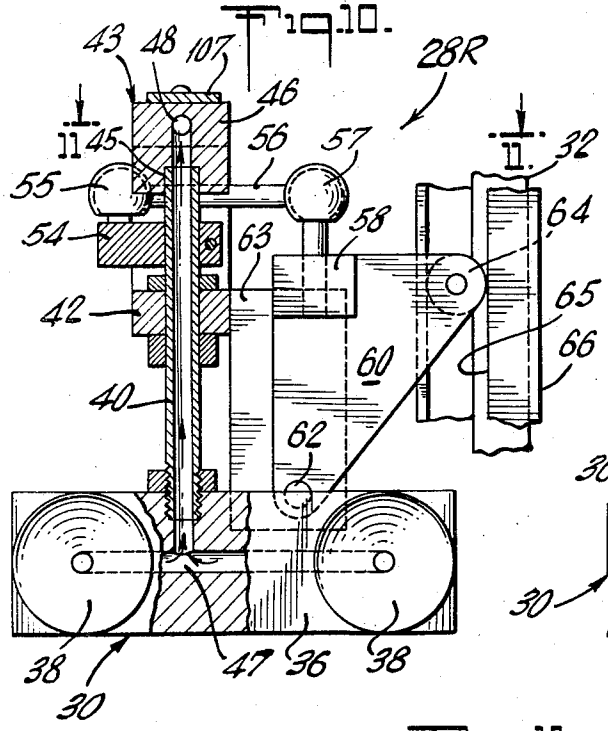


Fig. 11.

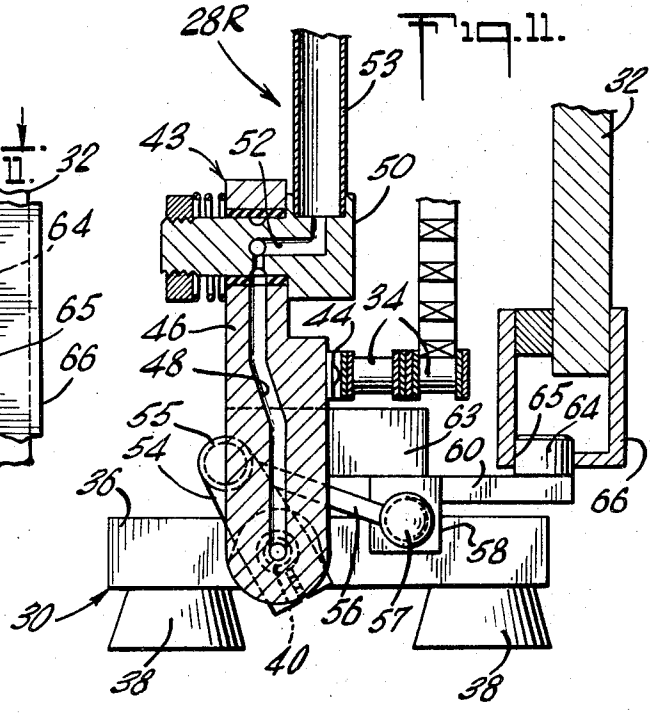


Fig. 12.

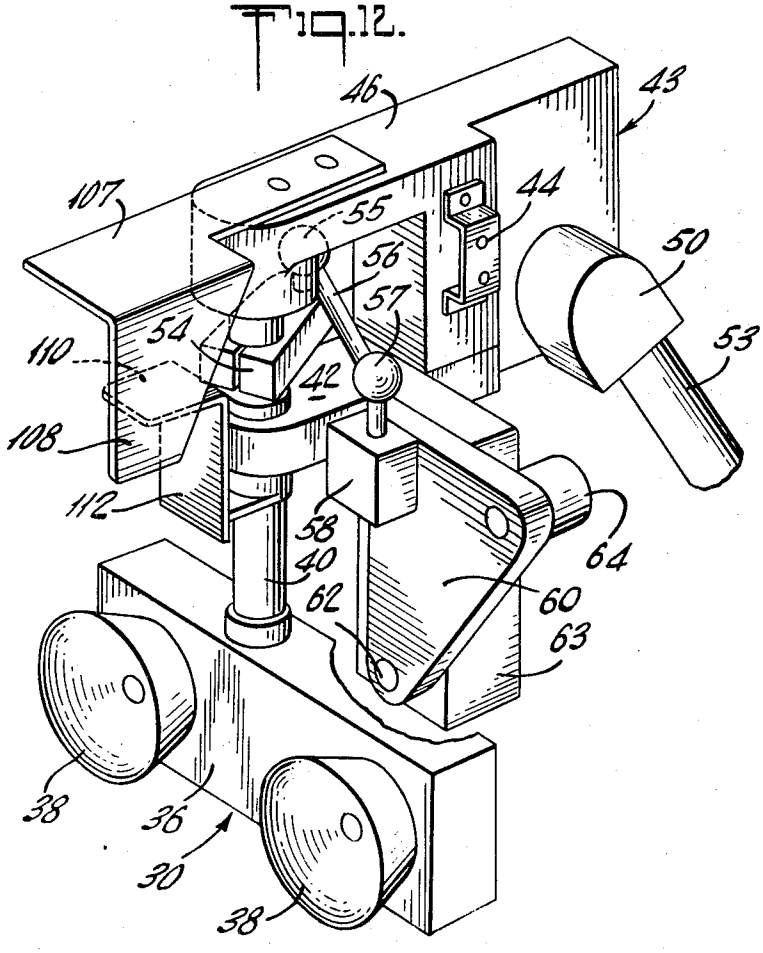


Fig.13.

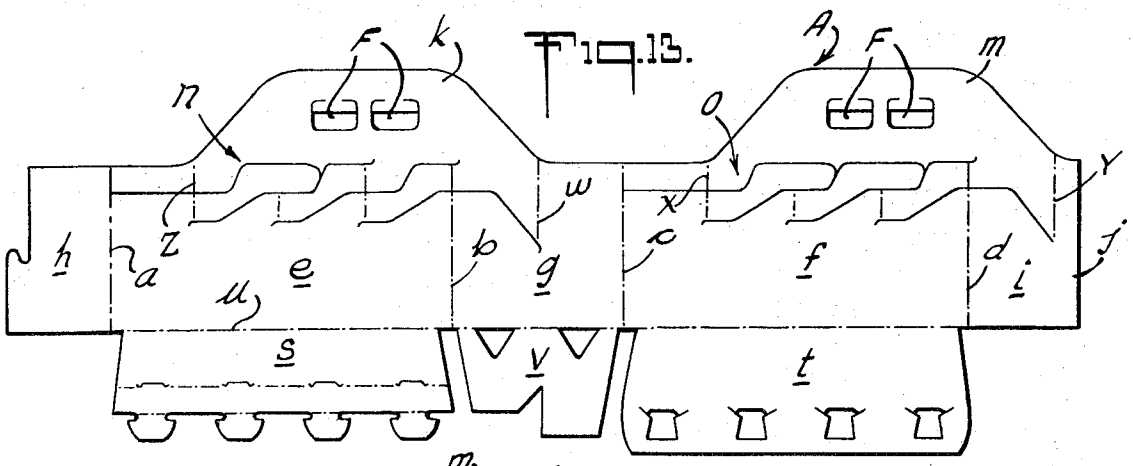


Fig.14.

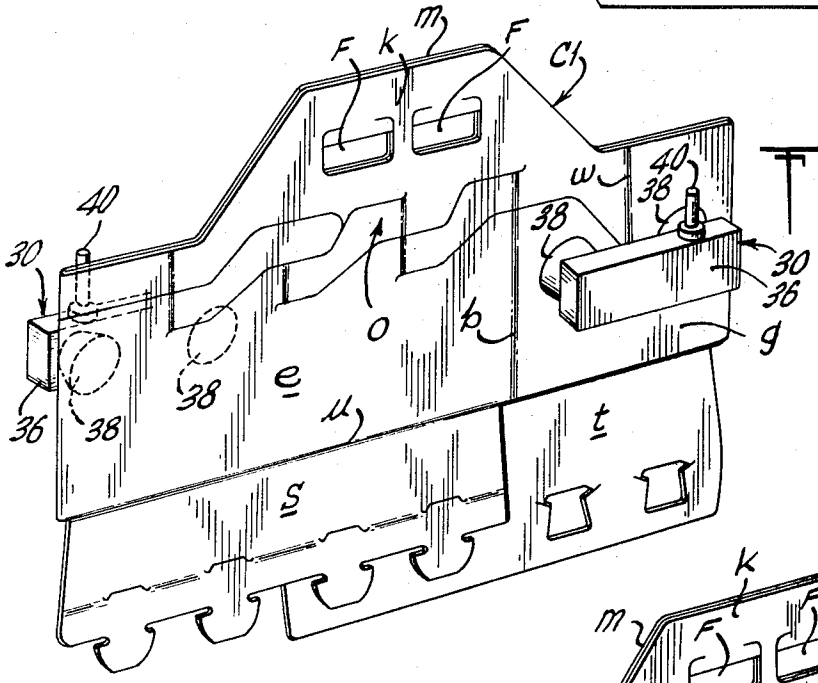
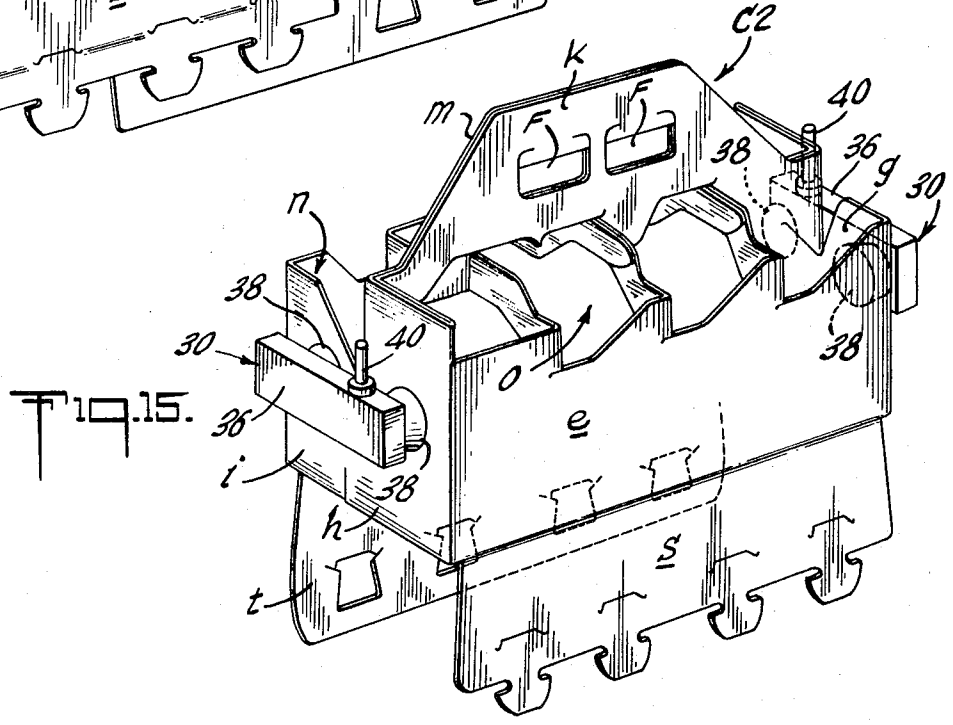


Fig.15.



PACKAGING MACHINE

This invention relates to packaging machinery or apparatus and is more particularly concerned with improvements in an apparatus for opening collapsed cellular carriers or cartons for beverage bottles or similar articles and loading the same, wherein the carriers are of the basket type and adapted to be loaded through the open bottom when set up with the bottom being thereafter closed by other apparatus.

In the marketing of beverages such as bottled beer, soft drinks and the like, one type of carrier or carton which has been employed is in the form of a cellular basket with an open top and having a collapsed, cell forming partition structure which is opened up to receive the bottles when the initially collapsed carrier is set up. Until recently most carriers of this type which have been employed commercially have had a bottom structure which is collapsible and which, when the carrier is set up, moves automatically to closed position. In loading this type carrier it is necessary for the bottles to be dropped into the cells through the open top of the carrier after the collapsed carrier has been opened up. This involves considerable handling of the bottles which is not desirable. More recently, cellular basket-type carriers have been developed which are designed to be loaded by inserting the bottles through the open bottom of the carrier when the carrier has been set up with the bottom being thereafter closed by hinging into position bottom wall panels which are interlocked or secured to form the bottom structure. A cellular carrier of this type is disclosed in copending application Ser. No. 277,742, filed Oct. 16, 1972, by Edwin L. Arneson and Harry J. Rossi. The design of this carrier with bottom loading capability has made it desirable to develop machinery or apparatus for opening and closing the carriers which can be readily incorporated in a packaging line where there is need for efficient and reliable operation at relatively high speed in order to obtain the desired volume of production. It is, therefore, a general object of the present invention to provide improved apparatus for opening and loading carriers of this type.

It is a more specific object of the invention to provide an apparatus for automatically opening up collapsed, cellular bottle carriers of the type which are adapted to be filled or loaded by depositing the opened up carriers on groups or assemblies of bottles which are advancing on a conveyor in a bottling line or the like.

It is another object of the invention to provide an apparatus for opening up collapsed, open top type cellular bottle carriers which are adapted to be filled by inserting the bottles through the bottom thereof, wherein the apparatus comprises a traveling conveyor on which successive collapsed carriers are advanced between cooperating pairs of gripping heads which are pivotally mounted and which automatically swing as they are advanced along a vertical path, so as to open up the cartons and deposit the same on assemblies or groups of bottles passing beneath the same on a supporting conveyor.

It is another object of the invention to provide an apparatus for opening up cellular basket-type bottle carriers which are adapted to be loaded by inserting groups of bottles through the open bottom thereof wherein the apparatus comprises oppositely disposed traveling conveyors on which pairs of cooperating pivotally mounted gripping heads are advanced along a vertical path to

which the collapsed carriers are fed for gripping engagement, by the heads, with the end wall forming panels which are located at opposite ends and on opposite sides of the collapsed carriers, the gripping heads being operated by mechanism spaced along the side of the path so as to swing the end panels in opposite directions and square up the successive carriers for deposit on groups of bottles of the proper number which are assembled and advanced on a supporting conveyor traveling beneath the opening apparatus.

These and other objects and advantages of the invention will be apparent from a consideration of the carrier or carton opening apparatus which is shown by way of illustration in the accompanying drawings wherein:

FIG. **1** is a front elevation, with portions broken away, of an apparatus which is adapted to open up successive cellular basket-type bottle carriers and deposit the same on groups of bottles of the proper number which are advanced on a conveyor traveling beneath the apparatus;

FIG. **2** is a partial side elevation, with portions broken away, showing the apparatus of FIG. **1**, the view being taken on the line **2—2** of FIG. **1** and being to a larger scale;

FIG. **3** is a horizontal section taken on the line **3—3** of FIG. **1**, to a larger scale, and with portions broken away;

FIG. **4** is a rear elevation showing a portion of the machine of FIG. **1**, to an enlarged scale, the view being taken on the line **4—4** of FIG. **3** and having portions broken away;

FIG. **5** is a detail sectional view taken on the line **5—5** of FIG. **4**;

FIG. **6** is a fragmentary, horizontal section taken on the line **6—6** of FIG. **1**, to an enlarged scale, the view showing a collapsed carrier gripped by the vacuum cups on the opening heads;

FIG. **7** is a fragmentary horizontal section taken on the line **7—7** of FIG. **1**, to an enlarged scale, the view showing a carrier in opened up position and carried by the opening heads;

FIG. **8** is a fragmentary vertical section taken on the line **8—8** of FIG. **6**;

FIG. **9** is a fragmentary vertical section taken on the line **9—9** of FIG. **7**;

FIG. **10** is a fragmentary vertical section taken on the line **10—10** of FIG. **7**, to a larger scale;

FIG. **11** is a fragmentary horizontal section taken on the line **11—11** of FIG. **10**;

FIG. **12** is a perspective view, to an enlarged scale, showing the vacuum cup gripping head;

FIG. **13** is a plan view showing the outer face of a cut and scored blank which is employed to form the collapsed carrier or carton which is adapted to be opened up by operation of the apparatus illustrated in FIGS. **1** to **12**;

FIG. **14** is a perspective view of the collapsed carrier or carton at a work station where it is engaged by the vacuum cup heads preparatory to opening the same; and

FIG. **15** is a perspective view similar to FIG. **14** with the carrier or carton at a further work station where it is in opened position.

The apparatus **10** which is illustrated in FIGS. **1** to **12** is mounted on a suitable supporting frame adjacent a horizontally disposed conveyor assembly **12** on which groups of beverage bottles B arranged in a double row

are advanced in spaced relation so as to bring each group of eight bottles into position relative to the apparatus **10** to receive an eight cell basket-type bottle carrier C which has been formed in collapsed condition from a cut and scored blank A (FIG. **13**). The apparatus **10** includes a conveyor mechanism **14** operative to feed collapsed carriers to successive work stations, where the carriers, indicated at C1 and C2 in FIG. **1** are gripped and set up or opened up so as to enable each successive carrier to be deposited on a group of the bottles B on the conveyor **12.** The bottom of each carrier C is open so as to receive the individual bottles in the carrier cells as it is approaching the bottom of a vertically disposed path where the carrier is traveling in a common vertical plane with the bottle advancing conveyor **12** but in a path which is normal to the path of the conveyor **12.** The opened carriers are deposited on the bottles and the carrier and bottle assembles are subsequently advanced to other apparatus which completes the loading operation by closing the bottom of each carrier.

The apparatus **10** is adapted to set up or open up successive bottle carriers of the cellular basket type such as, the eight bottle or eight cell carrier illustrated in FIGS. **13** to **15.** In FIG. **13** there is illustrated a blank A for forming the carrier C which is cut and scored as shown. The blank A is divided by longitudinally spaced, transverse score lines *a*, *b*, *c* and *d* into a series of connected wall forming panels comprising sidewall panels *e* and *f*, a connecting end wall forming panel *g* between the sidewall forming panels *e* and *f* and end wall forming half panels *h i* at opposite ends of the blank, with the latter having a glue flap forming portion *j* for connecting the same with the cooperating panel *h*, when the blank is folded about the transverse lines *a* and *c* to form the carrier in the collapsed condition as shown at C1 in FIG. **14.** Handle and partition forming panels *k* and *m* are formed along one side margin of the blank and cross partition strap assemblies *n* and *o* are cut in the material between the the wall panels *e*, *g* and *f*, *i* and the handle and partition panels *k* and *m*. The handle and partition panel members *k* and *m*, which are adapted to be secured in overlying relation when the carrier is formed, are provided with finger holes F for use in gripping the carrier handle structure. Bottom wall forming panels *s* and *t* extend along the opposite side margin of the blank and are adapted to hinge on a longitudinal score line *u* separating the same from the sidewall forming panels *e* and *f*, while a reinforcing panel *v* extends between the two bottom wall forming panels *s* and *t* and in hinged relation to the end wall panel *q*. The carrier C is initially formed in collapsed condition by folding the cut and scored blank A about the score lines *a* and *c* which brings the handle forming panels *k* and *m* into overlying relation where they are secured together so as to form the longitudinal partition and handle structure and complete the initial fabrication of the carrier in collapsed condition as shown at C1 in FIG. **14.** The handle and longitudinal partition members km hinge on the score lines *wx* and *yz* when the collapsed carrier is brought into opened up condition as shown at C2 in FIG. **15,** with the side wall panels *e* and *f* spaced on opposite sides of the handle and partition panels *km*. Reference is made to copending application Ser. No. 297,742 for a more detailed description of the blank A and carrier C.

The conveyor assembly **14** (FIGS. **1, 2, 3** and **5**) on which the carriers in collapsed condition are advanced to the opening mechanism comprises an endless chain **18** having a series of lugs **20** mounted thereon for engaging in the finger holes F of the carriers or cartons C. The chain **18** is mounted on suitable sprockets, the upper one of which as shown at **21** in FIG. **2** is carried on a cross shaft **22** which is journaled, in a suitable manner, in the support frame members and connected to a drive mechanism (not shown). The carriers C are delivered to the conveyor **14** from a suitable supply source, such as, for example, a magazine and feed mechanism as shown in U.S. Pat. No. 3,085,377, dated Apr. 16, 1963, granted to Robert H. Ganz. The chain travels in a vertical path between the upper sprocket **21** and a lower sprocket **23,** the return run being supported in part by a still lower sprocket indicated at **24.** Laterally spaced guide plate assemblies **25** and **25'** are mounted on frame cross bar members **26** and extend about the upper portion of the path of the chain **18** as it advances around the sprocket **21** and down along the vertical path thereof. The plates **25, 25'** have rearwardly facing guide edges or suitable guide slots (not shown) in which the carriers C are confined so as to control the path of travel down along the vertical run of the chain **18.** The carriers are tilted about a vertical axis and assume the position shown at C1 in FIGS. **1, 3** and **6** as they are advanced to the point between the gripping and opening mechanisms or assemblies **28L** and **28R** where the successive carriers are gripped by the vacuum cup heads **30** which take over control of the carriers for advance and opening of the same.

As the carriers C are advanced down the vertical path of the conveyor **14** at the front of the machine, they move between gripping and opening assemblies **28L** and **28R** which are disposed on the left and right sides of the conveyor path, as viewed in FIG. **1,** and which are to a large extent of identical construction. Each of these assemblies has a number of like elements which will be identified by the same numerals while some elements or features which are part of only one of the assemblies will be described separately. Each of the assemblies **28L** and **28R** (FIGS. **1** to **9**) comprises a main support plate **32** of generally rectangular outline which carries on one face thereof a traveling chain **34** with a series of spaced vacuum cup gripper heads **30** (FIGS. **8** to **12**). The assemblies **28L** and **28R** are fixed on opposite sides of the path of the conveyor assembly **14** and, as viewed in FIG. **1,** they are oriented 180° about a vertical axis relative to each other so that supporting chain **34** on the **28L** assembly is on the front face of the support plate **32** and on the **28R** assembly it is on the back face of the support plate **32.** This brings the gripper heads **30** on the assemblies into vertical paths of travel in vertical planes which are offset relative to each other as they take over control of the carriers from the conveyor **14.** The gripper heads **30,** in paired relation, traverse the vertical path along opposite sides of the path of the carriers or cartons C as they move down between the assemblies **28L** and **28R** where the gripper heads **30** are rotated so as to bring each pair of the cooperating heads into a vertical path of travel which is in a common vertical plane as shown in FIG. **7.** When the gripper heads **30** are moved into position to engage the carrier C which is advancing on the conveyor **14** they are moving in offset vertical planes so that they move into position to engage the

faces of the end wall panels *g* and *hi* which are positioned on opposite sides of the collapsed carrier (FIGS. 3, 6 and 14).

The vacuum gripper heads 30 (FIGS. 10 to 12) each comprise elongate rectangular block 36 having two vacuum cups 38 mounted in spaced relation on the one side face thereof. Block 36 is mounted in fixed relation on the lower end of a hollow shaft 40 as viewed in FIG. 12. The hollow shaft 40 is journaled in the lower leg 42 of the bifurcated end of a casting 43 which is secured by means of the bracket 44 to the chain 34 (FIG. 11). The upper end of the hollow shaft 40 is seated at 45 (FIG. 10) in a recess in the upper leg 46 of the casting 43. The hollow shaft 40 serves also as a vacuum conduit connecting the passageway 47 which leads to the vacuum cups 38 in the block 36 with a passageway 48 in the leg 46 of the casting 43. Passageway 48 connects with a spring urged, pivotally mounted coupling 50 in the opposite end of the casting 43 which has a passsageway 52 connecting with a conduit 53 forming part of the line to a vacuum source which will be hereinafter described. The rotation of the shaft 40 is controlled by a cam operated linkage which comprises radial arm 54 fastened at one end on the shaft 40 and connected at the other end by a ball joint 55 with a link rod 56 which has its other end connected by a ball joint 57 with a block member 58 mounted on the forward face of a cam plate 60 which is pivoted at 62 on a mounting bracket 63 extending downwardly and laterally of the leg 42 of the casting 43. The cam plate 60 has a cam follower 64 received in a cam slot 65 in a plate 66 mounted on the vertical edge of the assembly support plate 32. The cam plate 65 extends along the vertical run of the chain 34 which is at the side of the conveyor 14 and the cam track 65 controls the swinging movement of the vacuum cup carrier member 36. The uppermost portion of the cam track 65 holds the vacuum cup carrier member 36 on the assembly 28L in a position to engage the cups 38 with the back face of the carrier at C1, as shown in FIG. 1, while the vacuum cup carrier member 36 on the assembly 28R is swung into position to grip the forward face of the carrier at C1 as control of the carrier is transferred from the conveyor 14 to the vacuum heads. As the chains 34 move the vacuum heads 30 downwardly along the vertical path the cam track 65 pivots the vacuum cup carrier members 36 into parallel, oppositely disposed, vertical planes so as to open up the carrier into the position shown at C2 in FIG. 1.

The chains 34 (FIG. 4) which carry the vacuum cup gripper heads 30 are mounted on sprockets 70, 71, 72 and 73 with the vertical run thereof which is adjacent the conveyor 14 extending between the sprockets 71 and 72. The sprocket 70 is supported on a driven shaft 74 while the sprockets 71, 72 and 73 are supported on idler shafts 75, 76 and 77, extending from the support plate 32. The shaft 74 (FIGS. 1 to 3) is journaled in the support plate 32 and extended on the face opposite the chain 34. A beveled gear 74′ is carried on the extended portion of the shaft 74 which is driven by bevel gear 76 on the one end of a drive shaft 77 which is journaled in a supporting bracket 80 mounted on the support frame. The shaft 77 carries a sprocket 82 which is connected by the chain 83 to a sprocket 84 on the cross shaft 85, which is journaled in fixed frame portions of the machine.

The shaft 74 also carries a sprocket 86 which is connected by chain 87 which a sprocket 88 on a shaft 90 which extends through the plate 32 and a vacuum manifold member 92 (FIG. 5) which is secured to the plate 32 on the same side as the chain 34. A movable manifold member 93 is keyed to the shaft 90 and carries a series of fittings 94 which correspond in number to the number of vacuum heads carried on the chain 34. Each fitting 94 has a pivot block 95 mounted thereon which is at the closed end of a telescoping tube 96, the latter cooperating with the conduit forming tube 53 to form an extensible conduit between the pivot block 95 and each of the vacuum gripper heads 30. Each of these assemblies has a flexible conduit 97 connecting the ends of the pipe 96 with the passageway 98 in the pivot block 95. Rotating manifold plate 93 has a slot 100 which is positioned to connect with the interior of the member 94 so as to control the application of vacuum as the gripper heads move in the vertical path.

Each of the gripper heads 30 on the 28R assembly has associated carrier handle engaging pusher members 102 and 103 (FIGS. 1, 4 and 9) mounted so as to extend outboard of the chain 34 and spaced from the trailing end of the head assembly 30. These are grooved on their outboard faces, at 104 and 105, as shown in FIG. 9. As the gripper head assemblies 30 move down to the end of the vertical path and are manipulated to release the set up carrier the pusher arms 102 and 103 engage the upstanding carrier handle and partition assembly *km* of the carrier and move the same down into the proper seating position on the bottles. Pusher arms 102 and 103 are progressively longer and, therefore, progressively move the opened up carriers downwardly into the bottle assemblies. A final force down or depressing device 106 may be provided.

Each vacuum cup gripper head 30 on the assembly 28R has mounted thereon a pair of angle members for gripping and guiding the handle and longitudinal partition member *km* of the carrier as it is gripped by the vacuum head 30 at C1. One of these members 107 (FIG. 12) is in the form of an angle plate which is fastened on the top of the upper leg 46 of the casting 43 and extends at the end thereof. The angle plate 107 has a depending, vertically disposed leg 108 which cooperates with a horizontally disposed leg 110 on an angle bracket 112, the latter being secured for turning movement on the shaft 40 which swings the edge of member 110 toward and from the vertical face of member 108. The two arm forming or leg forming plate members 108 and 110 confine the carrier handle member *km* between them as the vacuum cup carrier member 36 is rotated to open up the carrier at C2. These members 108 and 110 guide the carrier as it is dropped down onto the bottle assembly.

On the assembly 28L the shaft 90 is extended forwardly and has its end journaled in the forked end 115 (FIGS. 1, 2 and 3) of a fixed frame member 116. A cam plate 117 on the extended shaft portion operates a lever arm 118 which is pivoted at 120 on a bracket 121 extending from fixed member 116. The lever 118 has an arm 122 with a cam follower roller 124 engaging the cam track on the cam plate 117. The lever arm 118 depends from the bracket 121 and has an angular lower end 125 on the end of which there is carried a vertically extending angle plate 126 for engaging the trailing corner of the squared up carrier at C2 so as to properly align the same for deposit on the bottles B which are

carried on the conveyor **12** below the same. The lever arm **118** is operated to move the opened up carrier along with the bottles on the conveyor as the carrier is released by discontinuing the vacuum operating the cups **38.**

As soon as the carrier is dropped down into engagement with the bottles, its travel is, of course, taken over by the bottles.

Mechanism is provided for insuring that the collapsed carriers will be gripped by the vacuum heads **30** as they are moved down into position for engagement with the heads. On each side of the conveyor **14** (FIGS. **1** and **2**) adjacent the opposed runs of the chains **34** on the assemblies **28L** and **28R** there is a depending rod **130** carrying on its lower end a pair of rollers **131** which are adapted to engage with the surface of the carrier on the opposite side from the side engaged by the vacuum cups **38** on the vacuum head **30.** The depending rod **130** is supported by a crank **132** which is pivotally mounted at **133** on a fixed portion of the machine **134** and pivotally connected at **135** at its opposite end to one end of a link bar **136,** the other end of the link bar **136** being pivoted at **137** to a crank arm **138** on a shaft **140.** The shaft **140** has a crank arm **142** pivotally connected at **143** to the end of a link bar **144** which extends to the cam shaft **85.** The link bar **144** has on its end a slot **145** in which the end of the link bar **144** is received. The shaft **85** carries a cam plate **146** on the track edge of which a cam follower roller **147** adjacent the end of the link bar **144** rides. The cam **146,** of course, is designed to operate the depending rod **130** in proper timed relation to engage the rollers **131** with the face of the carrier when the vacuum cups **38** engage the carrier on the opposite side and the vacuum is applied through the cups **38** so that the engagement of the vacuum head with the carrier in gripping relation will be assured.

The illustrated apparatus is particularly adapted for use in a bottling or packing plant in cooperation with apparatus for supplying assemblies of bottled beverages, or the like for filling the carriers C when they are opened up. The bottle supplying conveyor **12** advances beneath the apparatus and supplies groups of bottles in timed relation to the operation of the apparatus for opening the carriers. Guides, such as rollers **150** (FIG. **1**) may be provided to assist in guiding the open bottom wall panels *s* and *t* as the carriers drop onto the bottle assemblies. The collapsed carriers are supplied to the conveyor **14** and the apparatus **10** is operated to open the carriers as described herewith. The carrier and bottle assemblies are advanced by conveyor **12** to a bottom closing apparatus to complete the packaging operation.

I claim:

1. An apparatus for opening a folded tubular packaging container of the type which comprises a plurality of hingedly connected wall panels adapted to be unfolded by hinging in opposite directions the panels adjacent fold lines at opposite ends of the container, said apparatus comprising means for advancing successive containers in folded condition along a predetermined path with the container end fold lines extending in the direction of travel, panel gripping head assemblies, means for supporting said panel gripping head assemblies in paired relation for travel along opposite sides of the path of said container advancing means which supporting means comprises conveyor members mounted for travel in a path which extends in part along the path of travel of the containers, means on said gripping head assemblies for engaging in gripping relation with panels adjacent said container end fold lines which panels are disposed on opposite side faces of the container, means for moving said gripping head assemblies into position for engaging with opposite faces of each successive folded container while each said container is advancing, means for pivoting said panel gripping heads in opposite directions about axes extending in the direction of travel so as to hinge the panels which are gripped in opposite directions about said end fold lines and thereby open the container into tubular form.

2. An apparatus for opening a folded tubular packaging container of the type which comprises a plurality of connected wall panels adapted to be unfolded by hinging in opposite directions the panels adjacent fold lines at opposite ends of the container, said apparatus comprising means for advancing successive containers in folded condition along a predetermined path with the container end fold lines extending in the direction of travel, panel gripping head assemblies, means for supporting said panel gripping head assemblies in paired relation for travel along opposite sides of the path of said container advancing means, said means for supporting said panel gripping head assemblies including endless carriers having a portion of their paths of travel extending in generally parallel, spaced relation along opposite sides of the path along which said folded containers are advanced, means on said gripping head assemblies for engaging in gripping relation with panels adjacent said container end fold lines and disposed on opposite side faces of the container, means for pivoting said panel gripping heads in opposite directions about axes extending in the direction of travel so as to hinge the panels which are gripped in opposite directions about said end fold lines and thereby open the container into tubular form.

3. An apparatus as set forth in claim **2** wherein said panel gripping head assemblies are pivotally mounted on said endless carriers and said means for pivoting said panel gripping heads is cam controlled.

4. An apparatus as set forth in claim **2** wherein said panel gripping head assemblies include vacuum cups for engaging the container panels, means for connecting said vacuum cups to a vacuum source and means controlling the application of vacuum during a predetermined portion of the travel of said head assemblies.

5. An apparatus as set forth in claim **2** wherein said endless carriers are mounted on support frames and travel in generally parallel offset planes so as to position said gripping head assemblies for engaging opposite side faces of containers which are carried on said container advancing means.

6. An apparatus for opening a folded tubular packaging container of the type which comprises a plurality of connected wall panels adapted to be unfolded by hinging in opposite directions the panels adjacent hinge forming fold lines at opposite ends of the container, said apparatus comprising means for advancing successive containers in folded condition along a predetermined path with the container end fold lines extending in the direction of travel, panel gripping head assemblies, means for supporting said panel gripping head assemblies in paired relation for travel along opposite sides of the path of said container advancing means,

means on said gripping head assemblies for engaging in gripping relation with panels adjacent said container end fold lines and disposed on opposite side faces of the container, means for pivoting said panel gripping heads in opposite directions about axes extending in the direction of travel so as to hinge the panels which are gripped in opposite directions about said end fold lines and thereby open the container into tubular form, said means for pivoting said panel gripping head assemblies comprising means pivotally mounting said head assemblies and cam operated means for turning said gripping head assemblies on said pivotal mountings as they are advanced along said path.

7. An apparatus for opening a folded tubular packaging container of the type which comprises a plurality of connected wall panels adapted to be unfolded by hinging in opposite directions the panels adjacent hinge forming fold lines at opposite ends of the container, said apparatus comprising means for advancing successive containers in folded condition along a predetermined path with the container end fold lines extending in the direction of travel, panel gripping head assemblies, means for supporting said panel gripping head assemblies in paired relation for travel along opposite sides of the path of said container advancing means, means on said gripping head assemblies for engaging in gripping relation with panels adjacent said container end fold lines and disposed on opposite side faces of the container, means for pivoting said panel gripping heads in opposite directions about axes extending in the direction of travel so as to hinge the panels which are gripped in opposite directions about said end fold lines and thereby open the container into tubular form, said means for supporting said panel gripping head assembles comprising endless traveling carrier members and means mounting said carrier members for travel in transversely spaced paths extending along opposite sides of the path of the containers so as to bring said panel gripping head assemblies into position for engaging in gripping relation the container end panels on opposite side faces of a folded container.

8. An apparatus for opening a folded tubular packaging container of the type which comprises a plurality of connected wall panels adapted to be unfolded by hinging in opposite directions the panels adjacent fold lines at opposite ends of the container, said apparatus comprising means for advancing successive containers in folded condition along a predetermined path with the container end fold lines extending in the direction of travel, panel gripping head assemblies, means for supporting said panel gripping head assemblies in paired relation for travel along opposite sides of the path of said container advancing means, means on said gripping head assemblies for engaging in gripping relation with panels adjacent said container end fold lines and disposed on opposite side faces of the container, means for pivoting said panel gripping heads in opposite directions about axes extending in the direction of travel so as to hinge the panels which are gripped in opposite directions about said end fold lines and thereby open the container into tubular form, said means for advancing the folded containers having associated means for guiding the opposite ends of the containers so as to turn the folded containers about an axis extending in the direction of travel and to bring opposite ends thereof into a position for advance on opposite sides of the path of travel of cooperating gripping head assemblies which gripping head assemblies are positioned on said supporting means so as to grip the endmost panels on opposite sides of a folded container.

9. An apparatus for opening a folded tubular packaging container of the type which comprises a plurality of connected wall panels adapted to be unfolded by hinging in opposite directions the panels adjacent fold lines at opposite ends of the container, said apparatus comprising means for advancing successive containers in folded condition along a predetermined path with the container end fold lines extending in the direction of travel, panel gripping head assemblies, means for supporting said panel gripping head assemblies in paired relation for travel along opposite sides of the path of said container advancing means, means on said gripping head assemblies for engaging in gripping relation with panels adjacent said container end fold lines and disposed on opposite side faces of the container, means for pivoting said panel gripping heads in opposite directions about axes extending in the direction of travel so as to hinge the panels which are gripped in opposite directions about said end fold lines and thereby open the container into tubular form, said means for advancing said folded containers comprising an endless traveling conveyor member having spaced pairs of lugs thereon for engaging in apertures in said folded containers and guide members mounted along opposite sides of said conveyor member for guiding opposite ends of successive containers so as to tilt the containers about an axis extending in the direction of advance of said containers.

10. An apparatus for opening a collapsed tubular container of the type which is characterized by a series of hingedly connected wall panels adapted to collapse by folding on axially extending, parallel hinge forming fold lines into a common plane and to be opened by swinging the panels at opposite ends in opposite directions about their connecting hinge folds, said apparatus comprising conveyor means for advancing successive containers in collapsed condition along a predetermined path with the hinge forming end fold lines thereof extending in the direction of travel, gripping head assemblies, means supporting said gripping head assemblies for travel in paired, laterally spaced relation in paths extending along opposite sides of the path of said container advancing means, means on each of said gripping head assemblies for engaging in gripping relation a panel adjacent an end fold line of a container which is advanced thereto by said container advancing means, means swingably mounting each of said panel gripping means on said supporting means on an axis extending in the direction of travel of the containers, and means for swinging said panel gripping means of each pair thereof in opposite directions so as to swing the panels which are gripped in opposite directions about the hinge forming end fold lines and thereby open the container into tubular form.

11. An apparatus for opening a collapsed tubular container of the type which is characterized by a series of hingedly connected wall panels adapted to collapse by folding into a common plane and to be opened by swinging the panels at opposite ends in opposite directions about their connecting hinge folds, said apparatus comprising means for advancing successive containers in collapsed condition along a predetermined path with the end fold lines thereof extending in the direction of travel, gripping head assemblies supported for travel in

paired, laterally spaced relation along opposite sides of the path of said container advancing means, traveling conveyor members on which said gripping head assemblies are supported which traveling conveyor members are supported for traversing a path extending in part along opposite sides of the path of said container advancing means, means on each of said gripping head assemblies for engaging in gripping relation a panel adjacent an end fold line of a container which is advanced thereto by said container advancing means, each said panel gripping means being swingably mounted, and means for swinging the panel gripping means of each pair thereof in opposite directions about axes extending in the direction of travel so as to swing the panels which are gripped in opposite directions about the end fold lines and thereby open the container into tubular form.

12. An apparatus as set forth in claim **11** wherein said means for swinging said panel gripping means comprises a cam follower mounted on said panel gripping means and means forming cooperating cam tracks extending along opposite sides of the path of said container advancing means.

13. An apparatus as set forth in claim **11** wherein said gripping head assemblies each comprise a bracket mounted on said traveling conveyor member and having a pivot member thereon constituting a swingable mounting for said panel gripping means, said panel gripping means comprising a support member fixed on said pivot member and a vacuum cup on said support member, means connecting said vacuum cup with a vacuum source and means controlling the application of vacuum during a portion of the travel of the head assembly.

14. An apparatus as set forth in claim **11** wherein said means for advancing said containers in collapsed condition comprises a traveling conveyor having spaced container engaging lugs thereon and associated means extending along a portion of the path traversed by said conveyor for confining the ends of the containers to a predetermined path.

15. An apparatus as set forth in claim **14** wherein said means for confining the ends of the containers to a predetermined path comprises channel forming guide members extending adjacent said traveling conveyor and providing guide paths for the ends of the containers.

16. An apparatus as set forth in claim **11** said traveling conveyor members on which said head assemblies are supported, are mounted on generally rectangular, laterally spaced frames disposed on opposite sides of the path of said container advancing means with portions of the paths thereof in laterally spaced, parallel relation.

17. An apparatus as set forth in claim **16** wherein said traveling conveyor members each have mounted in spaced relation thereon a plurality of said gripping head assemblies and on one of said conveyor members there are mounted associated trailing members for engaging portions of the opened container for guiding the container as it is advanced along a lateral path upon the release of the opened container by the gripping means.

18. An apparatus as set forth in claim **11** wherein each of said gripping head assemblies includes a pair of cooperating plate members which are adapted to close on a portion of the container when the panel gripping means is operated to swing the container panel which it engages to open position.

19. An apparatus as set forth in claim **11** wherein back up means is provided at each side of the path of advance of the containers which is positioned to engage the opposite face of the collapsed container when an end panel is engaged by said panel gripping means so as to insure that the panel gripping means seats on the panel for effective gripping thereof.

20. An apparatus as set forth in claim **19** wherein said back up means comprises a roller member mounted on a pivotally mounted arm and means operating in timed relation to the movement of said panel gripping means to swing said back up means into operative position.

21. An apparatus for opening collapsed tubular containers of the type which are characterized by a plurality of hingedly connected wall panels adapted to be opened into squared up condition by swinging the panels at the opposite ends about hinge lines at said opposite ends, said apparatus comprising a pair of laterally spaced support frames disposed in a generally vertical common plane, a traveling conveyor on each frame having mounted thereon a series of container panel gripping head assemblies which are arranged for travel in oppositely disposed, paired relation and in paths which have laterally spaced, parallel portions, means for feeding collapsed containers downwardly between said frames, means on said gripping head assemblies for engaging container panels at the ends of collapsed containers and on opposite faces of said collapsed containers and means for operating said gripping head assemblies so as to grip said panels and swinging the same in opposite directions about the associated hinge lines to open up the containers.

22. An apparatus as set forth in claim **21** wherein said gripping head assemblies have vacuum cup members mounted thereon for gripping engagement with the container panels, and means connecting the vacuum cups with a source of vacuum.

23. An apparatus as set forth in claim **21** wherein said gripping head assemblies each comprise a supporting bracket member, a pivot member mounted at one end thereon, a support block on the free end of said pivot member, a vacuum cup on said support block, vacuum passageways extending through said block, said pivot member and said bracket member and means connecting said passageways with a source of vacuum.

24. An apparatus as set forth in claim **23** wherein said pivot member has a radial arm, a linkage connecting said radial arm with a plate member pivotally mounted on an arm extending from said bracket and carrying a cam follower, and means forming a cam track along the path of travel of said head for receiving said cam follower so as to control the movement of said vacuum cup support block.

25. An apparatus as set forth in claim **21** wherein said traveling conveyors are mounted on opposite faces of said support frames and arranged to travel in offset, parallel vertical paths.

26. An apparatus as set forth in claim **21** wherein said support frames are disposed in generally parallel, vertical planes which are offset relative to each other and said traveling conveyors are mounted on opposite faces of said frames.

27. An apparatus as set forth in claim **21** wherein said gripping head assemblies have means for engaging the container end panels which comprises a vacuum cup,

a mounting block for said vacuum cup, a pivot support for said mounting block and cam means for pivoting said mounting block into gripping relation with the container panel so as to grip said panel.

28. An apparatus as set forth in claim **21** wherein said traveling conveyors are arranged to carry the gripping head assemblies away from the containers at the bottom of the laterally spaced paths and said gripping head assemblies on one of said traveling conveyors each have associated container engaging arm members in trailing relation for engaging top portions of the opened container when they reach the bottom of said path so as to advance the open containers when the containers are freed from said gripping head assemblies.

29. An apparatus as set forth in claim **21** wherein said gripping head assemblies each have vacuum cup means pivotally mounted thereon and associated means for swinging the vacuum cup means into engagement with an end panel on a container when the head assembly is advanced along said parallel path, means connecting the vacuum cup means with a source of vacuum and control means for applying vacuum while the vacuum cup means is traversing said parallel path so as to grip the container panel and to release the container at the bottom end of the path.

30. An apparatus for opening a collapsed tubular container of the type which comprises a series of wall panels which are hingedly connected on parallel, axially extending hinge forming fold lines for collapse into a common plane and adapted to be opened by hinging the panels at opposite ends in opposite directions about hinge forming end folds, said apparatus comprising means for advancing successive containers in collapsed condition downwardly along a generally vertical path with the container end folds extending in the direction of travel, panel gripping assemblies, means supporting said panel gripping assemblies for travel in oppositely disposed, paired relation on opposite sides of the path of said container advancing means, means on each said gripping assembly for engaging in gripping relation with a panel adjacent an end fold of each said container, means for turning the panel gripping means on said supporting means in opposite directions about pivotal axes extending in the direction of travel of said containers so as to hinge in opposite directions the panels which are gripped and thereby open the container into tubular form, means for releasing the panel gripping means so as to free the open containers, conveyor means for advancing assemblies of articles in a path below the container opening apparatus, and means associated with the opening apparatus for guiding the opened containers as they are dropped onto successive article assemblies.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,848,519 Dated November 19, 1974

Inventor(s) ROBERT H. GANZ

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

On the inside cover page, the name of the assignee -- FEDERAL PAPER BOARD COMPANY, INC. -- should be inserted after the inventor

Column 3, line 61, "km" should be italicized

Signed and sealed this 4th day of February 197

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Pater