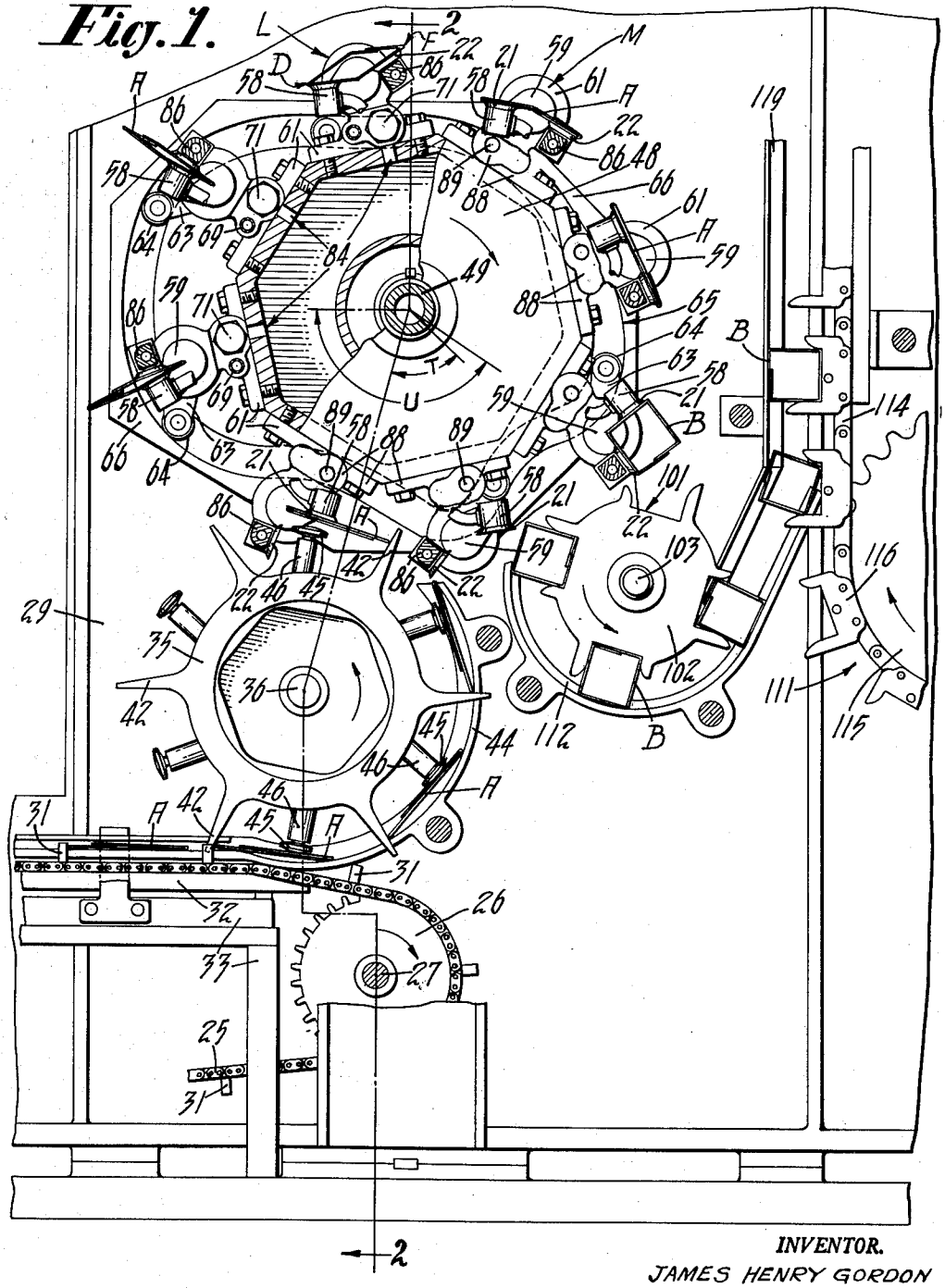
May 16, 1961 J. H. GORDON 2,984,162

METHOD OF AND APPARATUS FOR REFORMING COLLAPSED CONTAINER BODIES

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Fig. 1.



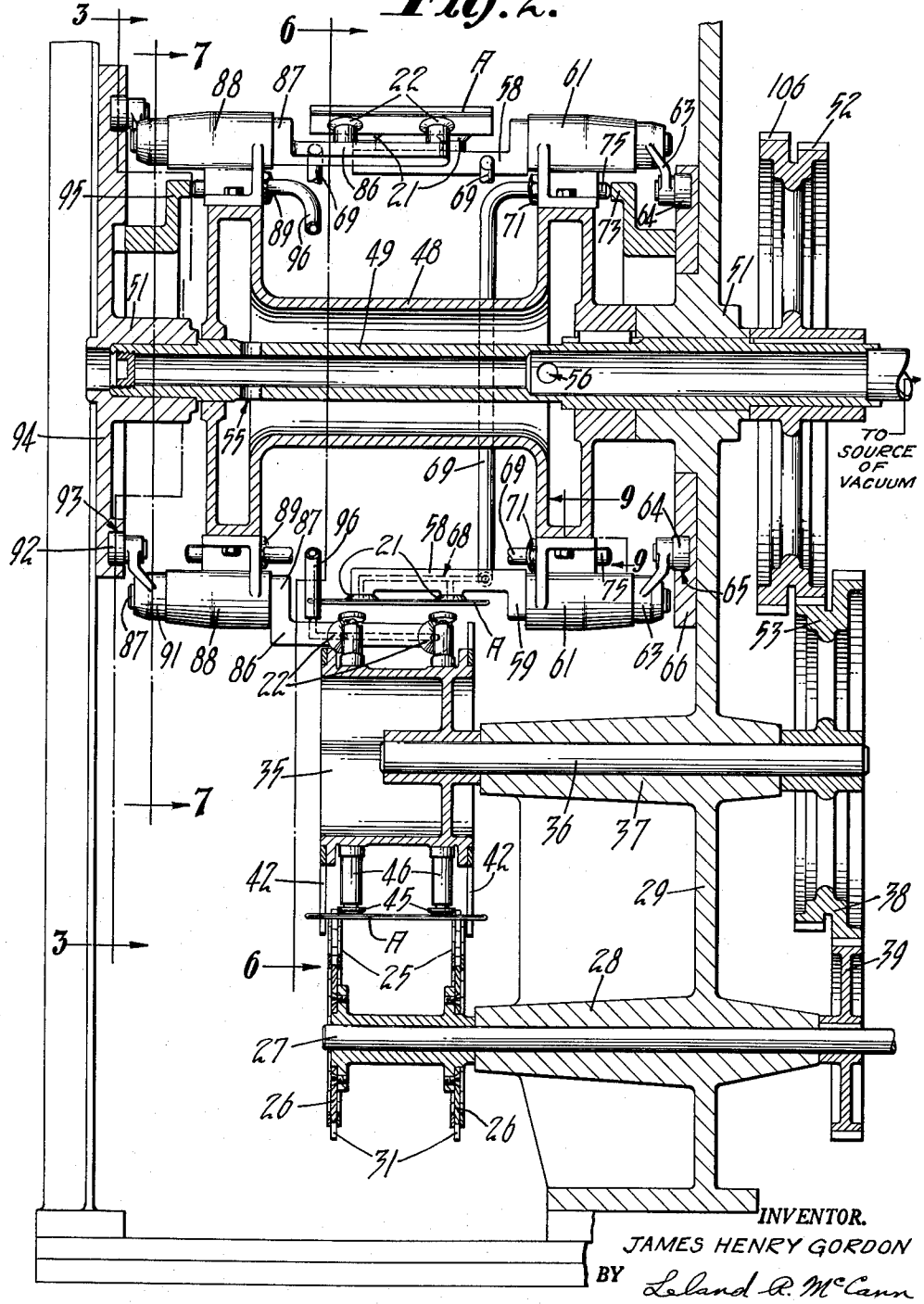
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METHOD OF AND APPARATUS FOR REFORMING COLLAPSED CONTAINER BODIES

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Fig. 2.



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METHOD OF AND APPARATUS FOR REFORMING COLLAPSED CONTAINER BODIES

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Fig. 3.

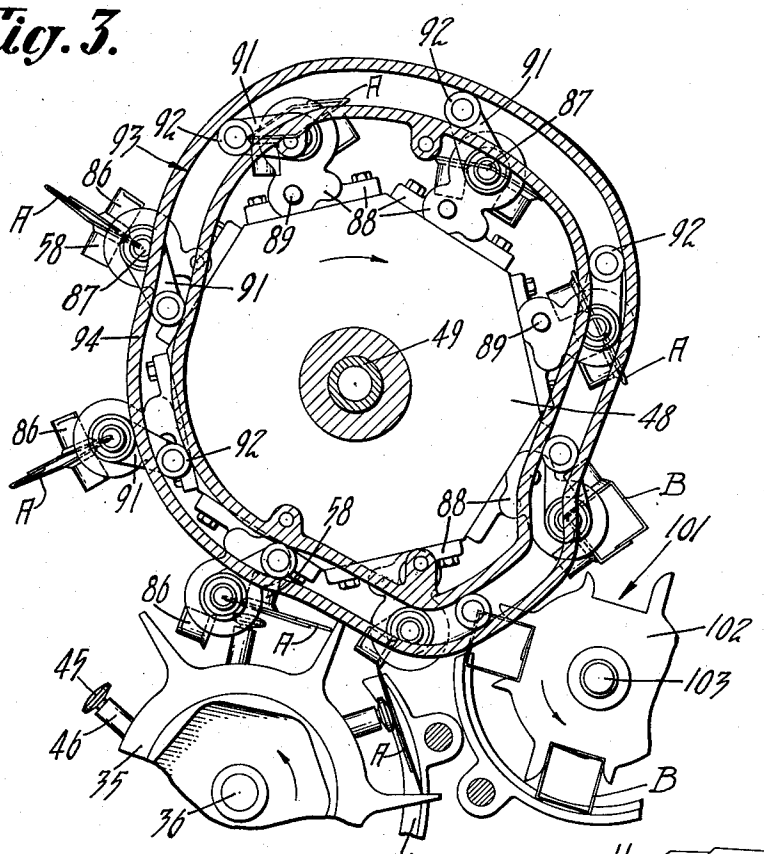


Fig. 4.

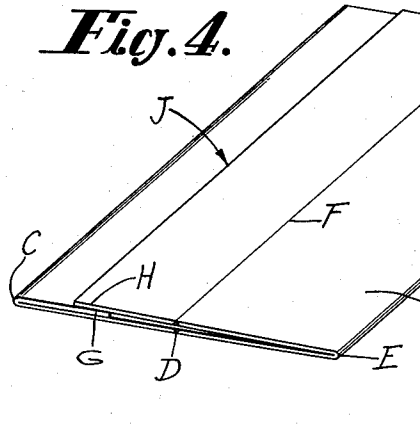
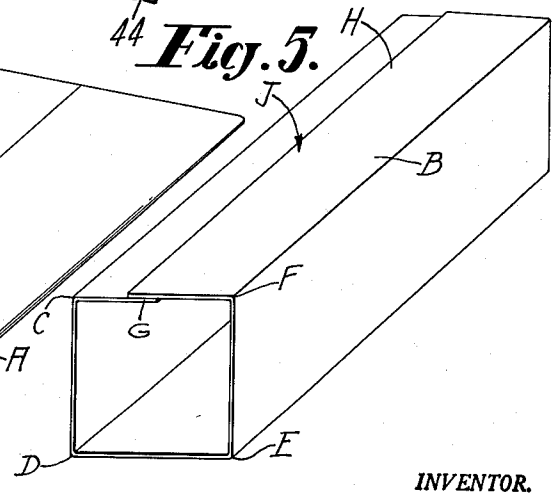


Fig. 5.



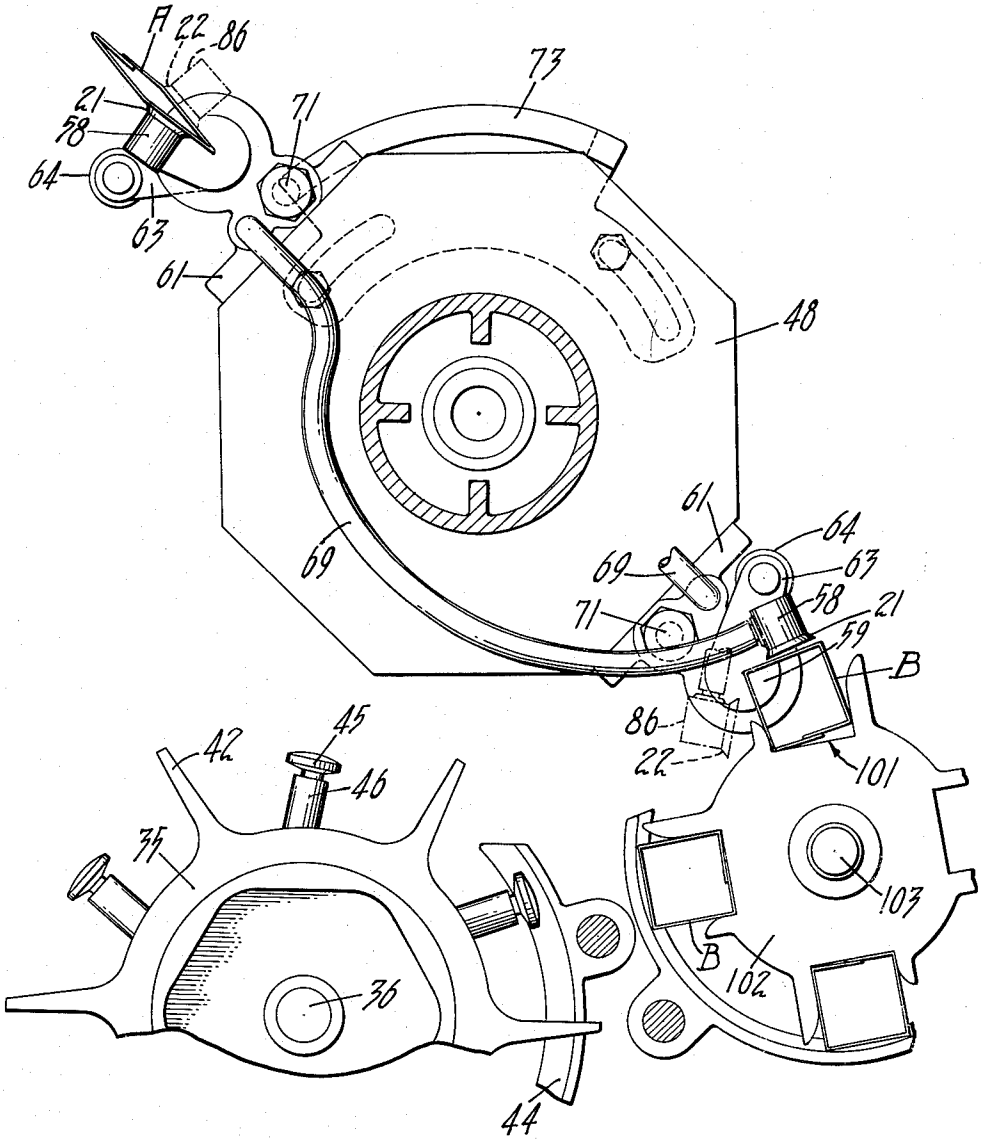
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METHOD OF AND APPARATUS FOR REFORMING COLLAPSED CONTAINER BODIES

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Fig. 6



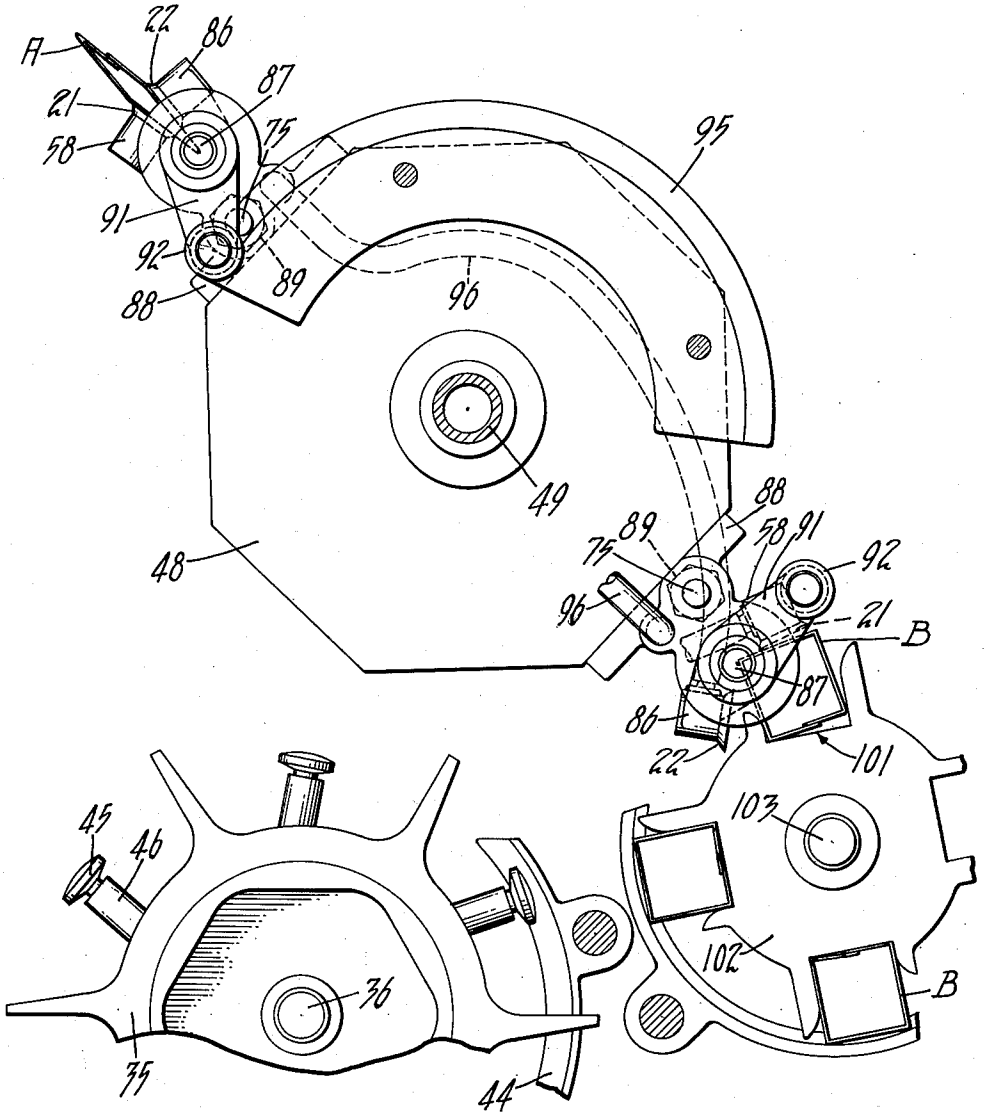
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Fig. 7.



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METHOD OF AND APPARATUS FOR REFORMING COLLAPSED CONTAINER BODIES

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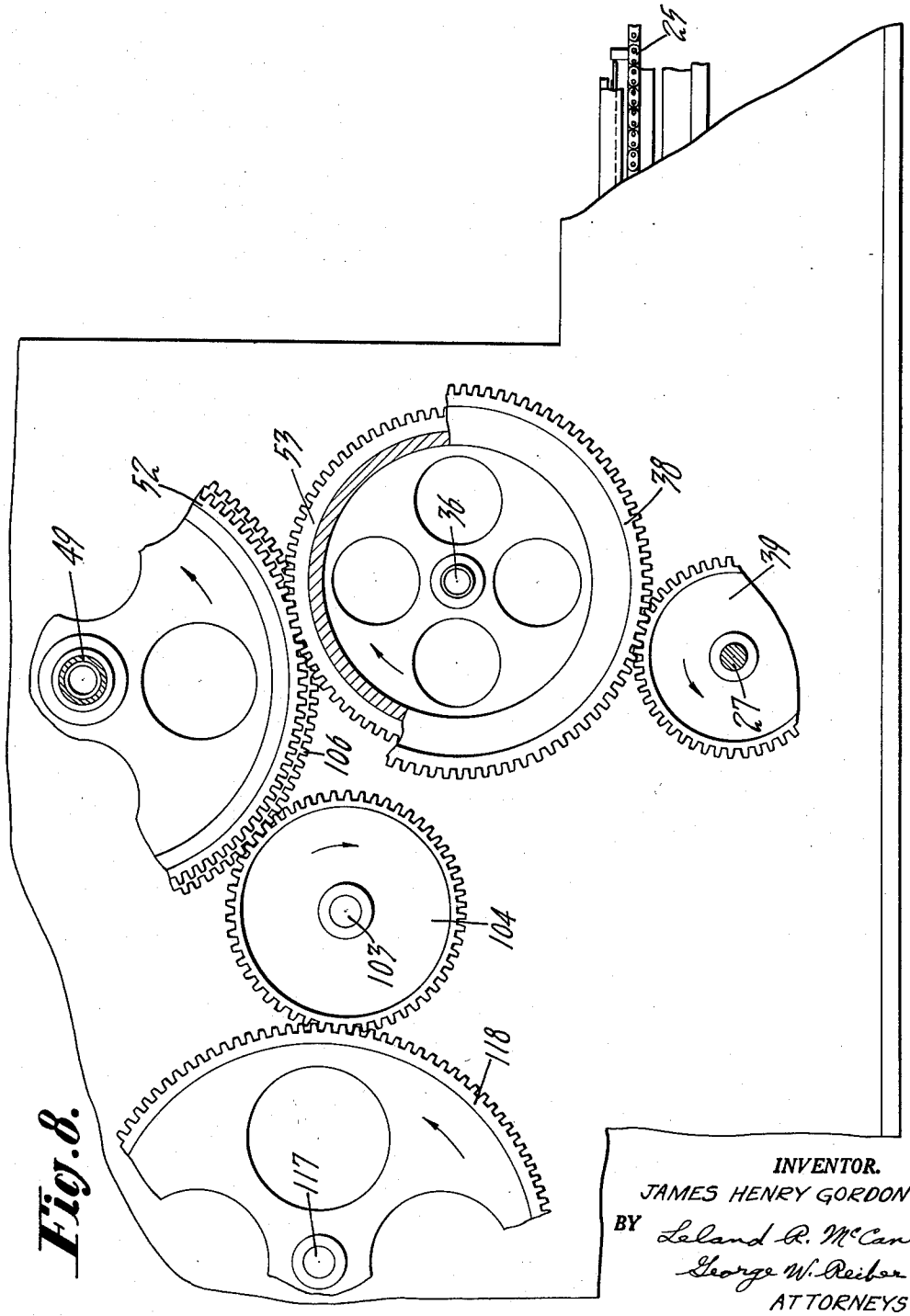


Fig. 8.

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METHOD OF AND APPARATUS FOR REFORMING COLLAPSED CONTAINER BODIES

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Fig. 11.

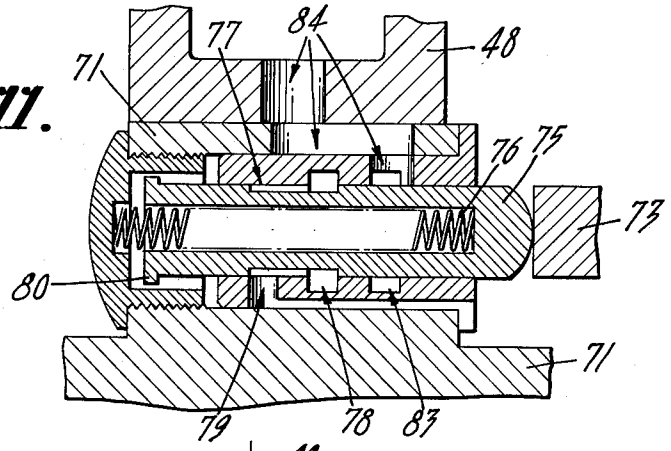


Fig. 10.

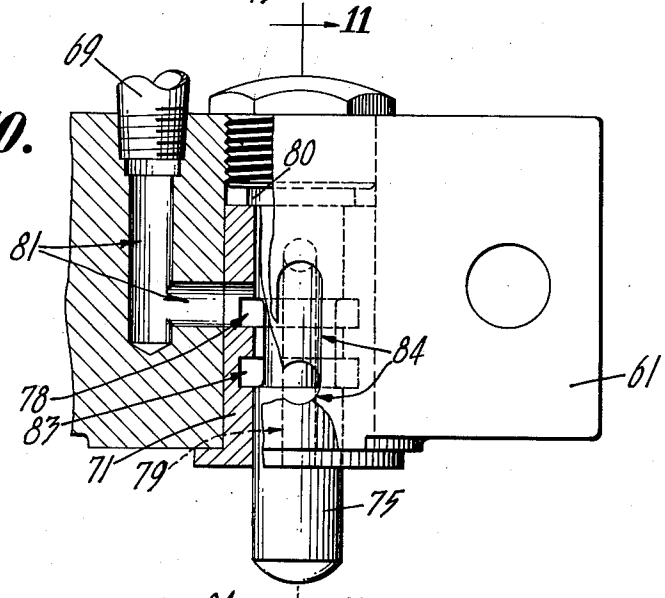
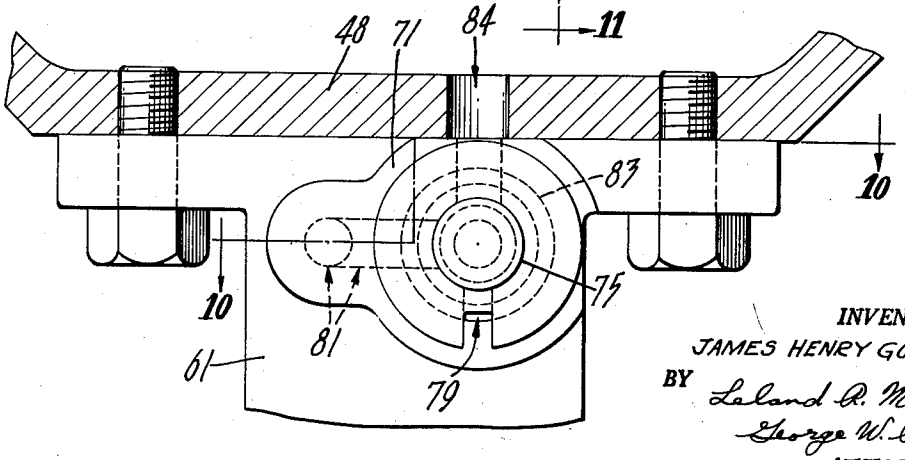


Fig. 9.



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2,984,162

METHOD OF AND APPARATUS FOR REFORMING COLLAPSED CONTAINER BODIES

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Filed Dec. 23, 1958, Ser. No. 782,521

8 Claims. (Cl. 93—53)

The present invention relates to a method of and apparatus for reforming collapsed can or container bodies and has particular reference to steps of and devices for spreading apart the collapsed side walls of fibre containers to reform the collapsed bodies into rectangular tubular bodies for use.

In the manufacture of fibre containers such as the well known rectangular milk container, the bodies are made from a flat blank having transverse crease lines along which the blank is folded to produce a rectangular tubular body. Usually overlapping edges of the body are adhesively secured to each other to hold the body together as a unitary structure.

As an expedient in the manufacture of such bodies, the blanks are folded along two crease lines only so that portions of the blank which include the side seam edges are folded over onto the other portions, and the side seam edges secured together so as to produce a completely unitary body structure, but in a flat collapsed form. Such collapsed container bodies are easier to stack for storage or shipment since they occupy a minimum of space as compared with the fully formed open bodies, and they are also easier to handle and to feed automatically into subsequent operation machines. It is necessary, however, to reform them into open tubular bodies before they can be converted into containers having end closures attached thereto.

It is an object of the instant invention to provide a method of and apparatus for reforming such collapsed container bodies into fully open tubular bodies to facilitate conversion of the bodies into containers.

Another object is to effect the reforming of the collapsed bodies automatically while they are traveling along a path of travel at high speed preparatory to entering a subsequent operation machine so as to correlate the reforming operation with the high speed of the subsequent operation machine.

Another object is to provide for the pre-breaking or flexing of unfolded crease lines in the collapsed bodies so as to facilitate squaring up of the side walls and to provide for the retention of the walls in their squared-up relation when the collapsed bodies are fully reformed.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a side elevation of an apparatus embodying the instant invention and disclosing the steps of the instant method of reforming container bodies, with parts of the apparatus broken away and parts in section;

Fig. 2 is a transverse sectional view taken substantially along the broken line 2—2 in Fig. 1, with parts broken away;

Fig. 3 is a sectional view taken substantially along the line 3—3 in Fig. 2 with parts broken away;

Fig. 4 is an enlarged perspective view of a collapsed container body to be reformed;

Fig. 5 is an enlarged perspective view of the collapsed container body in fully reformed condition;

Figs. 6 and 7 are sectional views taken substantially along the lines 6—6, 7—7 in Fig. 2, with parts broken away;

Fig. 8 is a side elevation as viewed from the right in Fig. 2, with parts broken away;

Fig. 9 is an enlarged sectional view taken substantially along the broken line 9—9 in Fig. 2, with parts broken away;

Fig. 10 is a sectional view taken substantially along the broken line 10—10 in Fig. 9 and

Fig. 11 is a sectional view taken substantially along the line 11—11 in Fig. 10.

As a preferred and exemplary embodiment of the instant invention the drawings illustrate a method of and an apparatus for receiving collapsed fibre container bodies A (Fig. 4) and for reforming the collapsed bodies A into tubular rectangular bodies B (Fig. 5) preparatory to attaching end closure members thereto to convert them into containers such as the well known milk containers hereinbefore mentioned.

A container body B (Fig. 5) preferably is made from a single blank of fibre board, which is folded along spaced and parallel crease lines C, D, E, F to produce a rectangular shaped tubular body. Side seam edges G, H of the blank are overlapped and adhesively secured together to produce a side seam J which holds the body parts united as a unitary structure.

To expedite the manufacture and the subsequent handling and storing of the bodies prior to the attachment of the end closure members thereto, the flat blank preferably is folded along the crease lines C and E so that portions of the blank are folded back on themselves as shown in Fig. 4. Simultaneously with this operation the side seam edges G, H are overlapped and secured together. The result of these operations is the collapsed container body A illustrated in Fig. 4.

In the instant method of reforming container bodies, the collapsed container bodies A are fed along a sinuous path of travel through a plurality of working stations at which each collapsed body is fed into position between a pair of vacuum cups 21, 22 (Fig. 1) which are movable relative to each other and which are moved to grip opposite sides of the body. The vacuum cups are arranged to take hold of the body in the space between the folded crease line E (Fig. 4) and the two unfolded crease lines F, D for a particular purpose.

While the vacuum cups 21, 22 grip the collapsed body, they are moved apart along oppositely directed arcuate paths of travel. This action spreads the walls of the body apart from the originally flat collapsed condition shown in Fig. 4, to the fully open condition shown in Fig. 5. However, this reforming movement does not stop at this stage, but continues on, with the continued arcuate movement of the vacuum cups, to recollapse the body in the opposite direction as shown at L in Fig. 1. This opening and reclosing of the collapsed body A in the opposite direction folds the body along the previously unfolded crease lines D, F (Fig. 4).

In order to insure that the reformed container body B will remain in a substantially rectangular shape when it is released by the vacuum cups 21, 22 the cups after recollapsing the body, as shown at L in Fig. 1, continue on along their arcuate path of travel, and bend the recollapsed body in a reverse direction as indicated at M in Fig. 1. This action fully breaks or flexes the corners defined by the folded crease lines C and E, and thereby relieves or dissipates any springiness in the body walls

which would otherwise tend to return the body to a collapsed or partially collapsed condition.

After breaking the corners C, E, the vacuum cups 21, 22 reverse their arcuate travel and in moving toward each other, flex the collapsed body to again spread its walls apart until it reaches the desired rectangular tubular shape. In this fully reformed state of the body, the cups 21, 22 release it for further advancement to a subsequent operation machine.

Referring now to the drawings in more detail, the apparatus of the instant invention receives the pre-formed collapsed container bodies A on a horizontally disposed conveyor which preferably comprises a pair of spaced and parallel endless chains 25 (Figs. 1 and 2) which operate over a pair of sprockets 26 mounted on a conveyor shaft 27 journaled in a bearing 28 formed in a frame 29 which may be a portion of a more elaborate machine for operating on the reformed bodies. The conveyor shaft 27 preferably is rotated continuously in any suitable manner.

Feed dogs 31 carried on the conveyor chains 25 at spaced intervals therealong feed the collapsed container bodies A into the apparatus in a substantially continuous procession and in timed and spaced order. To facilitate this feeding operation the upper runs of the chains 25 are supported in a horizontal position by a pair of spaced and parallel tracks 32 attached to a subframe 33 of the main frame 29.

As the collapsed container bodies A enter the apparatus, the conveyor 25 carries them into a position adjacent a pick-off wheel 35 which is mounted on a continuously rotating shaft 36 (Figs. 1 and 2) journaled in a bearing 37 in the frame 29. The shaft 36 is driven by and in time with the conveyor shaft 27 through meshing gears 38, 39 mounted on the respective shafts (see also Fig. 8).

The pick-off wheel 35 is provided with pairs of radially disposed prongs 42 which during rotation of the wheel, and in time with the feed dogs 31 on the conveyor 25, move into and travel along the path of travel of the collapsed container bodies A on the conveyor 25. As each prong 42 rotates into position it engages behind a collapsed body A and sweeps it forward, off the conveyor 25 and onto and along an upwardly curved pair of guide rails 44 which partially surround the pick-off wheel 35. Resilient or yieldable spring backed pressure elements 45 disposed in radial holders 46 on the wheel 35 between the prongs 42 exert a slight pressure on the collapsed bodies A as they move along the guide rails 44. The pick-off wheel 35 propels the collapsed container bodies A upwardly along the guide rail 44 into a position where they are gripped by the vacuum cups 21, 22 hereinbefore mentioned.

There are a plurality of sets of the vacuum cups 21, 22 and they are mounted in spaced relation around the periphery of a hollow rotatable vacuum drum 48 mounted on a hollow shaft 49 journaled in a pair of spaced bearings 51 in the frame 29. The shaft 49 is continuously rotated in time with the conveyor 25 and the pick-off wheel 35 through a gear 52 (Figs. 2 and 8) which meshes with a gear 53 preferably formed as an integral part of the gear 38 on the pick-off wheel shaft 36.

The interior of the drum shaft 49 beyond the gear 52 connects with any suitable source of vacuum. Ports 55, 56 in the portion of the shaft disposed within the vacuum drum 48 provides communication between the interior of the drums and the source of vacuum to maintain the drum in a vacuumized condition.

Each set of vacuum cups comprises two of the cups 21 and two of the cups 22. The two cups 21 are carried on a transverse arm 58 (Figs. 1 and 2) which extends parallel with the axis of the drum and is provided at one end with a trunnion 59 which is pivotally mounted in a bearing bracket 61 secured to the periphery of the vacuum drum 48 adjacent one edge thereof (the right as viewed in Fig. 2). Beyond the bearing bracket, the trunnion 59 carries a cam arm 63 having a cam roller 64 which operates in a cam groove 65 of a stationary face cam 66 secured to the adjacent frame 29. The cam groove 65 is shaped to pivot the trunnion 59 and its transverse cup arm 58 to swing the vacuum cups 21 through their arcuate path of travel as they move around with the vacuum drum to effect the operations on the collapsed container body as hereinbefore mentioned.

In order to vacuumize and vent the cups 21 to grip and release the body A, a channel 68 in the transverse arm 58 is connected by a tube 69 to a cam actuated control valve 71 housed in one of the other bearing brackets 61, instead of its own bearing bracket merely to provide for better location of a stationary cam shoe 73 (see Fig. 6) attached to the frame 29 adjacent the stationary face cam 66.

The control valve 71 includes a horizontally slidable plunger 75 (Figs. 2, 10 and 11) which is located for engagement against the stationary cam shoe 73 as the drum 48 rotates. A compression spring 76 within the plunger 75 urges the latter outwardly toward the cam shoe. The plunger 75 is provided with an annular groove 77, which when the plunger is in engagement with the cam shoe 73, is in register with an annular vent groove 78 (Fig. 11) and a vent channel 79, both of which are formed in the valve 71 adjacent the plunger. The annular groove 78 connects with a channel 81 which leads into the tube 69 as best shown in Fig. 10. Through this connection the vacuum cups 21 are in communication with the vent channel 79 when the plunger 75 is in engagement with the cam shoe 73 and hence the vacuum cups are in a vented condition.

When the plunger 75 rides off the cam shoe 73, the spring 76 pushes the plunger outwardly and thus moves its annular groove 77 out of register with the vent channel 79 but retains its register with the valve groove 78. This closes the vent channel 79. A shoulder 80 on the plunger stops it in the right place. This movement of the plunger shifts its annular groove 77 into register with an annular vacuum groove 83 in the valve 71. This vacuum groove 83 is in direct communication with the vacuumized interior of the drum 48, by way of ports 84 in the valve and in the periphery of the drum.

Hence when the plunger 75 is in this extended position, a direct communication is provided from the vacuum drums 48, through the vacuum groove 83, plunger groove 77, vent groove 78, channel 81 and tube 69 to the vacuum cups 21 to maintain them in a vacuumized condition.

In a similar manner, the two vacuum cups 22 of each set, are carried on a transverse cup arm 86 (Figs. 1 and 2) which extends across the drum 48 adjacent to the cup arms 58 and in parallelism with the axis of the drum. Each of the cup arms 86 at one end are provided with a trunnion 87 which is pivotally mounted in a bearing bracket 88 secured to the periphery of the vacuum drum 48 adjacent the edge opposite the brackets 61 (at the left as viewed in Fig. 2). These brackets 88 are similar to the brackets 61 and each bracket 88 houses a vacuum control valve 89 which is identical to the control valves 71.

Beyond the bearing brackets 88, the trunnions 87 carry cam arms 91 having cam rollers 92 which operate in a cam groove 93 (see also Fig. 3) of a stationary face cam 94 secured to the adjacent frame 29. The cam groove 93 is shaped to pivot the trunnions 87 and their cup arms 86 to swing the vacuum cups 22 through their arcuate path of travel as they move around with the vacuum drum to effect the operations on the collapsed container body as hereinbefore mentioned. An arcuate stationary cam shoe 95 (see Figs. 2 and 7) is secured to the face cam 94 to actuate the control valves 89 at the proper time. These control valves 89 are connected by tubes 96 (Fig. 7) to the cup arms 86 to vacuumize and vent the cups 22.

In the operation of the apparatus, the vacuum cups 21

are vented during a period when they travel under the vacuum drum 48 as they approach the pick-up wheel 35; an angular distance substantially equal to that indicated at T in Fig. 1. In a similar manner the vacuum cups 22 are vented while they travel through an angular distance indicated at U in Fig. 1. During these periods the plungers 75 of the control valves 71 and 89 are riding on the respective arcuate cam shoes 73, 95.

As a set of the vented vacuum cups 21, 22 approach the pick-up wheel 35, they are spread apart as shown in Fig. 1, with the cups 21 in a substantially radial relation to the vacuum drum 48 and the cups 22 disposed ahead of the cups 21 and substantially at an angle of ninety degrees thereto. In this relation and as they are moving past the pick-up wheel 35, the cups 21 engage against the collapsed container body A in the pick-up wheel. At this instant the plunger 75 of the cooperating control valve 71 rides off the arcuate cam shoe 73 and thus opens the valve to the vacuum. This vacuumizes the cups 21 and causes the collapsed body A to cling to the cups.

As the vacuum drum 48 and the pick-up wheel 35 continue to rotate, the cups 21 carry the collapsed body A, away from the pick-up wheel 35. When the body is clear of the wheel, the cups 22 pivot inwardly toward the opposite side of the body and clamp it against the cups 21. In this position the cooperating cups 21, 22 carry the body upwardly along a curved path of travel around the top of the vacuum drum. During this travel, the plunger 75 of the cooperating control valve 89 rides off of its cam shoe 95 and opens the valve to the vacuum to vacuumize the cups 22 and cause them to grip the collapsed body A.

With the body A thus gripped on opposite faces or sides by the vacuum cups 21, 22, both sets of cups 21, 22 are pivoted by their respective face cams 66, 94 as hereinbefore mentioned to open the collapsed body A, close it in a reverse direction, flex the newly folded crease lines D, F and reopen the body as a completely reformed body B ready for discharge, as illustrated in Fig. 1.

After reforming of the collapsed body A into the rectangular shaped body B, the vacuum cups 21, 22 still gripping the body, deposit it into one of a plurality of rectangular shaped pockets 101 (Figs. 1, 6 and 7) on the periphery of a transfer turret 102 located adjacent the path of travel of the body around the vacuum drum 48. This turret 102 is mounted on a continuously rotating shaft 103 journaled in a bearing in the frame 29. The shaft 103 is rotated by an idler gear 104 (Fig. 8) which meshes with a driving gear 106 preferably formed integrally with the gear 52 on the vacuum drum shaft 49. The transfer turret 102 is thus rotated in time with the drum.

When the reformed body B is deposited in a turret pocket 101, the vacuum cups 21, 22 are vented by reengagement of the plungers 75 of their cooperating control valves 71, 89 with their respective cam shoes 73, 95. This action dissipates the vacuum in the cups and thereby releases the reformed body B to the transfer turret 102 as shown in Figs. 6 and 7.

While the vented cups 21, 22 move on to reapproach the pick-up wheel 35 for a repeat pick-up and reforming operation on another collopsed body A, the released reformed body B in the transfer turret 102 is advanced along a curved path of travel under the turret as shown in Fig. 1 and is transferred to an elevator 111 or other suitable mechanism to deliver the reformed body B to a suitable place of deposit or subsequent operation machine. A curved guide rail 112 (Fig. 1) disposed adjacent the turrent 102 retains the bodies B in the turret pockets 101 and directs them to the elevator 111.

The elevator 111 preferably is an endless chain 114 which operates over suitable sprockets 115 and which carries spaced pocket forming elements 116 to receive and advance the bodies in spaced and timed order as they are received from the transfer turret. One of the sprockets 115 is a driving spracket and is mounted on a drive shaft 117 (Fig. 8) carrying a gear 118 which meshes with the transfer gear 104 for actuating the elevator in time with the transfer turret. Vertical guide rails 119 (Fig. 1) are provided adjacent the elevator chain 114 to retain the bodies B in the elevator pocket elements 116.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction, and arrangement of parts of the apparatus mentioned herein and in the steps and their order of accomplishment of the method described herein, without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the apparatus and method hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. An apparatus for reforming substantially rectangular shaped collapsed container bodies, comprising a hollow rotatable drum, means for rotating said drum, means communicating with the interior of said drum for maintaining it in a vacuumized condition, a pair of juxtaposed parallel arms pivotally mounted on said drum, a pair of oppositely disposed vacuum cups carried on said arm for engaging opposed faces of a collapsed container body, means connecting said cups with the interior of said drum and including a control valve on said drum for opening said cups to the interior of said drum to vacuumize said cups and to cut off said vacuum and vent said cups, means for pivoting said arms to swing said cups forwardly and reversely through independent arcs oppositely to each other to grip a said collapsed container body between them and to open said body into a reformed substantially rectangular tubular body when the cups are vacuumized and to thereafter release said reformed body when said cups are vented, and means operable upon said control valve in time with the rotation of said drum to open and vent said valve.

2. An apparatus of the character defined in claim 1 wherein said means for pivoting said cup arms are a pair of stationary cams disposed adjacent said drum and cam arms connected with said cup arms and operable by said cams.

3. An apparatus for reforming flatly collapsed rectangular container bodies having two opposed corners folded and two opposed corners unfolded, comprising a pair of oppositely disposed gripper elements for engaging opposed faces of a said collapsed container body, a pivotal mounting for each of said gripper elements, and means for pivoting said gripper elements toward each other to grip said collapsed container body between them, and to then swing said gripper elements in opposite directions through arcuate paths of greater than ninety degrees to spread said body open and recollapse it in a reverse direction to fold said unfolded corners and to bend said reversely collapsed body between said newly folded corners to oppositely flex the flattened first mentioned folded corners, said means swinging said gripper elements reversely to reopen said reversely collapsed body to produce a fully reformed tubular body of rectangular cross section.

4. Apparatus for reforming collapsed tubular container bodies having completed flattened side seams, comprising a rotatable vacuumized drum, a pair of suction grippers pivotally mounted on said drum for receiving therebetween a collapsed and flattened tubular container body having scored fold lines thereon, means for feeding said body to between said grippers, and means for swinging said grippers on their pivotal mountings in opposite directions along arcuate paths of travel first toward one another to grip said body on opposite sides and adjacent walls thereof and then away from each other to open said body on the folded score lines and thereafter to reversely fold the body on said fold lines to again flatten

and to oppositely flex said body on said folded score lines, said swinging means being thereafter operative to reversely swing said grippers toward one another through said arcuate paths to reopen said reversely folded and flattened body and produce a fully reformed tubular body of rectangular shape and cross section.

5. Apparatus for reforming collapsed tubular container bodies as defined in claim 4, wherein said suction grippers are moved away from each other by said swinging means through an arcuate path of substantially 180°, and thereafter towards one another through an arcuate path of substantially 90° respectively for the purposes described.

6. The method of reforming flatly folded and collapsed rectangular container bodies having two opposed corners folded and two opposed corners unfolded, comprising the steps of gripping opposed adjacent faces of a said flatly folded container body, pulling said gripped faces apart along opposed arcuate paths to expand said collapsed container body to fully open condition, further pulling said gripped faces apart along said arcuate paths to reversely fold and recollapse said body along said unfolded corners to flex said corners, and then pushing said gripped faces toward each other in reverse opposite directions along said opposed arcuate paths to again expand said recollapsed body to fully open condition, thereby producing a

fully reformed tubular container body of rectangular cross section.

7. The method of claim 6, wherein said opposed adjacent faces of said flatly folded container body are gripped by suction.

8. The container reforming apparatus of claim 1 having a plurality of pairs of juxtaposed parallel arms and vacuum cups mounted in spaced circumferential relation on the periphery of said drum, a pick-up wheel said collapsed container bodies to said cup pairs, a having spaced prongs thereon for successively feeding transfer turrent having peripheral pockets for receiving the reformed container bodies, and means for rotating said pick-up wheel in timed relation with the rotation of said drum.

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