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Peacock

[11] **3,739,695**

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[54] **BOTTOM MEMBER INSERTING APPARATUS FOR CONTAINER-FORMING MACHINE**

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[21] Appl. No.: **182,043**

Related U.S. Application Data

[62] Division of Ser. No. 868,789, Oct. 23, 1969, Pat. No. 3,628,428.

[52] **U.S. Cl.** ..... **93/39.1 R**, 93/55.1 R

[51] **Int. Cl.** **B31c 1/06**

[58] **Field of Search** ..... 93/39.1, 39.2, 39 CO, 93/39.1 P, 55.1, 36.5, 39.3

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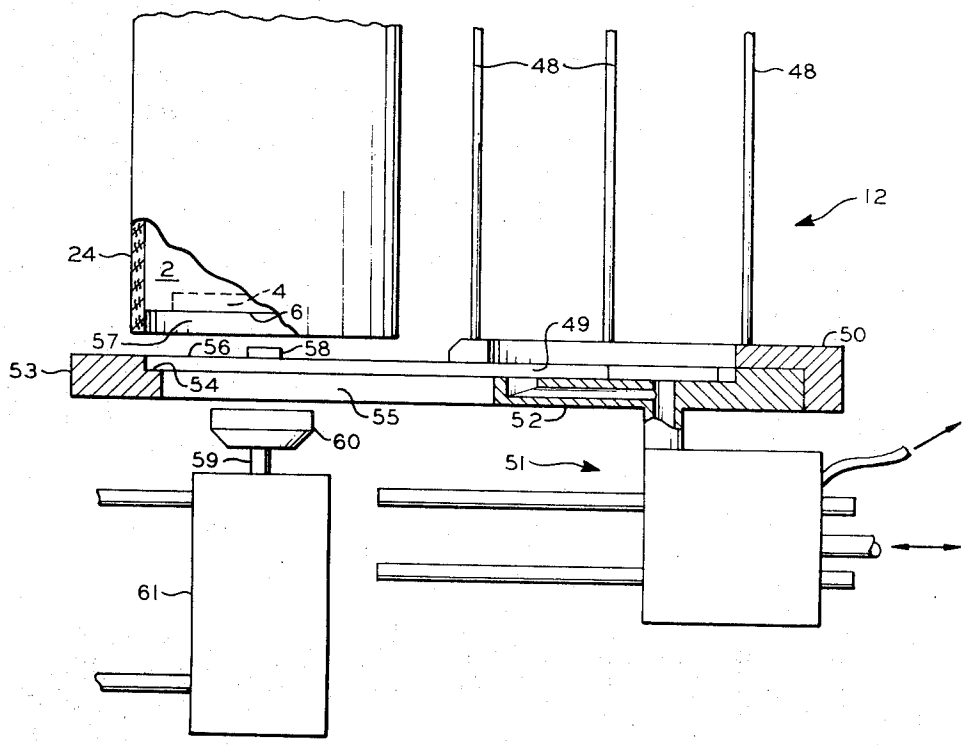
[57] **ABSTRACT**

An apparatus having an aligning element, a rim extending around a portion of a receiving surface of the aligning element, a pair of holding lugs attached to the rim, and an inserting rod movable relative to the aligning element for inserting a bottom member into a chamber of an adjacently positioned body.

4 Claims, 9 Drawing Figures



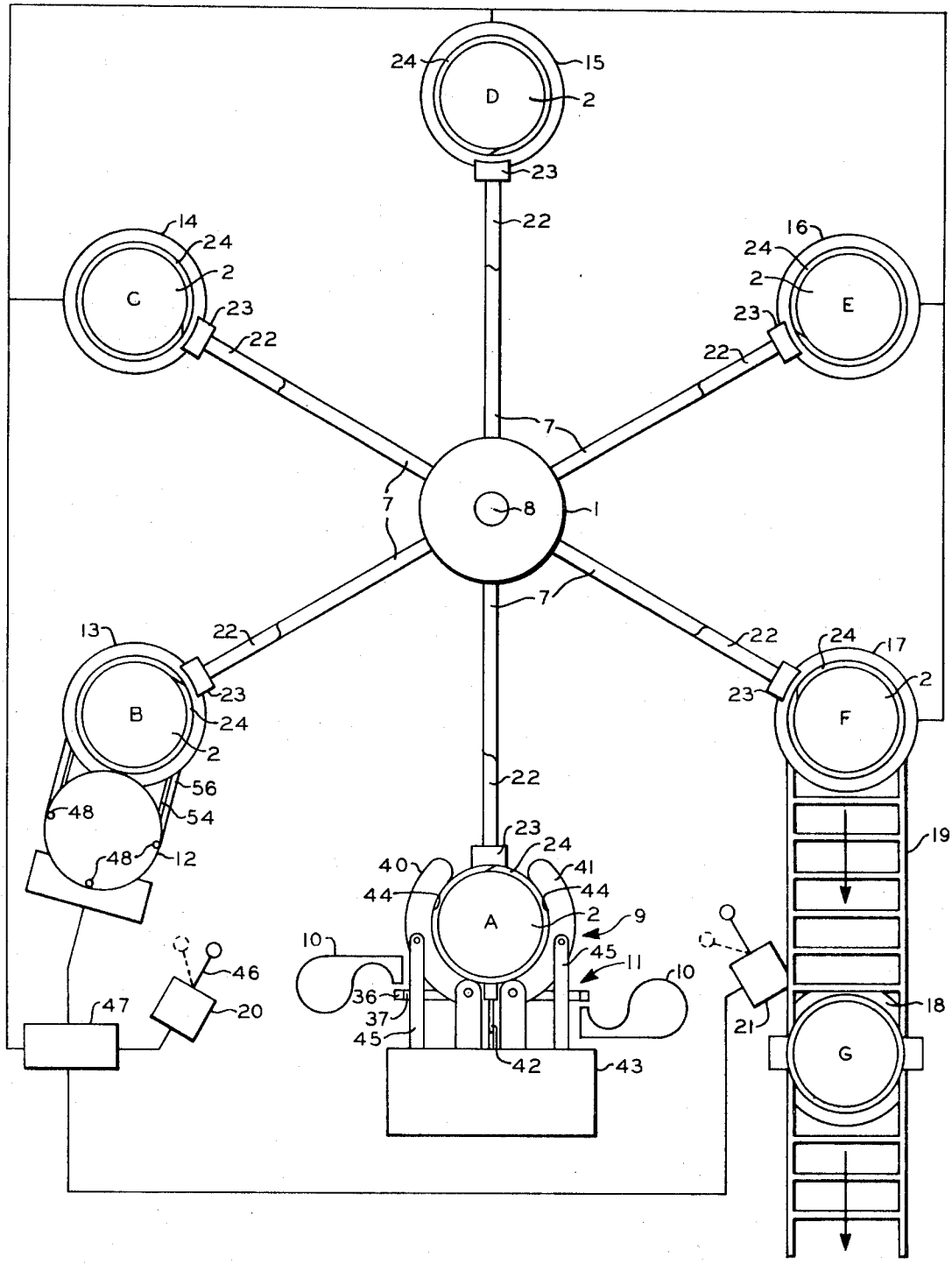


FIG. 1

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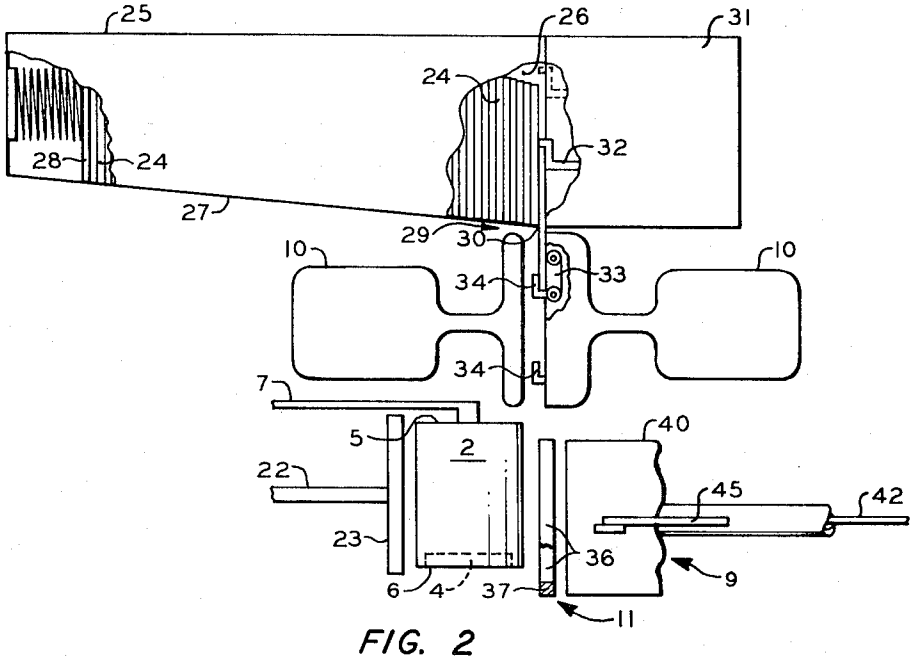

FIG. 2

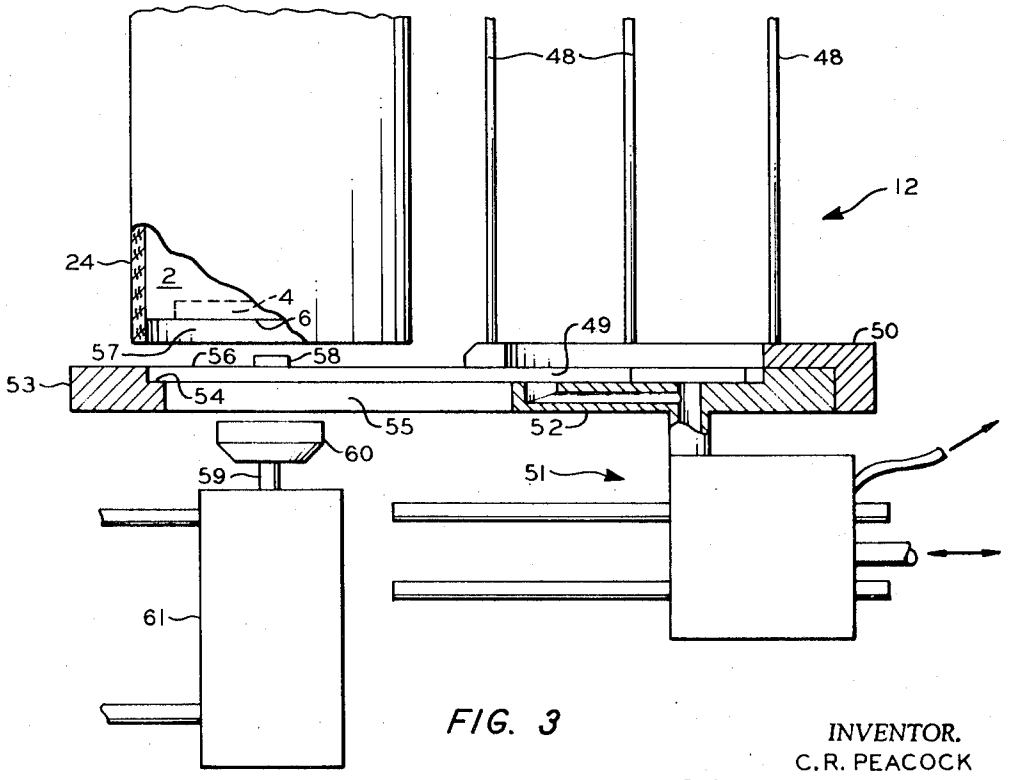

FIG. 3

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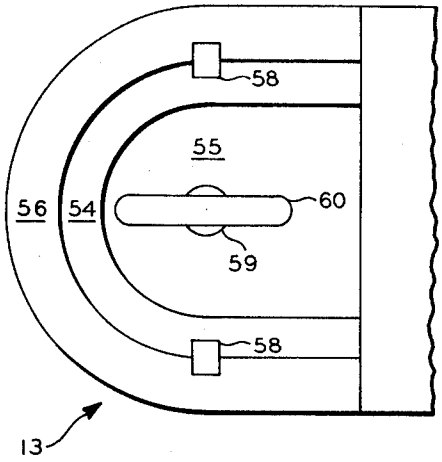

FIG. 4

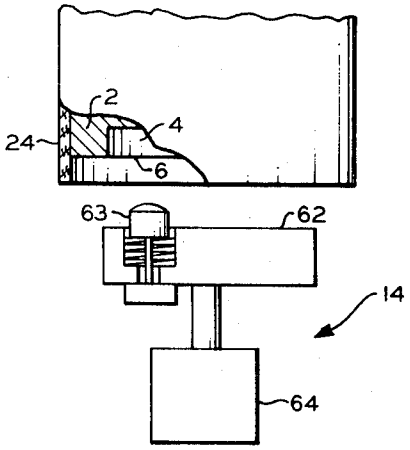

FIG. 5

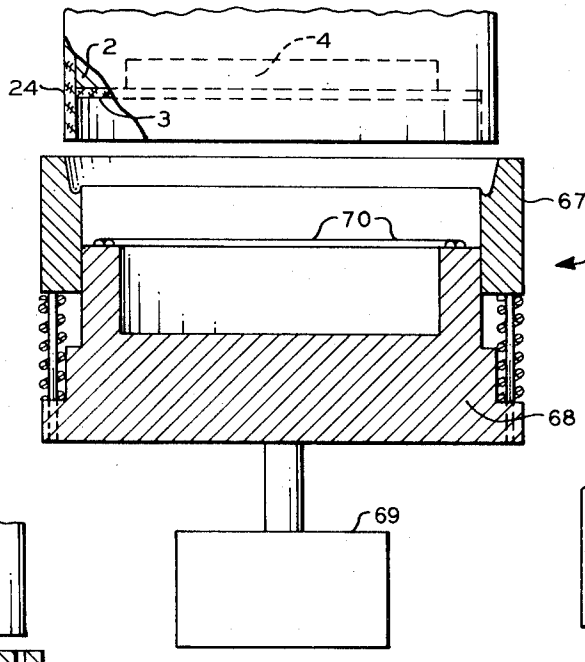

FIG. 7

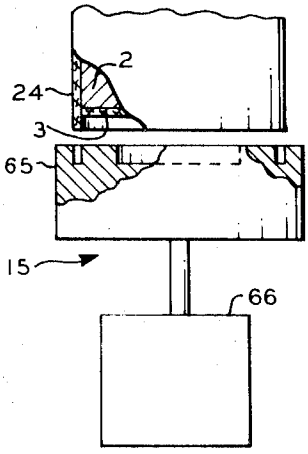

FIG. 6

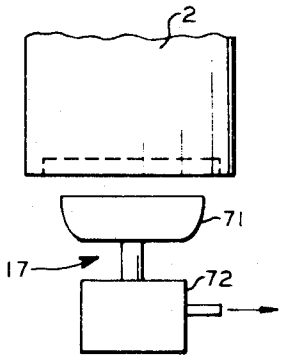

FIG. 8

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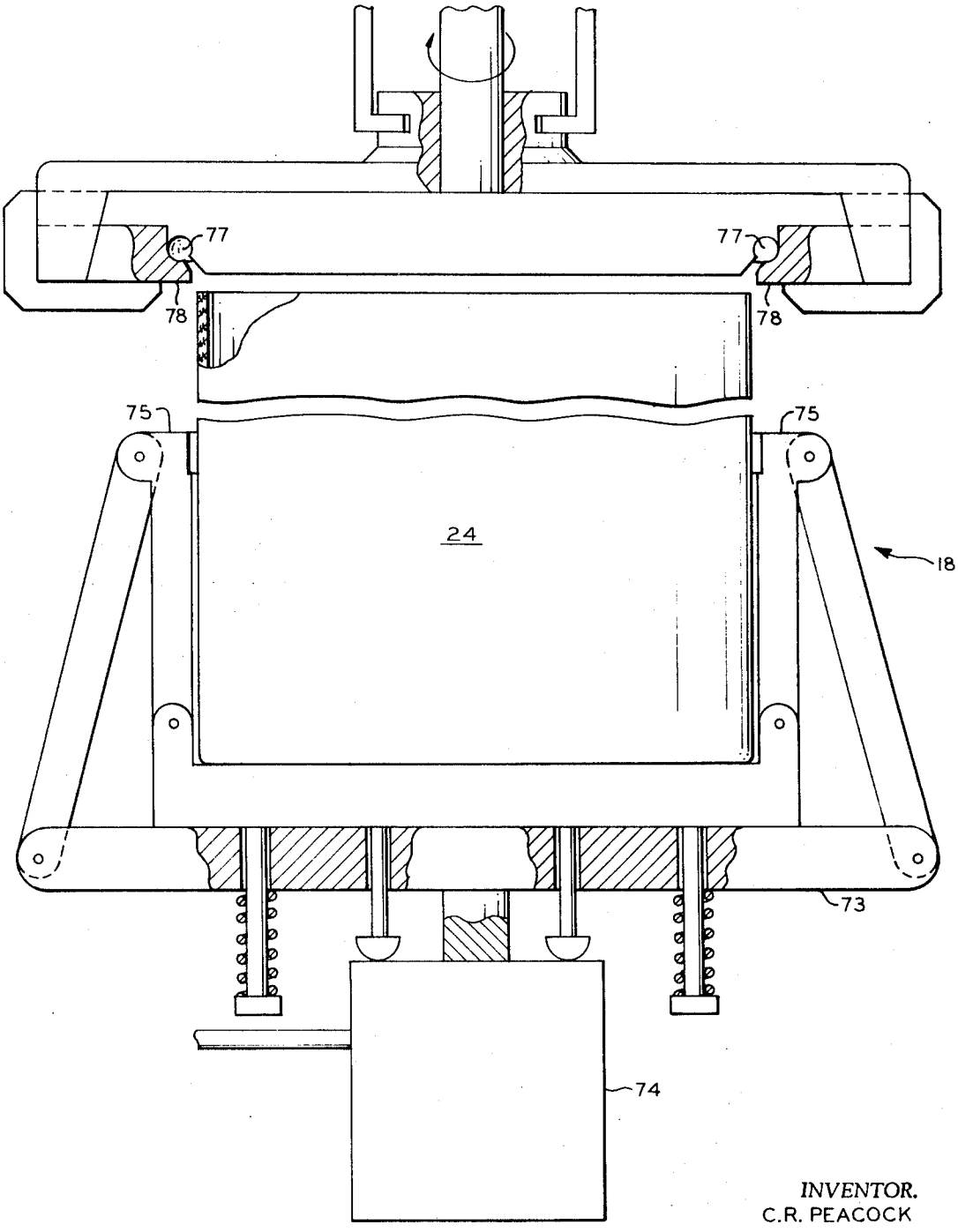

FIG. 9

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BOTTOM MEMBER INSERTING APPARATUS FOR CONTAINER-FORMING MACHINE

This application is a division of application Ser. No. 868,789, filed Oct. 23, 1969, now U.S. Pat. No. 3,628,428, of same inventor and entitled "Container-Forming Machine."

This invention relates to an apparatus for inserting a bottom member into a chamber of a body. More particularly, this invention relates to an apparatus of a container-forming machine for inserting a bottom member into side walls of a container.

Heretofore utilized container-forming machines experienced problems in most every function performed by the machine. For example, the sidewall blank feeding mechanism often malfunctioned or failed to properly issue a blank in a correct position for wrapping said blank around a mandrel. Sealing of the blanks required a large number of complicated machine components and, once wrapped around a mandrel, the sealed sidewall was often misaligned relative to the mandrel and the associated machine component. A misaligned sidewall thereafter caused other carton-forming operations to improperly function resulting in a malformed carton that would necessarily be rejected.

Correctly positioned sidewalls also were damaged during insertion of the bottom member and the sealing of said member. These problems were frequently caused by improper positioning of a bottom member relative to an inserting means or the failure of the inserting means to correctly position the bottom member relative to the sealed sidewall prior to sealing. In order to correct the problems associated with insertion of the bottom member, machines were constructed which formed a container having a recessed bottom member with a downwardly extending rim that was thereafter sealed to the sidewall. This container utilized substantially more material to construct, was of more fragile construction, and formed a mating of parts that were difficult to seal.

It is therefore an object of this invention to provide an improved container-forming machine. Another object of this invention is to provide a container-forming machine with improved machine components. Yet another object of this invention is to provide an apparatus for correctly aligning a sidewall on a mandrel. A further object of this invention is to provide a unique apparatus for inserting a member into a chamber of a body. A still further object of this invention is to provide a machine for automatically, substantially continuously, forming cartons. Another object of this invention is to provide a machine that will continue to operate until a preselected, consecutively occuring number of machine component malfunctions have occurred. Other aspects, objects, and advantages of the present invention will become apparent from a study of the disclosure, the appended claims, and the drawings.

In the drawings,

FIG. 1 is a diagrammatic plan view of the turret machine, the mandrels, and the operating stations of this invention;

FIG. 2 is a diagrammatic side view in partial cross-section of station 1 and the associated machine component of the carton-forming machine of this invention;

FIG. 3 is a diagrammatic side view in partial cross-section of station 2 and the associated machine component; and

FIG. 4 is a top view of a portion of the machine component of station 2;

FIG. 5 is a diagrammatic side view in partial cross-section of station 3 and the associated machine component;

FIG. 6 is a diagrammatic side view in partial cross-section of station 4 and the associated machine component;

FIG. 7 is a diagrammatic side view in partial cross-section of station 5 and the associated machine component; and

FIG. 8 is a diagrammatic side view of station 6 and the associated machine component;

FIG. 9 is a diagrammatic side view in partial cross-section showing a top roll-crimper apparatus of the machine of this invention.

Referring to FIG. 1, letters A–G represent stations of the machine with stations A–F being stations consecutively positioned around a turret 1. A plurality of elongated, substantially vertically positioned mandrels 2 are connected at their upper end in spaced relation one to the other. Each mandrel has walls 3, a recessed base 4, upper and lower ends 5, 6 (better seen in FIG. 2) and is connected at its upper end 5 to a turret-bar 7. All mandrels 2 are radially and arcuately equally spaced relative to an axis 8 of the turret 1 for intermittent movement of the mandrel 2 along a common pathway from one to another of the stations A, B, C, D, E, and F. Wrapping means 9, heating means 10, and a sidewall blank positioning element 11 are positioned adjacent that mandrel 2 located at the first station A. A bottom member magazine 12 and a bottom member inserting means 13 are positioned adjacent a mandrel 2 located at the second station B. A seating-detecting means 14 is positioned adjacent a mandrel 2 located at the third station C, a heating means 15 is positioned adjacent a mandrel 2 located at the fourth station D, a bottom crimping-sealing means 16 is positioned adjacent a mandrel 2 located at the fifth station E, and a stripping means 17 is positioned adjacent a mandrel 2 located at the sixth station F. A top curling means 18 is positioned at the seventh station G that is spaced a distance from the sixth station and connected thereto by conveying means 19 for moving a sidewall with a sealed member to other machine components. Sensing means 20, 21 are positioned adjacent the pathway of the mandrels 2 of the turret 1 for sensing malfunctions of a machine component and delivering a signal responsive to a detected malfunction. It should be understood that the number of stations and the functions performed at each station can be varied without departing from the invention.

A plurality of sidewall clamps 22, each having a face 23, are movably attached to the turret 1 for movement between a first position, as shown at station F, at which the face 23 is spaced from a sidewall 24 mounted on a mandrel 2 and a second position, as shown at stations A, B, C, D, or E at which the face is in contact with and urging the overlapping edges of a sidewall 24 against the wall 3 of the mandrel 2 covered by said sidewall. The turret 1 and associated sidewall clamps 22 and mandrel 2 are rotatable by a power source and control for intermittent movement from one to another of the consecutively positioned stations by a turret index drive (not shown).

Referring to FIG. 2, at the first station A a sidewall magazine 25 is positioned adjacent and at a higher ele-

vation than a mandrel 2 located at said first station A. The sidewall magazine has an elongated chamber 26, a downwardly angled floor 27 and biasing means 28. The lower end 29 of the floor 27 of the sidewall magazine 25 has an opening for separately passing sidewall blanks from the chamber through the opening. The sidewall blanks 24 are preferably maintained within the magazine 25 in a substantially vertical position. The biasing means 28 can be a weight, spring, or other device for urging the sidewall blanks 24 longitudinally through the chamber 26 toward the opening 30 on the lower end 29 of the floor 27. The thickness of the sidewall blanks 24 and the downwardly angled floor 27 of the magazine 25 space the upper edge of each blank at a different elevation thereby vertically separating a portion of one blank from the other to facilitate separate feeding of the blanks through the opening 30 of the floor 27. The angled floor 27 also decreases the amount of force required to move the sidewall blanks longitudinally through the chamber 26 toward the opening. By decreasing the biasing force, the possibility of damaging sidewall blanks within the magazine is reduced.

A sidewall feed assembly 31 having a movable blade 32 is attached to the sidewall magazine 25 adjacent the opening 30 of the floor 27. The blade 32 extends into the chamber 26 of the magazine and is vertically movable between a first position (shown by broken lines) at which the blade is adjacent and at a higher elevation than the opening 30 of the floor 27 of the magazine and an intervening sidewall blank 24 and a second position at which the blade 32 is adjacent the opening 30 and the intervening sidewall blank 24 is urged through the opening 30 by the blade 32 moving from the first to the second position. A sidewall conveying means, preferably a rotatable chain 33 with a plurality of outwardly positioned lugs 34 connected thereto is positioned adjacent and at a lower elevation than the opening 29 of the sidewall magazine 25 for receiving a sidewall blank 24 from the magazine 25, holding and moving the sidewall blank 24 downwardly from the magazine 25 at a controlled rate, and releasing the blank for gravitational positioning of the blank 24 in a sidewall blank positioning element 11. It is preferred that a heating means 10 comprising a pair of oppositely directed heaters are positioned adjacent opposed edges and sides of a sidewall blank 24 held by the sidewall conveying means for heating portions of the sidewall blank 24 during downward movement of the blank by the conveying means. Other means for sealing one edge of the blank to the other, such as glue and the like, can be utilized but it is preferred that the edges by polyethylene coated and said edges be heat-sealed one to the other. Hot air heaters are preferred, but other type heaters can be utilized to raise the temperatures to seal together the edges of the sidewall blanks 24.

A sidewall blank positioning element 11 is positioned adjacent a mandrel 2 located at the first station A. The positioning element 11 has vertical retaining members 36 and a sidewall supporting base 37. The supporting base 37 is positioned substantially parallel to, spaced laterally from, and at a lower elevation than the lower end 6 of a mandrel 2 located at the first station A. The vertical members 36 and supporting base 37 are adjacent and at a lower elevation than the sidewall magazine 25 for receiving sidewall blanks from the magazine, maintaining the sidewall blanks in a vertical position, and gravitationally aligning a bottom edge of a blank relative to the end 6 of the mandrel 2. By providing a supporting base 37 that permits gravitational alignment of the sidewall blank relative to the end 6 of the mandrel 2, alignment of the sidewall blank 24 is more precise, damage of sidewalls is reduced, and subsequent bottom sealing is more uniform and fluid-tight.

Wrapping means 9 are positioned adjacent a mandrel 2 located at the first station A and separated therefrom by a heated sidewall 24 positioned in the positioning element 11. The wrapping means has movable first and second wrapping wings 40, 41 and a holding bar 42 for movement from a first position (shown in FIG. 2) at which the wrapping wings 40, 41 and holding bar 42 are spaced from the sidewall blank 24 in the positioning element 11 and a second position (shown in FIG. 1) at which the first and second wrapping wings 40, 41 and holding bar 42 are urging the sidewall blank into circumscribing and overlapping contact with the walls 3 of the mandrel 2. The wrapping wings 40, 41 and holding bar 42 are moved by a power source 43 laterally into contact with the sidewall 24 positioned in the positioning element 11 with the holding bar 42 first holding the sidewall 24 against the mandrel 2 and the wings 40, 41 thereafter bending the sidewall around the mandrel. By providing only lateral movement of the sidewall 24 from the supporting base 37 of the positioning element 11 to the mandrel 2, the bottom edge of the sidewall blank is maintained in the plane of the supporting base 37 and at a preselected distance downwardly from the end 6 of the mandrel. As viewed best in FIG. 1, the inner surface 44 of the wings 40, 41 are of the general configuration of the mandrel 2 with intervening sidewall 24 thereby providing a tight forcible contact of the sidewall 24 with the mandrel 2. Overlapping of the sidewall 24 by the wings 40, 41 can be accomplished by moving one wing prior to movement of the other wing, providing different alignment of each wing relative to the mandrel, attaching the wing actuating rods 45 to the wings at different relative positions, or by other means known in the mechanical art.

A sensing means 20, here shown as a sidewall sensor having a deflectable switch arm 46 is positioned adjacent and at a lower elevation than the lower end 6 of the mandrel 2 and in the pathway of a sidewall 24 mounted on said mandrel 2 moving from the first to a second station for sensing a sidewall on a mandrel passing said sensor 20 and delivering a signal in the absence of said sidewall. In the absence of a sidewall, the switch arm 46 passes beneath the lower end 6 of the mandrel 2 and is not deflected, whereas, if a sidewall is present, the sidewall contacts and deflects the switch arm 46.

The signal delivered by the switch 20 in response to movement of the switch arm 46 is delivered to control means 47 that is electrically connected to a bottom member inserting means 13 and other machine components 14, 15, 16, 17 that are associated with the turret 1. A signal from the switch 20 indicating the absence of a sidewall 24 on a mandrel 2 passing from the first to the second station causes the control means 47 to prevent operation of the bottom member inserting means 13 and the other machine components when the turret 1 indexes that mandrel 2 having no sidewall to the station adjacent the particular machine component. That control means 47 is not, however, a part of this invention.

FIG. 3 shows means for inserting a bottom member 3 into a lower projecting portion of a sidewall 24 cover-

ing a mandrel 2. That bottom member inserting means 13 and associated bottom member magazine 12 are positioned adjacent a mandrel 2 located at the second station B. The bottom disc magazine 12 has a plurality of disc retaining rods 48, an opening 49 adjacent the magazine base 50, and is attached to a movable extractor 51, having a vacuum head 52, movable by a power source (not shown) for creating a vacuum and intermittently moving a bottom disc 3 through the opening 49 of the magazine 12, releasing the attached disc in contact with the bottom member inserting means 13 by releasing the vacuum, and returning to a position adjacent the magazine 12.

The bottom member inserting means 13 is positioned adjacent the bottom member magazine 12 and a mandrel located at the second station B at a lower elevation than the lower end of a sidewall 24 mounted on the mandrel 2. The inserting means 13 has an aligning element 53 having a receiving surface 54 with an opening 55 and a rim 56 extending around a portion of the periphery of the receiving surface. The opening 55 of the receiving surface 54 is coaxially aligned relative to the longitudinal axis of the mandrel 2 and adjacent the chamber 57 defined by a body, here a sidewall, encompassing said mandrel 2. The rim 56 of the receiving surface contacts a member moving across the receiving surface and aligns said member relative to the sidewall. A pair of opposed holding lugs 58 are separately attached to the rim 56 and extend a distance from the rim toward the opening 55 whereby portions of each opposed lug 58 overlie separate portions of the receive surface 54. An inserting rod 59 having an elongated end 60 is positioned within the opening 55, attached to an elevator means 61, and is movable in response to actuation of the elevator means 61 from a first position at which the end is immediately below a member positioned between the lugs 58 and the receiving surface 54, through a first distance of a second position at which the end 60 and portions of the member are within the chamber 57 and portions of the member are held between the lugs 58 and the receiving surface 54, and through a second distance to a third position at which the end 60 and the member are within the chamber of the body. By so constructing the bottom member inserting means, the bottom member is flexed to a curved or bowed configuration, the central portion of the disc is inserted into the chamber of the body and the portions of the member restricted by the lugs are thereafter released and snap into the chamber. This construction allows a member or bottom disc to be correctly positioned within the chamber without lateral movement of the disc relative to the sidewall or body upon initial contact of the disc with the body. This lateral movement of the disc is prevented by contact of the disc by the lugs 58. For simplicity in construction, it has been found that each lug 58 should be positioned on the rim 56 at a location adjacent a side of the pathway of member moving across the receiving surface 54. Although the distance each lug 58 extends from the rim 56 toward the opening is dependent upon the spacing of the receiving surface 54 from the entrance of the chamber 57, it has been found that each lug should preferably extend from an edge of the member toward the inserting rod 59 a distance in the range of 0.5 percent to 5 percent of the width of the bottom disc or member. The distance of the receiving surface 54 to the chamber 57 should be constructed for movement of the member by the rod 59 as previously described. Lugs 58 extending a lesser distance toward the opening do not permit sufficient bending of the disc for satisfactorily inserting the bottom member and larger lugs cause the bottom member to objectionably deform.

FIG. 4 is a plan view of the bottom member described with reference to FIG. 3 showing the inserting means 60, the lugs 58, and the receiving surface 54, and the inserting rod 59.

FIG. 5 shows a seating-detecting means 14 positioned adjacent and at a lower elevation than a mandrel 2 located at the third station C. The seating-detecting means 14 comprises a seating head 62, a sensing switch 63, and a power source 64 for intermittently raising the seating head 62 into contact with a bottom disc for seating the bottom disc at a preselected position relative to a sidewall 24 circumscribing a mandrel 2 and signaling the control means 47 in the absence of a bottom disc.

FIG. 6 shows shows a heating means 15 positioned coaxially adjacent and at a lower elevation than a mandrel 2 located at the fourth station D. The heating means 15 comprises a heating head 65 and a power source 66 for moving the heating head 65 into close proximity with portions of the bottom member and the lower portions of the sidewall 24 circumscribing a mandrel 2 for raising the temperature of said portions to above a value at which the heated surfaces will adhere one to another upon placing said surfaces forcible contact. The heating means can be hot air or radiant type heaters, or a combination of both types.

FIG. 7 shows a bottom crimping-sealing means 16 positioned adjacent a mandrel 2 located at a fifth station E. The bottom crimping-sealing means 16 comprises a movable crimping sleeve 67 circumscribing a sealing element 68. The upper end of the crimping sleeve is angled downwardly and inwardly and is located adjacent a sidewall mounted on a mandrel for movement by a power source into contact with the lower portion of the sidewall for crimping said portion inwardly toward the axis of the mandrel. The upper end of the sealing element is substantially parallel to the recessed base 4 of the mandrel 2 for forcibly compressing the bottom disc and the crimped lower portion of the sidewall together between the upper end of the sealing element 68 and the end 6 of the mandrel 2. The crimping sleeve 67 is downwardly movable during crimping operations for engagement of the sealing element 68 after the crimping sleeve 67 has moved inwardly all portions of the sidewall 24 positioned at a lower elevation than the bottom disc. Although the upper end of the sealing element 68 has a surface substantially parallel to the end 6 of the mandrel 2, it is preferred that said upper end have a plurality of protrusions 70 formed thereon to increase the pressure exerted on localized portions of the sidewall thereby assuring a fluid-tight seal.

FIG. 8 shows a stripping means 17 positioned adjacent a mandrel 2 located at a sixth station F. The stripping means 17 comprises a vacuum head 71 and a power source 72 for moving the vacuum head into contact with a bottom disc extracting the sidewall and associated bottom from the mandrel 2, and depositing the extracted carton on a conveying means 19, better shown in FIG. 1.

FIG. 9 shows a top-curling means 18 positioned at the seventh station G that is located a distance spaced

from the sixth station F. The top-curling means **18** comprises a lifting stool **73** movable by power source **74.** The lifting stool **73** has holding wings **75** for gripping the carton and maintaining said carton against rotation. A rotatable top-curling element **76** is positioned adjacent and at a higher elevation than the upper edge of the carton on the lifting stool. The top-curling element **76** has an upwardly and outwardly directed curling surface **77** and movable directing elements **78** for outwardly rolling the top of the container during contact and rotation of the top-curling element **76** relative to the carton.

In the operation of the improved apparatus of this invention, the mandrels **2** are intermittently indexed to the next successive station by a power source and associated index drive. Considering the operation performed at each station, a sidewall blank is fed from the sidewall magazine **25** by the sidewall feed assembly **31** to a lug **34.** The lug **34** lowers the sidewall at a controlled rate past heating means **10** which heat opposed sides and ends of the blank. The lug **34** thereafter releases the heated sidewall which gravitationally aligns its lower edge relative to the lower end of a mandrel **2** located at the first station A on the sidewall supporting base **37** of the positioning element **11.** Thereafter, the holding bar **42** moves a portion of the sidewall into contact with the mandrel **2** and the first and second wrapping wings **40, 41** move other portions of the sidewall circumferentially around the mandrel and into overlapping relationship. The face **23** of the sidewall clamp **22** moves into forcible contact with the overlapping edges of the sidewall thereby holding the sidewall forcibly against the mandrel **2** and assuring a fluid-tight seal of the heated overlapping edges. The wings **40, 41** are then retracted and the mandrel is moved to the second station B. In moving from the first to the second station, sensing means **20** determine if a sidewall has, in fact, been installed on the mandrel **2** and signals a controlling means **47** in response to that operation.

At the second station B, a bottom disc is fed from the bottom member magazine **12** to the bottom member inserting means **13** which actuates the inserting rod **59** to move the bottom disc into the lower portion of the sidewall surrounding the mandrel **2.** Inserting rod **59** then retracts and that mandrel **2** is moved to the third station C.

At the third station C, a seating-detecting means **14** moves upwardly into the sidewall, correctly positioning the bottom disc relative to the lower edge of said sidewall, and indicates to the controlling means **47** the presence or absence of a bottom disc therein. The seating-detecting means **14** then retracts and that mandrel is moved to the fourth station D.

At the fourth station D, the heating means **15** moves upwardly into a position for heating portions of the bottom disc and sidewall, heats said portions and thereafter retracts to a position spaced from the mandrel, sidewall and associated disc. That mandrel **2** is then moved to the fifth station E.

At the fifth station E, the crimping-sealing means **16** is moved upwardly by the power source **69** to force portions of the sidewall inwardly and into forcible contact with the bottom disc. The crimping-sealing means **16** thereafter retracts and that mandrel is moved to the sixth station F.

At the sixth station F, the vacuum head **71** of the stripping means **17** contacts the bottom of the container, extracts the container from the mandrel **2,** and deposits said container on conveying means **19** which moves the container to the seventh station at which the top of the container is curled. That mandrel then proceeds to the first station A to initiate a new cycle.

The control means **47** and associated sensing means **20, 21** and detecting means **14** is connected to each machine component. A signal delivered to a machine component indicating a malfunction of the previous machine component prevents the carton-forming operation of that machine component on the mandrel **2** associated with the malfunction. A counting mechanism permits the machine of this invention to continue operation until a preselected consecutively occurring number of machine component malfunctions have occurred.

The improved carton-forming machine and associated machine components of this invention is therefore constructed to automatically, substantially continuously form cartons of improved quality. Other modifications and alterations of this invention will become apparent to those skilled in the art from the foregoing discussion and accompanying drawing, and it should be understood that this invention is not to be unduly limited thereto.

What is claimed is:

1. An apparatus for inserting a member into a chamber of a body, comprising:

an aligning element having a receiving surface with an opening and a rim extending around a portion of the periphery of the receiving surface and being positioned adjacent the chamber for aligning a member moving across the receiving station and into contact with the rim;

a pair of opposed holding lugs, each attached to the rim and extending a distance from the rim toward the opening;

an inserting rod having an end and being movable from a first position at which the end is adjacent and at a lower elevation than a member positioned between the lugs and the receiving surface, through a first distance to a second position at which the end and portions of the member are within the chamber of the body and portions of the member are held between the lugs and the receiving surface and through a second distance to a third position at which the end and the member are within the chamber of the body; and

elevator means for moving the inserting rod and the member from the receiving surface into the chamber of the body.

2. An apparatus, as set forth in claim **1,** wherein each lug is positioned on the rim at a location adjacent a side of the pathway of a member moving onto the receiving surface.

3. An apparatus, as set forth in claim **1,** wherein each lug extends from an edge of the member toward the inserting rod a distance in the range of 0.5 percent to 5 percent of the width of the member.

4. An apparatus, as set forth in claim **1,** including a movable vacuum means for moving a member across the receiving surface and releasing said member in contact with the rim.

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