

[54] **POLYGONAL SHAPED CONTAINER BODY FORMING APPARATUS**

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 [51] Int. Cl.² **B31F 1/00; B31B 1/38**
 [58] Field of Search **93/82, 77 R, 94 PS; 113/1 G, 120 M**

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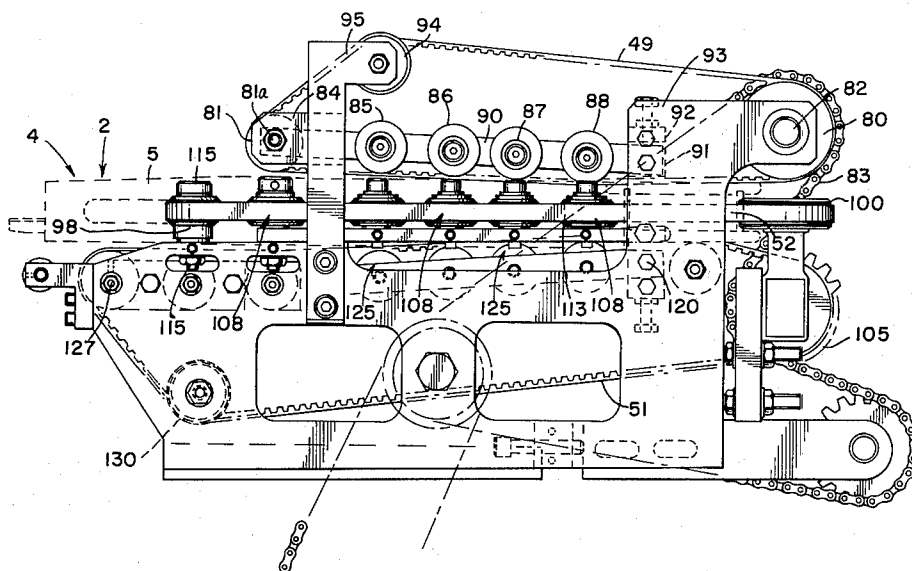
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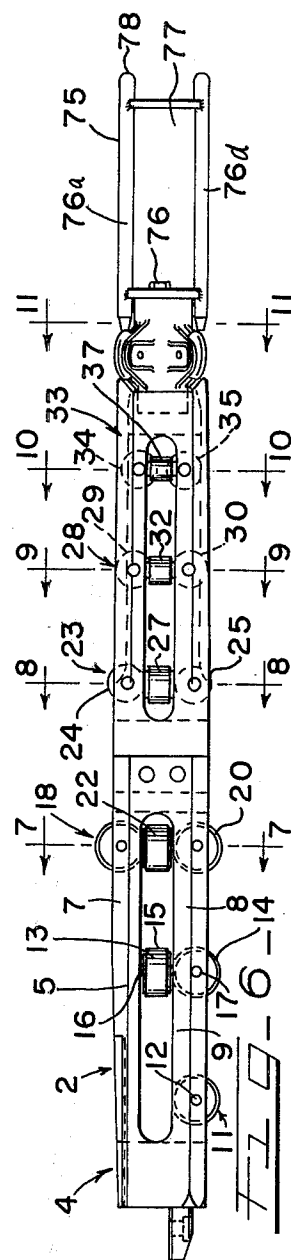
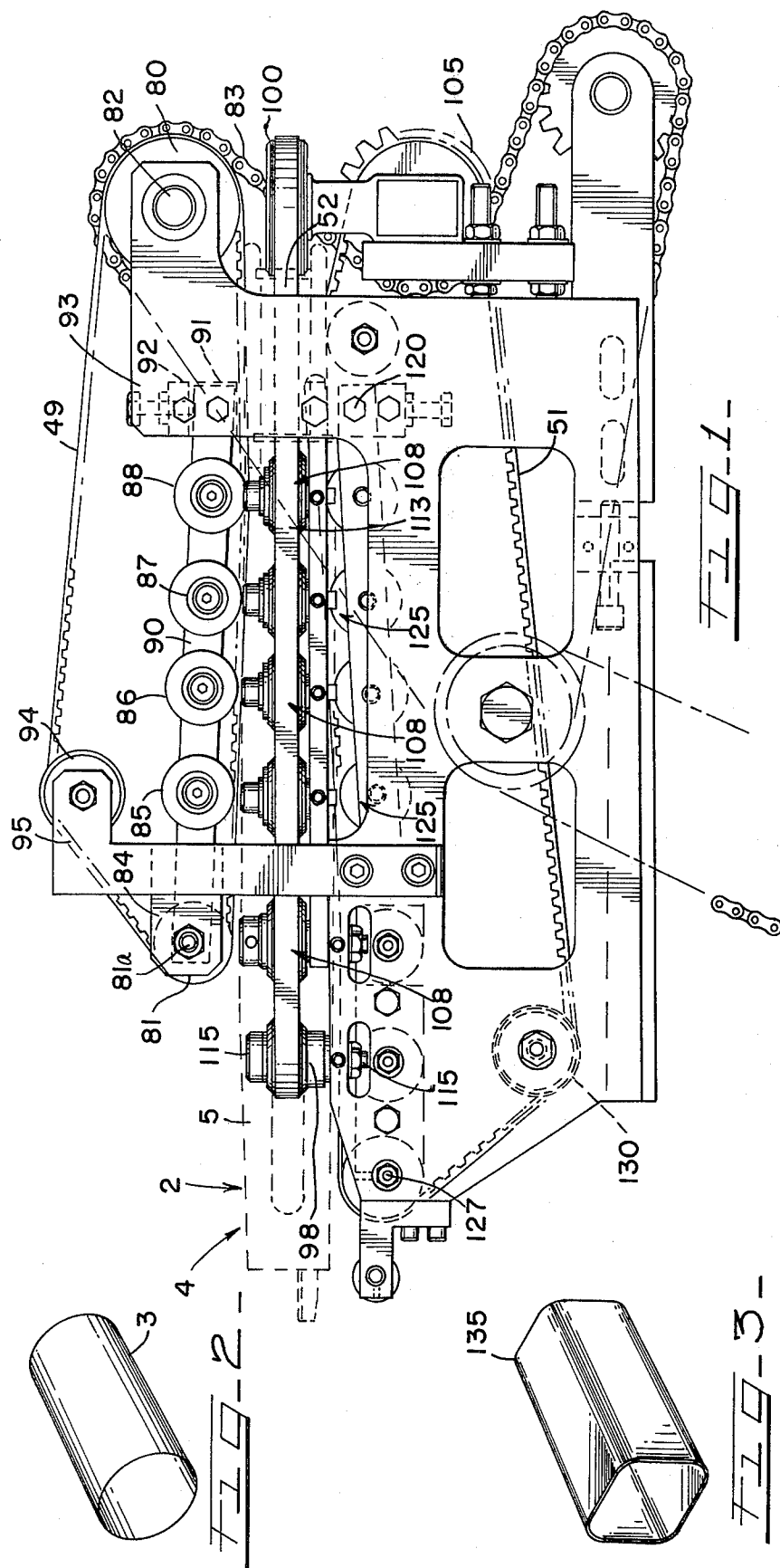
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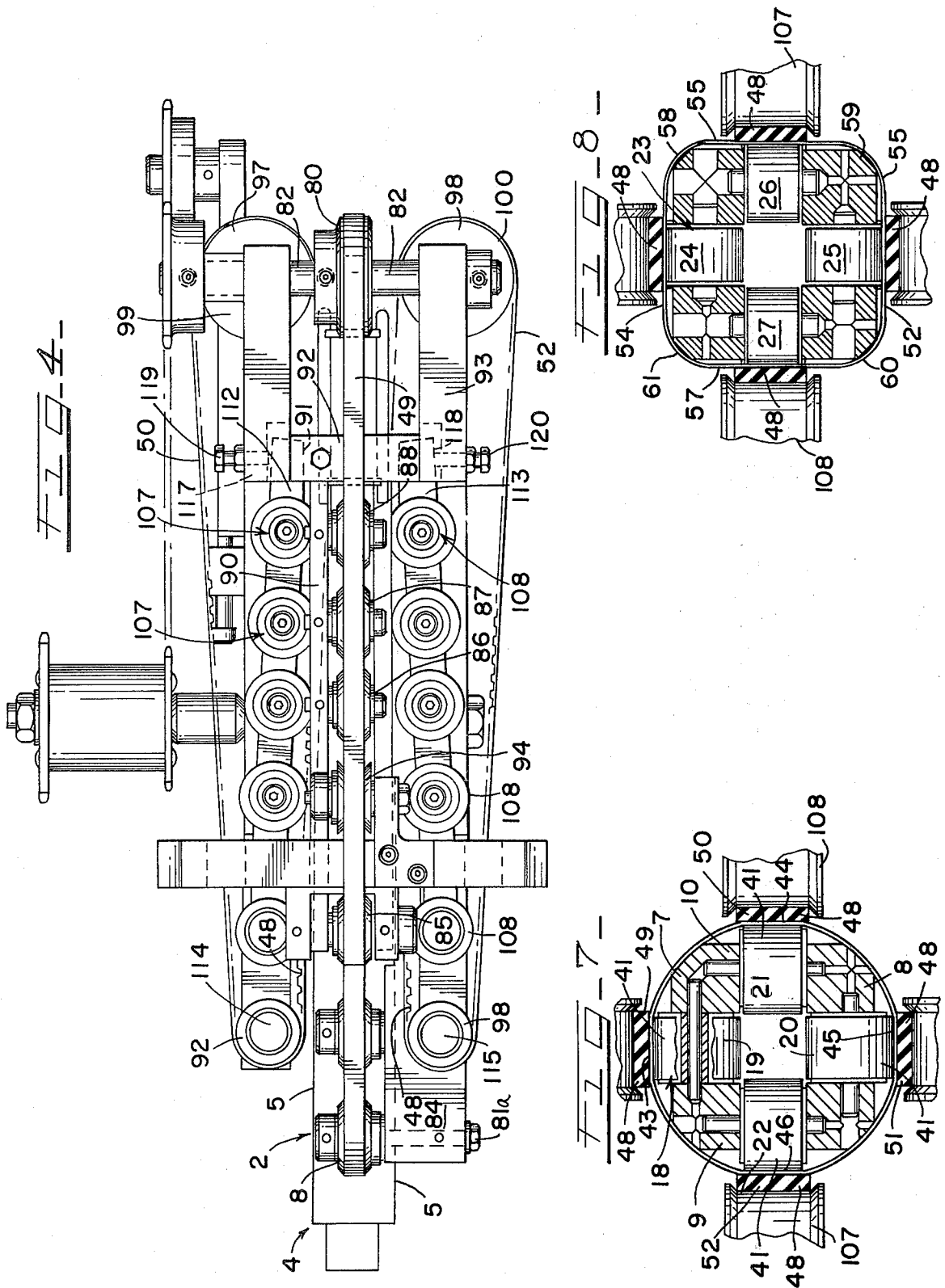
[57] ABSTRACT

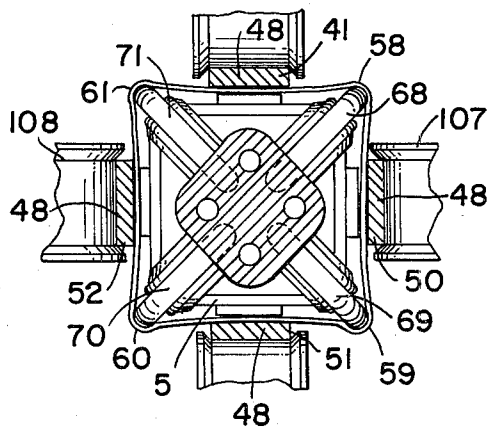
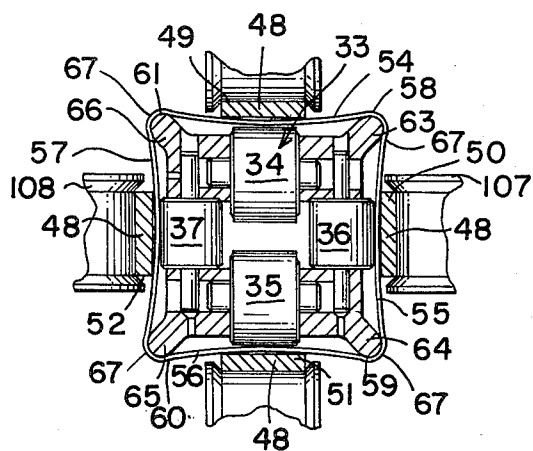
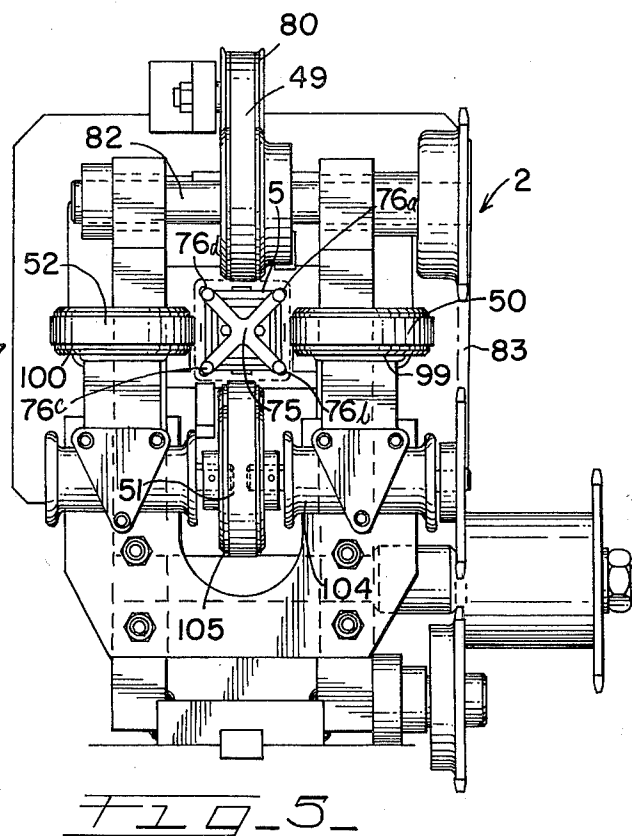
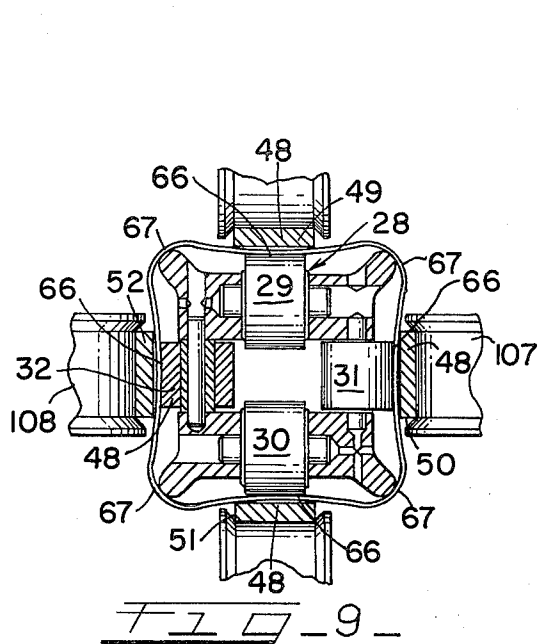
A container body former comprises a forming horn with moving surface means for deforming a cylindrical body into polygonal shape while transporting the body. The moving surface means comprises rollers mounted on all sides of the horn and belts arranged to press the container body against the rollers and also to advance such body from the inlet to the outlet end of the horn.

10 Claims, 11 Drawing Figures









POLYGONAL SHAPED CONTAINER BODY FORMING APPARATUS

DISCUSSION OF THE PRIOR ART

The best known art is U.S. Pat. No. 3,736,846 owned by applicant's assignee. In this patent the square body forming structure comprises a plurality of rods on which a cylindrical body is sleeved. Wheels are provided which interdigitate with the rods and through frictional engagement with the external side of the body are intended to slide the body off the rods. It has been found that particular care and adjustment of the pressure of the wheels against the body had to be maintained and such adjustment depended upon the nature of surface condition of the body composition. Slick surfaces on the body dictated the use of special wheel peripheries to insure a non-slip condition since the only propulsion for the container body along the length of the forming mandrel is delivered by the wheel which essentially are in line-contact with the body surfaces although they serve also to deform the body into a square shape.

It will be apparent that any hesitation in the movement of a body would back up all of the following forms. This requires a manual assist by the operation to dislodge the obstruction.

The immediate attendance of an operator is mandatory and malfunction materially reduces the production rate not to mention the possibility that some of the container bodies may be deformed, broken or otherwise made unuseable and must be manually stripped off the mandrel.

SUMMARY OF THE INVENTION

The present invention is directed to a novel self-stripping, efficient apparatus for forming a can body of polygonal shape from a cylindrical preform.

A more particular object is to provide a novel combined forming and conveying means which provide extensive contact with the can body not only to obtain a firm purchase thereagainst, but also to hold the body for a sufficient length of time after initial deformation to cause the deformation to set before the can body is released so as to minimize the spring-back.

A still further object is to provide a novel mandrel for forming the container body, said mandrel being preferably of square cross-section and having a series of rollers on each side thereof, each series of rollers being progressively recessed toward the discharge end of the mandrel into the respective side of the mandrel body and providing gradually deepening depressions in the sides of the mandrel into which the respective sides of the container body forms are deformed by endless belts pressing against the external surfaces of the side portions of the container bodies to set the sides against excessive spring-back.

A further object is to provide a novel container body forming mandrel which provides moving surfaces which clasp the container sides therebetween and function not only to advance the container body along the mandrel but also serve to shape the sides of the container.

These and other objects and advantages inherent in and encompassed by the invention will become more apparent from the specifications and drawings wherein:

FIG. 1 is a side elevational view of the novel body forming apparatus;

FIG. 2 is a perspective view of a preform of the container made by the apparatus;

FIG. 3 is a perspective view of the container body form made by the apparatus;

FIG. 4 is a top plan view of the structure shown in FIG. 1;

FIG. 5 is an end view of the apparatus shown in FIG. 4;

FIG. 6 is a top plan view of the mandrel;

FIG. 7 is an enlarged sectional view taken substantially on line 7—7 of FIG. 6;

FIG. 8 is an enlarged sectional view taken substantially on line 8—8 of FIG. 6;

FIG. 9 is an enlarged sectional view taken substantially on line 9—9 of FIG. 6;

FIG. 10 is an enlarged sectional view taken substantially on line 10—10 of FIG. 6, and

FIG. 11 is an enlarged sectional view taken substantially on line 11—11 of FIG. 6.

DESCRIPTION OF THE INVENTION

Attention is directed to U.S. Pat. No. 3,736,846 the disclosure of which is hereby incorporated herein.

The present body forming structure 2 is serially associated with the apparatus shown and described in the aforesaid patent wherein blanks of paper board are formed into a cylindrical preform generally indicated 3 as shown in FIG. 2.

This preform is delivered onto the inlet end portion 4 of a forming horn 5 which at that portion is tapered to easily accept the cylindrical preform 3 delivered thereto.

The forming horn is generally of box section having top and bottom walls 7 and 8 and interconnecting side walls 9 and 10.

As best seen in Fig. 7, the forming horn is provided with sets of operating rollers. The first set indicated 11 comprises a roller recessed in bottom wall 8 and mounted thereon on a shaft 12 for rotation on an axis transverse to the axis of the mandrel. The roller 11 projects below the bottom wall 8 thereof. The second set of rollers 13 comprises a pair of side rollers 14 recessed in walls 9 and 10 and a bottom roller 15. Rollers 14 and 15 are mounted on respective walls on shafts 16, 17 respectively on axes parallel to the shaft 12. The third set of rollers 18 comprises upper and lower rollers 19, 20 and side rollers 21, 22 recessed in respective walls and also mounted therefrom on shafts parallel to those of the other rollers. A fourth set of rollers 23 comprises upper and lower rollers 24, 25 and side rollers 26, 27. A fifth set of rollers 28 comprises upper and lower rollers 29, 30 and 31, 32 and a sixth set of rollers 33 comprises upper and lower rollers 34, 35 and 36, 37.

All of these rollers are mounted on parallel axis and the first three sets of rollers project from their respective sides a substantially equal amount whereas the fourth through sixth roller set recede into the respective sides of the horn as best seen in FIGS. 9, 10 and 11.

The sets of rollers are spaced a distance apart less than the length of the container body and fourth through the sixth roller sets are progressively recessed into the respective sides of the horn structure as best seen in FIG. 6. Referring now to FIGS. 7 through 10 it will be noted that the rollers of the fourth roller set shown in FIG. 7 constitute the initial reforming mechanism for converting the cylindrical form of the container body into square shape and that the first three

sets of roller assemblies are a transition means for advancing the cylindrical forms from the input mechanism onto the reforming horn and it is for such reason that the can body is first grasped at the bottom and then at the sides and moved onto the initial forming roller set 18.

The roller set 18 has substantially large sections 41 of its upper and lower rollers 19, 20, and its side rollers 21, 22 projecting outwardly of the respective sides of the box section body structure of the horn, which along the first three roller sets, it tapered toward the receiving end 4 thereof as best seen in FIG. 6 to facilitate entry of the cylindrical form onto the horn. In the first forming stage the cylindrical body of the container is deformed at four equally spaced regions 43, 44, 45 and 46 by engagement with respective rollers and by being pressed thereagainst by the advance runs 48 of belts 49, 50, 51 and 52 which are located at the four sides of the horn body.

As best seen in FIGS. 1 and 4, the belts 48 have a corrugated canboard grasping profile and the advance runs of the belts each diverge away from the respective side of the horn toward inlet 4 so as to provide an easy entry for the container body. It will be noted in FIG. 8 that the fourth set of rollers 23 project only slightly beyond the respective sides of the horn body and that the container is now formed with four sides 54, 55, 56 and 57 and joined by rounded corners 58, 59, 60 and 61.

The preform container is then moved to the fifth set 28 of rollers as seen in FIG. 9 whereat the horn is provided with corner rails 63, 64, 65 and 66 (FIG. 10) whereby the sides 54-57 of the container are bowed, inwardly to begin forming the corners. It will be seen that the rollers 29-32 have their peripheries 66 inwardly of the outer edges 67 of the respective corner rails.

The container preform is next advanced to the sixth station 33 of rollers as seen in FIG. 10 wherein the rollers 34-37 are set in still further inwardly of the outer edges 67 of the corner rails and thus the belts bow the respective sides of the container inwardly a distance sufficient to set the corners 58-61 of the container.

The container is thereafter moved onto the corner forming thin disk type rollers 68, 69, 70 and 71 which rotate on axes 90° apart at substantially 45° across the corners of the horn. The disks are aligned with respective rails as seen in FIGS. 6 and 11 and the peripheral edge portions 72 of these disk rollers are continuations of the respective rails whereby the interior corners of the container are caused to ride over the disks to set the corners inasmuch as the belts are in contact with the sides of the container, and are deflecting the some inwardly initially between the respective rails and then between the disk rollers.

The disk rollers facilitate the stripping of the container bodies from the forming horn onto a skeletal receiver bracket 75 which is bolted as at 76 to the downstream or discharge end of the horn body. The bracket comprises four equally spaced corner rods aligned with the respective disk rollers in longitudinal alignment with the horn. The four rods fit into respective interior corners of the container body which is preferably made of kraft paper which may be lined with a suitable plastic or metal such as aluminum foil or may be wax coated.

At this last station the belts continue to depress the sides of the container inwardly in the spaces 77 between the rods. The belts continue past the discharge

end of the bracket and function to discharge the square shaped container into associated apparatus such as an end capping machine.

The upper belt is trained about pulleys 80 and 81. The driving pulley 80 is mounted on a cross-shaft 82 which is driven through a chain and sprocket drill 83 from a suitable power source. The idler pulley 81 is carried by a bolt 81a connected to an arm 84 which is mounted on the frame structure of the machine.

A set of back-up rollers 85, 86, 87, and 88 are arranged behind the advance rim 49 of the upper belt in radial alignment with respective rollers 19, 24, 29 and 34. This set of rollers is mounted on a support bar 90 which is pivoted at one end on bolt 81a and at the downstream end is fitted into a vertical slot 91 in a guide bar 92 which is connected to a frame structure 93 of the machine frame. The support bar 90 is adjusted vertically by a bolt 93 threaded in the guide bar 92 and having its lower end abutting the floating unsupported end of the support bar. Tension in the upper belt is adjusted by an idler pulley 94 mounted by an eccentric on an extension 95 of the arm 84, the pulley 94 engaging the underside of the return rim 96 of the upper belt 48.

The side belts 48 are mounted on idler and driving pulleys 97, 98 and 99, 100 respectively. The idler pulleys 97, 98 are bolted on the machine frame structure and the driving pulleys are connected to driving shafts (not shown) of a transmission gear box assembly 102 which is mounted on an end frame member 103 of the unit.

The gear box assembly has an input shaft 104 which mounts the drive pulley 105 of the lower belt 48. The input shaft is driven by the chain and sprocket drive 83 as best seen in FIG. 5.

Having reference to FIG. 4 it will be seen that the advance runs of the side belts are biased against the side rollers by back up roller sets 107 and 108 respectively, which align with respective side rollers on the horn body, as best seen in FIGS. 9-11.

The roller sets 107, 108 mounted respectively on support bars 112, 113 respectively. Bar 112 is pivoted at its end on a vertical pin 114 which also mounts the idler pulley 97, pin 114 being supported from the frame 93.

Bolt or pin 115 mounts idler 98 and pivotally connects with bar 113, the pin 115 being secured to the frame structure 93. Bars 112 and 113 at their downstream distal ends are mounted in brackets 117, 118 and are adjustably biased toward the forming horn by set screws 119, 120 threaded in the respective brackets. Advancing the screws swings the bars inwardly and retracting the screws releases the pressure of the backing rollers on the advance runs of respective belts.

The bottom back up roller set 125 comprises a series of rollers aligned with rollers 20, 25, 30 and 35.

As best seen in FIG. 1, the rollers 235 are mounted in bar 126 which is pivoted at our end on bolt stud or pin 127 which mounts pulley 128 of the lower belt 48m said belt being trained about driving pulley 105. The tension lower belt is adjusted by an idler 130 eccentrically mounted on frame 93.

It will be understood that the round preform 3 is thus formed with a square shaped body 135 as seen in FIG. 3 and that the transition from one form to the other is readily accomplished.

Having described a preferred embodiment of the invention it will become apparent that other modifications will now become readily apparent to those skilled in the art which fall within the scope of the appended claims.

We claim:

1. A container body forming apparatus for reshaping a tubular container body of generally circular cross-section into a polygonal cross-section comprising a shaping horn having inlet and discharge ends and a plurality of sides, adjacent sides defining corners, moving surface means on each side of the horn for engagement with the interior of the container body, means providing continuous moving faces in substantially radial alignment with respective surface means for engaging the exterior of the container and claspings the same with the surface means, and means mounting said surface means on the horn recessed into respective sides in planes progressively receding into the horn and converging toward said discharge end, and said faces disposed in planes converging from said inlet end toward said discharge end and operative to deflect said container body inwardly of the sides of said horn and to continuously hold the same in said deflected condition wrapped about said corners and to commitantly advance said body toward said discharge end, and means providing moving surfaces at said corners for carrying the container body.

2. The invention according to claim 1 and said continuous moving faces comprising endless belts having advance runs opposing respective surface means.

3. The invention according to claim 2 and said surface means comprising a series of rollers.

4. The invention according to claim 3 and adjustable backing rollers behind the advance runs of the belts in radial alignment with respective rollers on the horn.

5. A container body forming apparatus for reshaping a tubular container body of generally circular cross-section into a polygonal cross-section comprising a shaping horn having inlet and discharge ends and a plurality of sides defining said polygonal shape, moving surface means on each side of the horn for engagement with the interior of the container body, means providing continuous moving faces in substantially radial alignment with respective surface means for engaging the exterior of the container body and claspings the same with the surface means, said surface means progressively receding into the body toward said discharge end and recessed into respective sides, and said faces converging from said inlet end toward said discharge end and operative to deflect said container body inwardly of the sides of said horn and to continuously

hold the same in said deflected condition and to commitantly advance said body toward said discharge end and said horn having a plurality of corners and rolling disks disposed adjacent to said discharge end of the horn and having axes of rotation subtending the corners, and said disks having peripheral edges disposed in alignment with the corners longitudinally of the horn.

6. A container body forming apparatus for reshaping a tubular container body of generally circular cross-section into a polygonal cross-section comprising a shaping horn having inlet and discharge ends and a plurality of sides defining said polygonal shape, moving surface means on each side of the horn for engagement with the interior of the container body, means providing continuous moving faces in substantially radial alignment with respective surface means for engaging the exterior of the container body and claspings the same with the surface means, said surface means progressively receding into the body toward said discharge end and recessed into respective sides, and said faces converging from said inlet end toward said discharge end and operative to deflect said container body inwardly of the sides of said horn and to continuously hold the same in said deflected condition and to commitantly advance said body toward said discharge end and said continuous means comprising endless belts opposing each side of the horn, back up rollers behind each belt biasing a portion thereof toward the opposing moving surface means, and means for biasing said rollers comprising a floating bar mounting the rollers.

7. The invention according to claim 6 and said belts each having an advance run with leading and trailing ends, and each floating bar pivoted at the leading end of the related advance run and means for adjusting the trailing end of the bar toward and away with respect to the advance run of the associated belt.

8. The invention according to claim 7 and said moving surface means comprising sets of rollers progressively inset into the respective side of the horn and adjacent to the inlet end having sectors projecting beyond the respective sides and at the discharge end recessed below the respective sides whereby the container body as it progresses along the length of the horn is reshaped into the form of the horn.

9. The invention according to claim 8 and each of said belts being driven from said discharge ends to hold the advance runs taut.

10. The invention according to claim 9 and said belts being serrated for grasping the external sides of the container body.

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