United States Patent

[11] 3,602,106

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[45] Patented **Aug. 31, 1971**
[73] Assignee **Ex-Cello-O Corp.**
Detroit, Mich.

[54] **MACHINE FOR FORMING PAPERBOARD CONTAINER BOTTOM CLOSURE**
20 Claims, 31 Drawing Figs.

[52] **U.S. Cl.** 93/44.1
[51] **Int. Cl.** B31b 1/02
[50] **Field of Search** 93/44.1

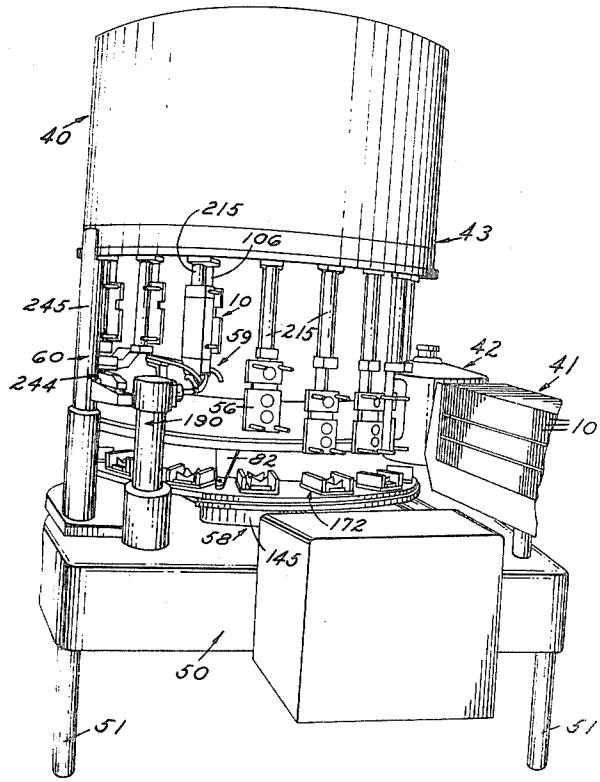
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Primary Examiner—Granville Y. Custer, Jr.
Attorney—James H. Bower

ABSTRACT: A continuous motion container-fabricating machine for forming a paperboard container bottom closure. The machine comprises a support means, a rotary turret provided with a plurality of working stations with a vertically reciprocable container carrier means at each station, a container bottom heater means including floating heater carrier plate and adjustable heater heads on the carrier plate, a bottom closure folding and tucking means including a pair of rotating breaker fingers mounted on the same shaft and operatively associated with a pair of water-cooled guide rails, and a floating pressure rail means operating with a pressure arm sealing assembly.

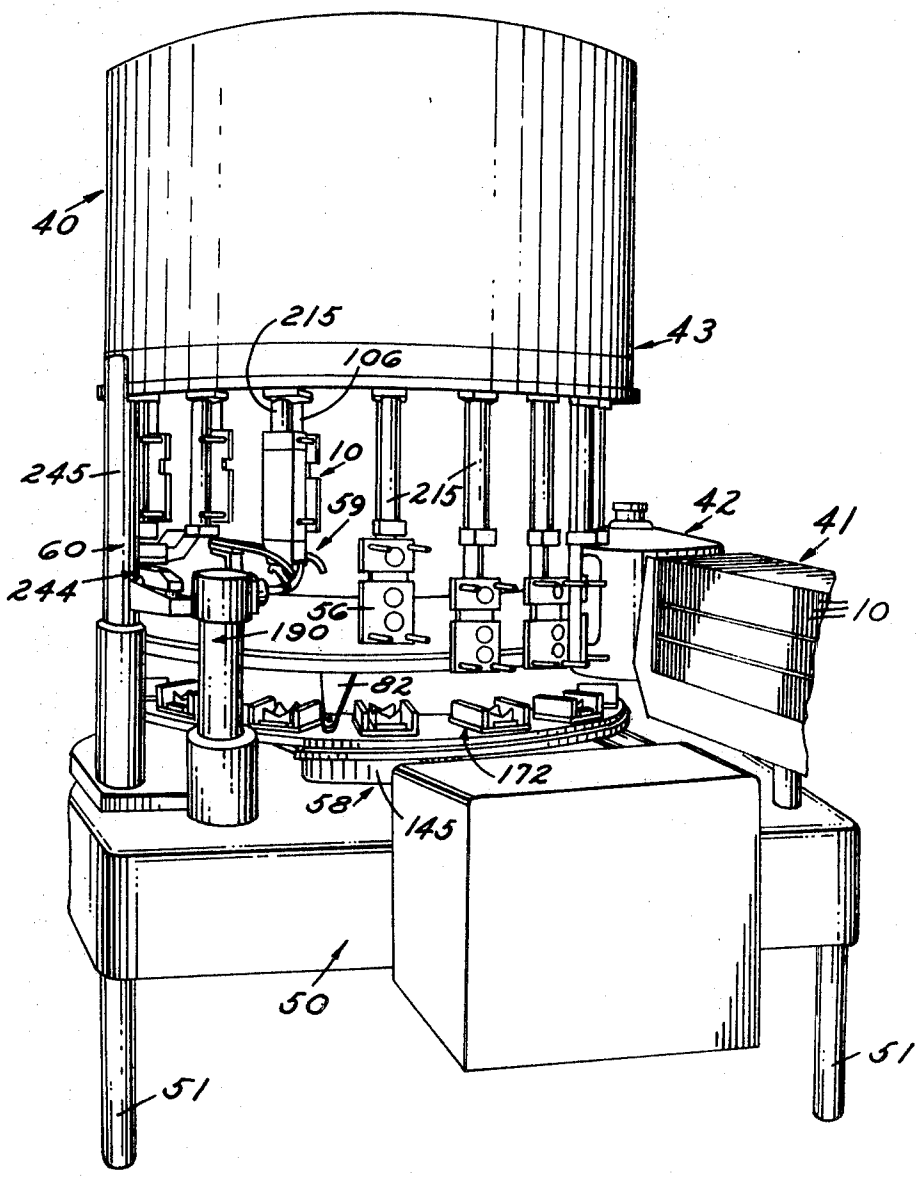


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SHEET 01 OF 18

FIG. 1



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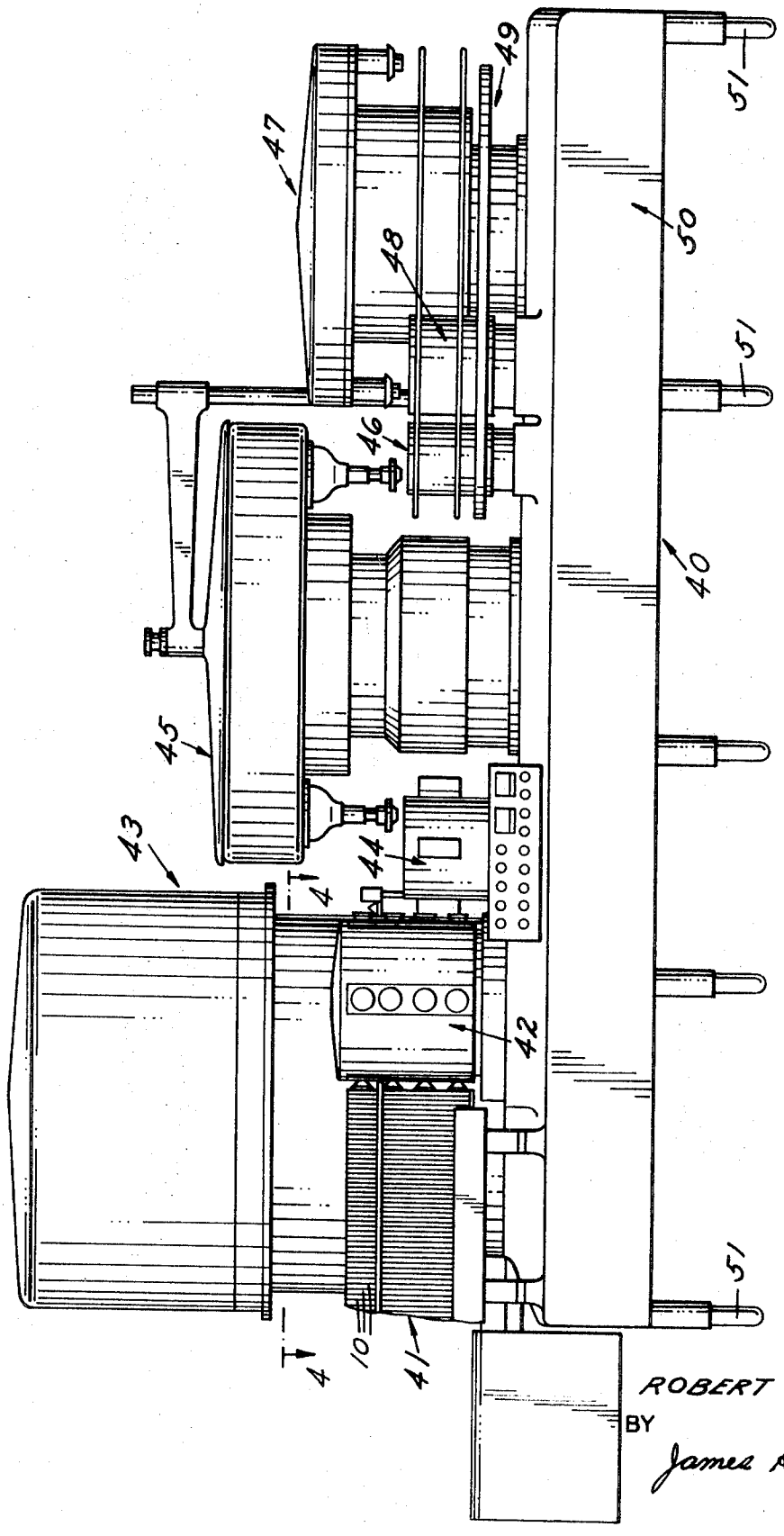


FIG. 2

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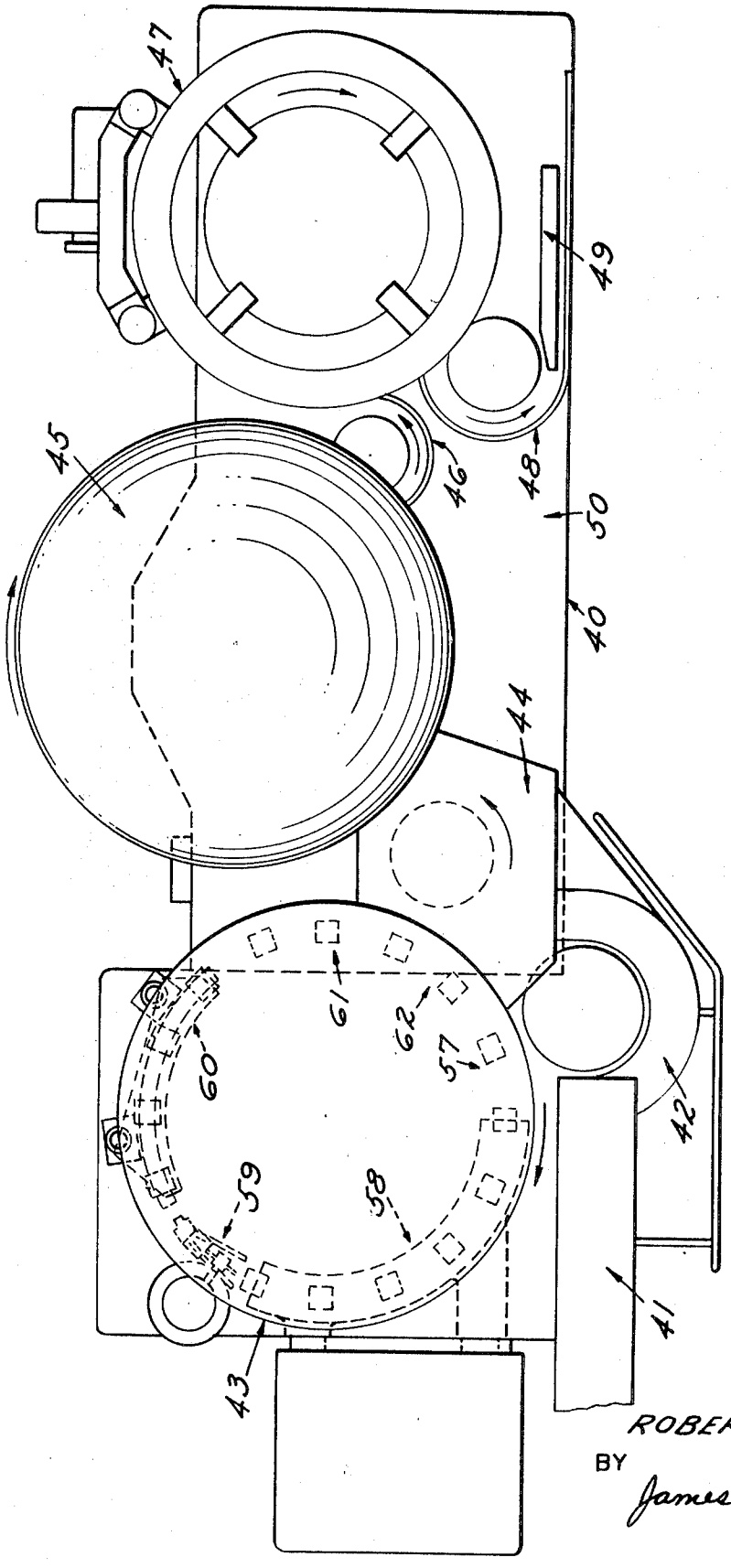


FIG. 3

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FIG. 4

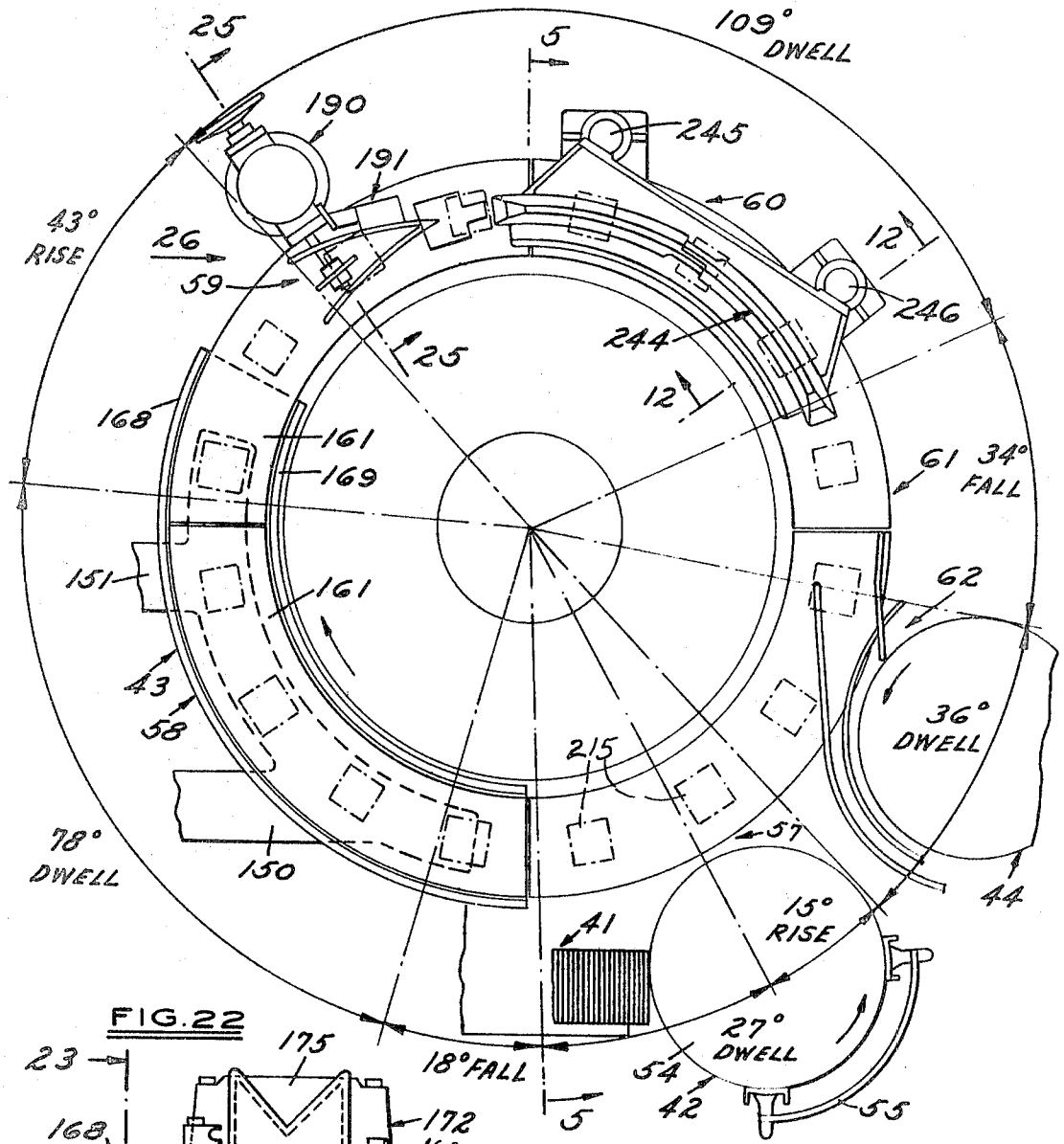
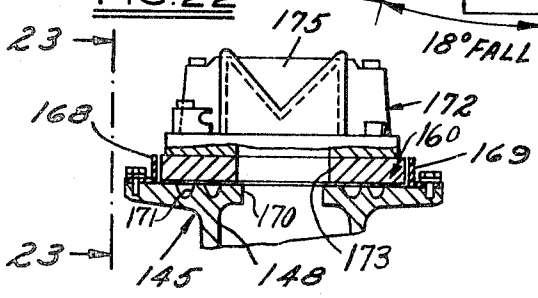
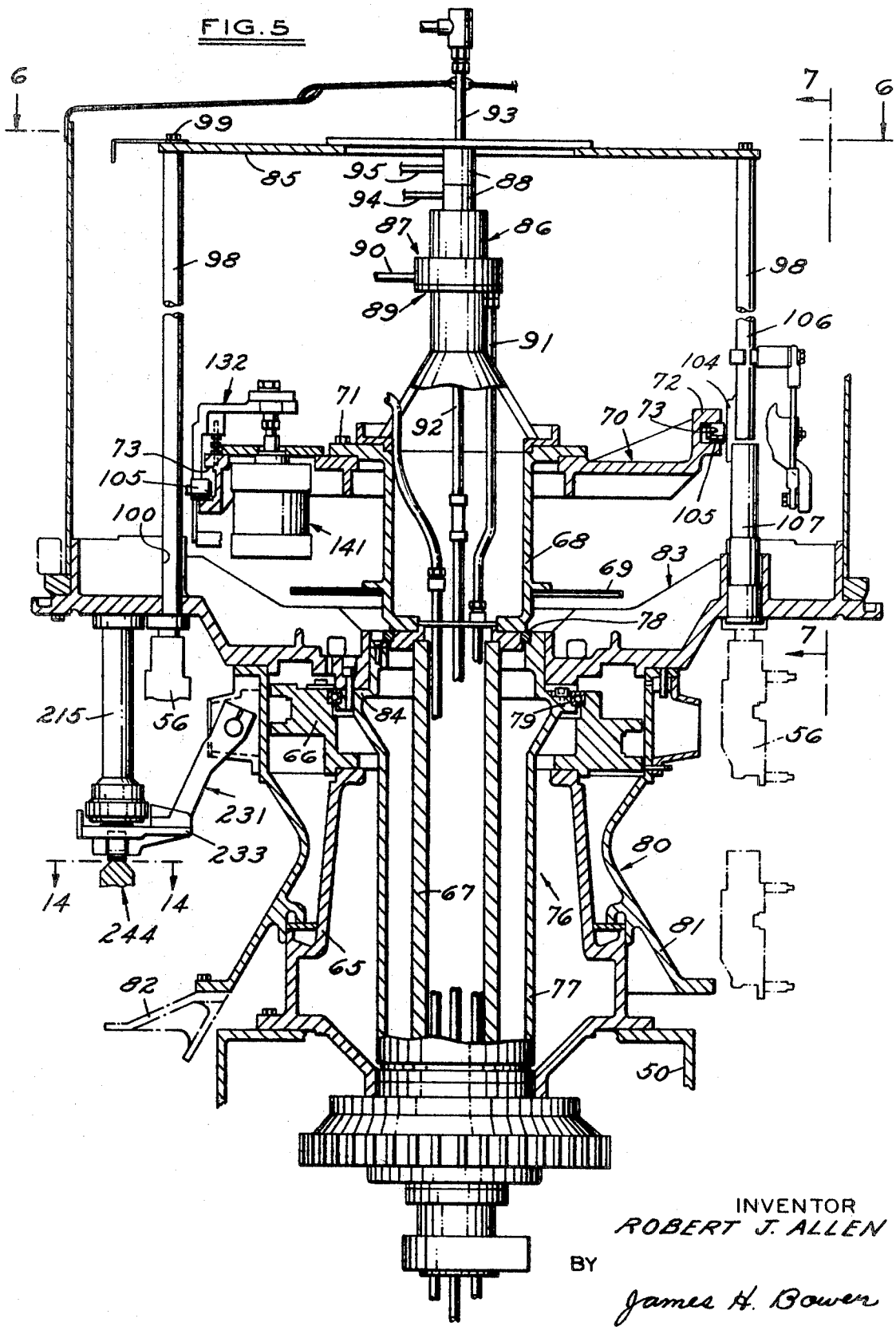


FIG. 22



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FIG. 5



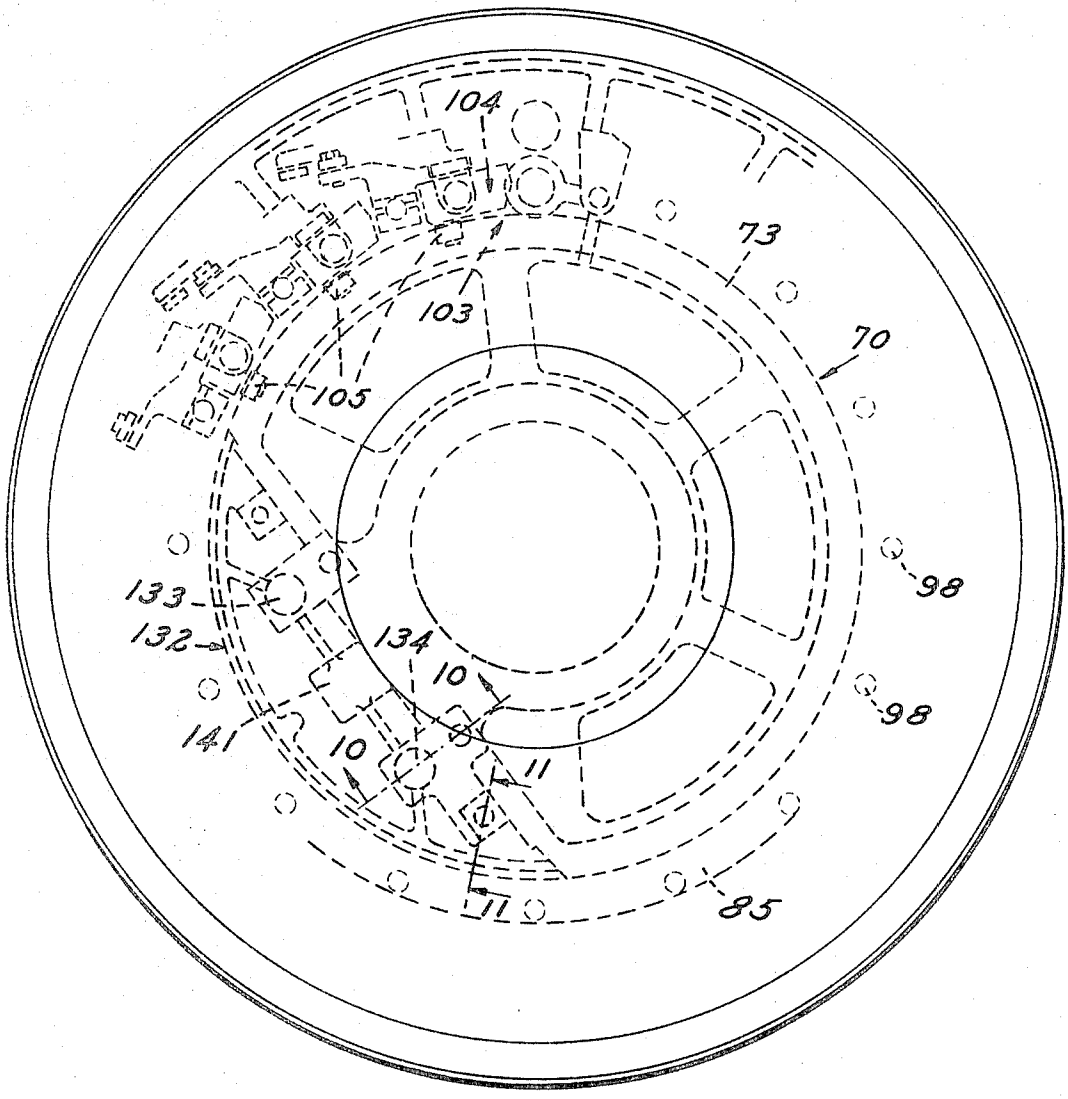
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FIG. 6

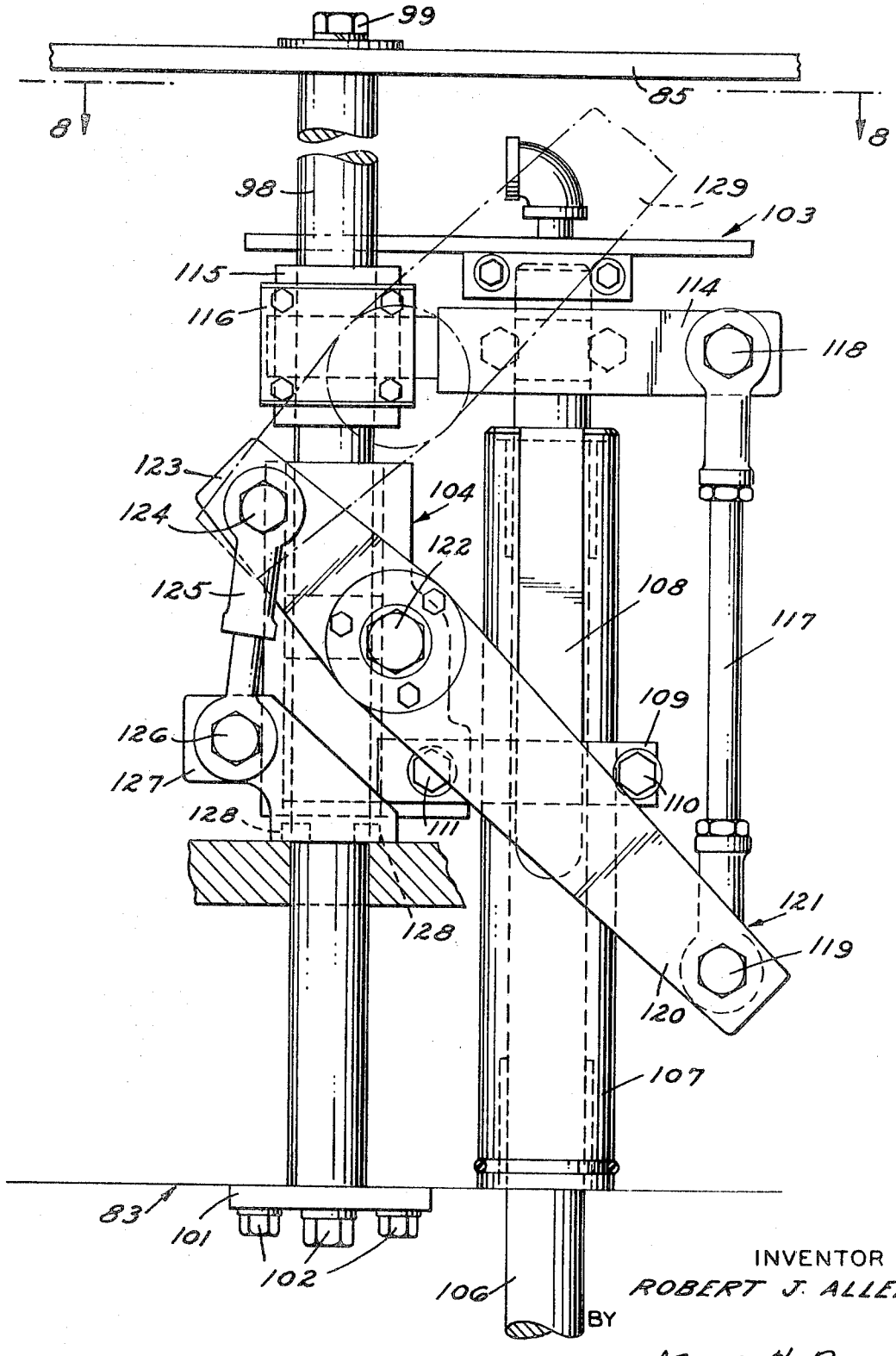


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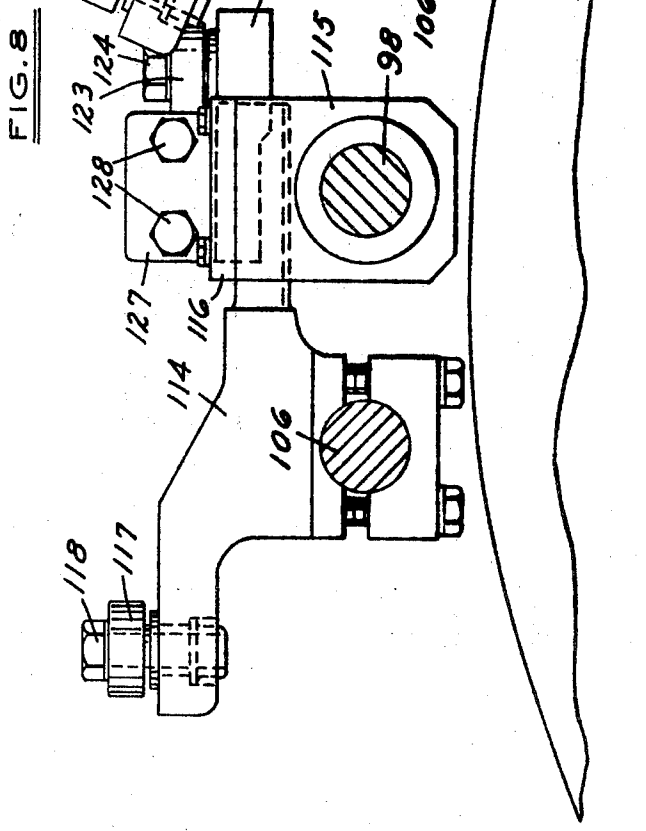
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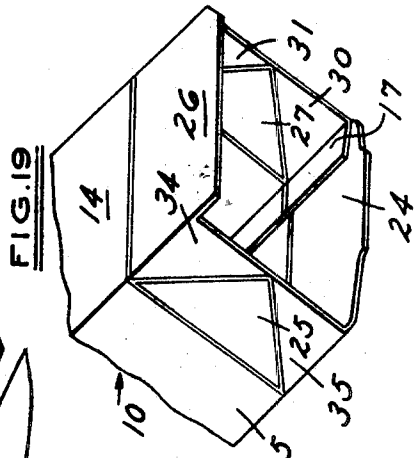
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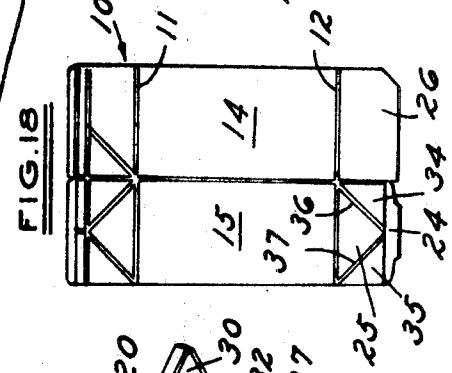


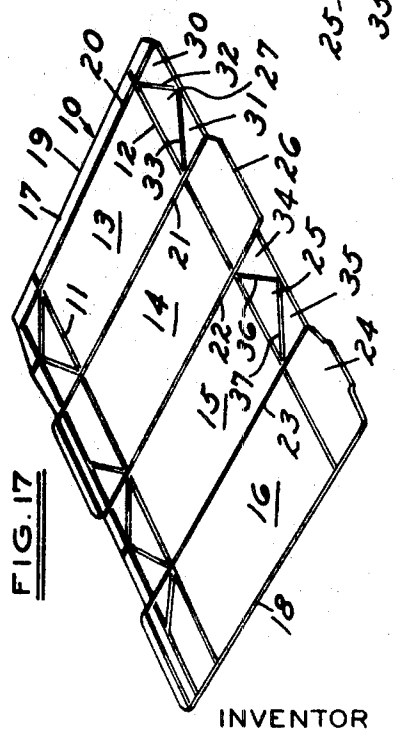
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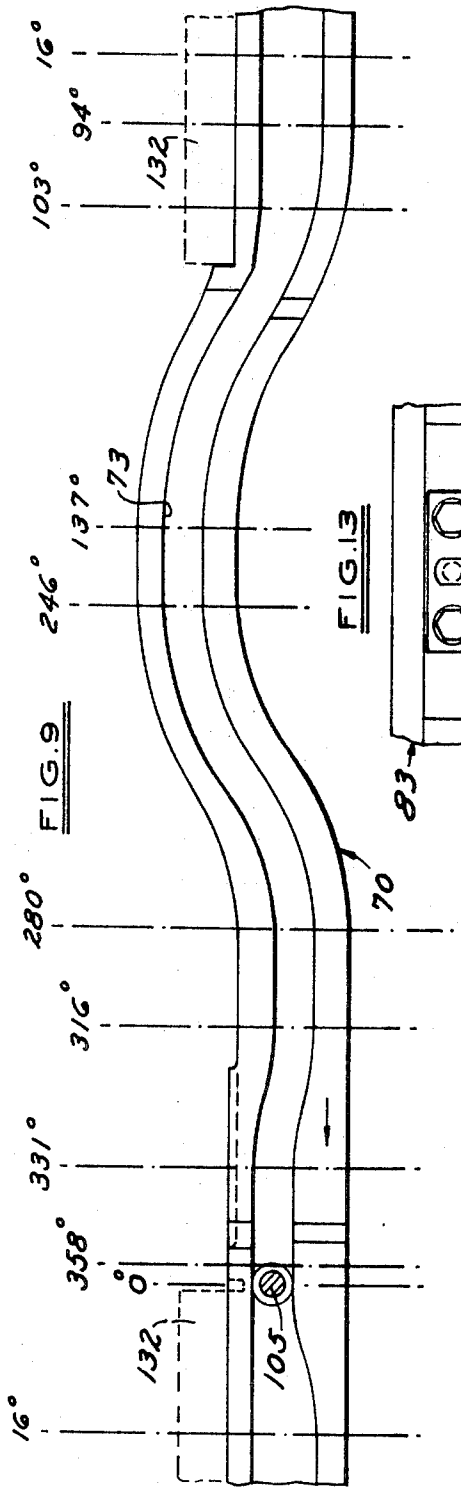


FIG. 9

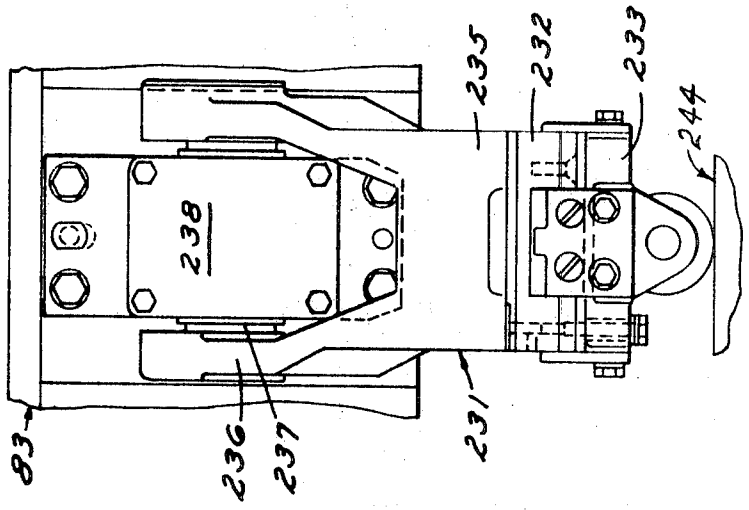


FIG. 13

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FIG. 16

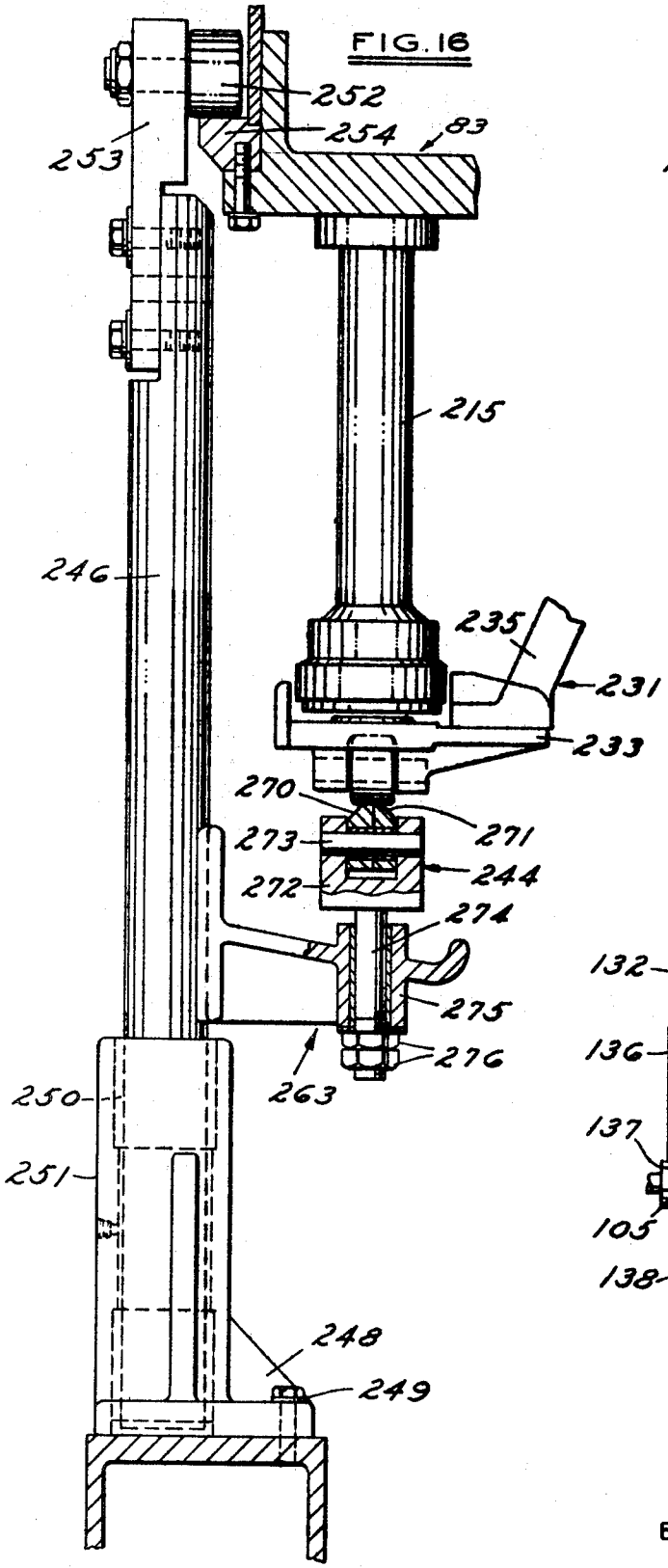


FIG. 10

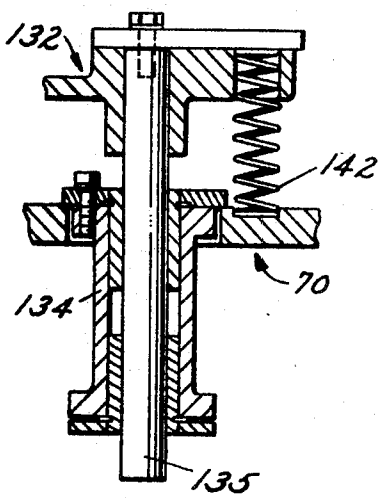
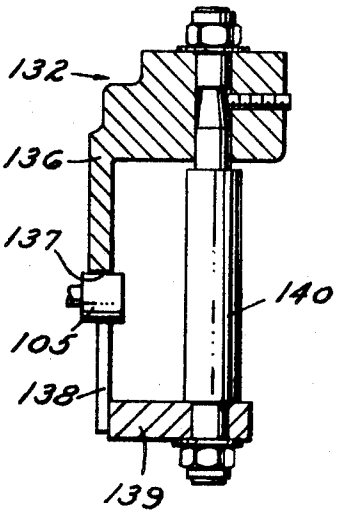


FIG. 11



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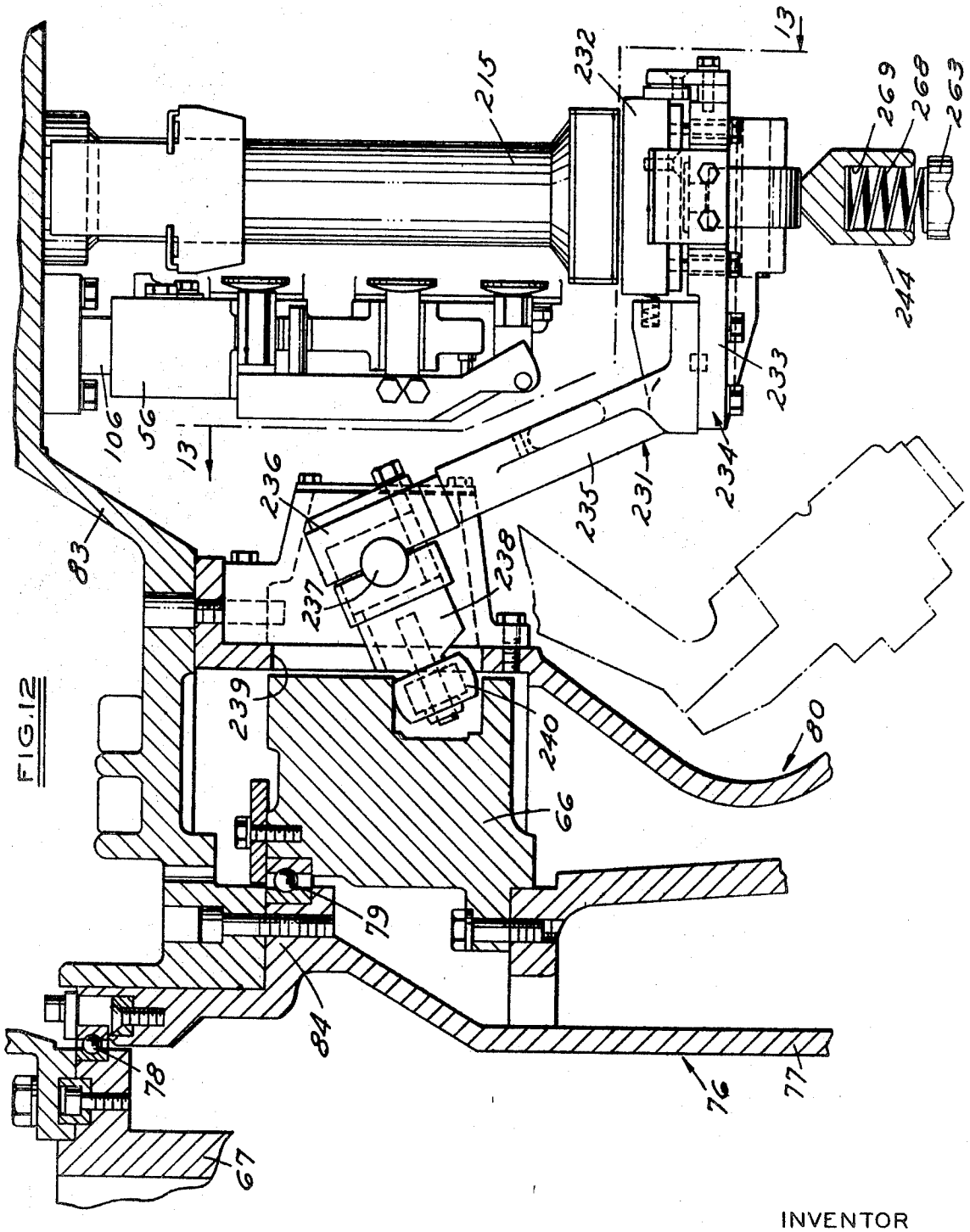


FIG. 12

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FIG. 14

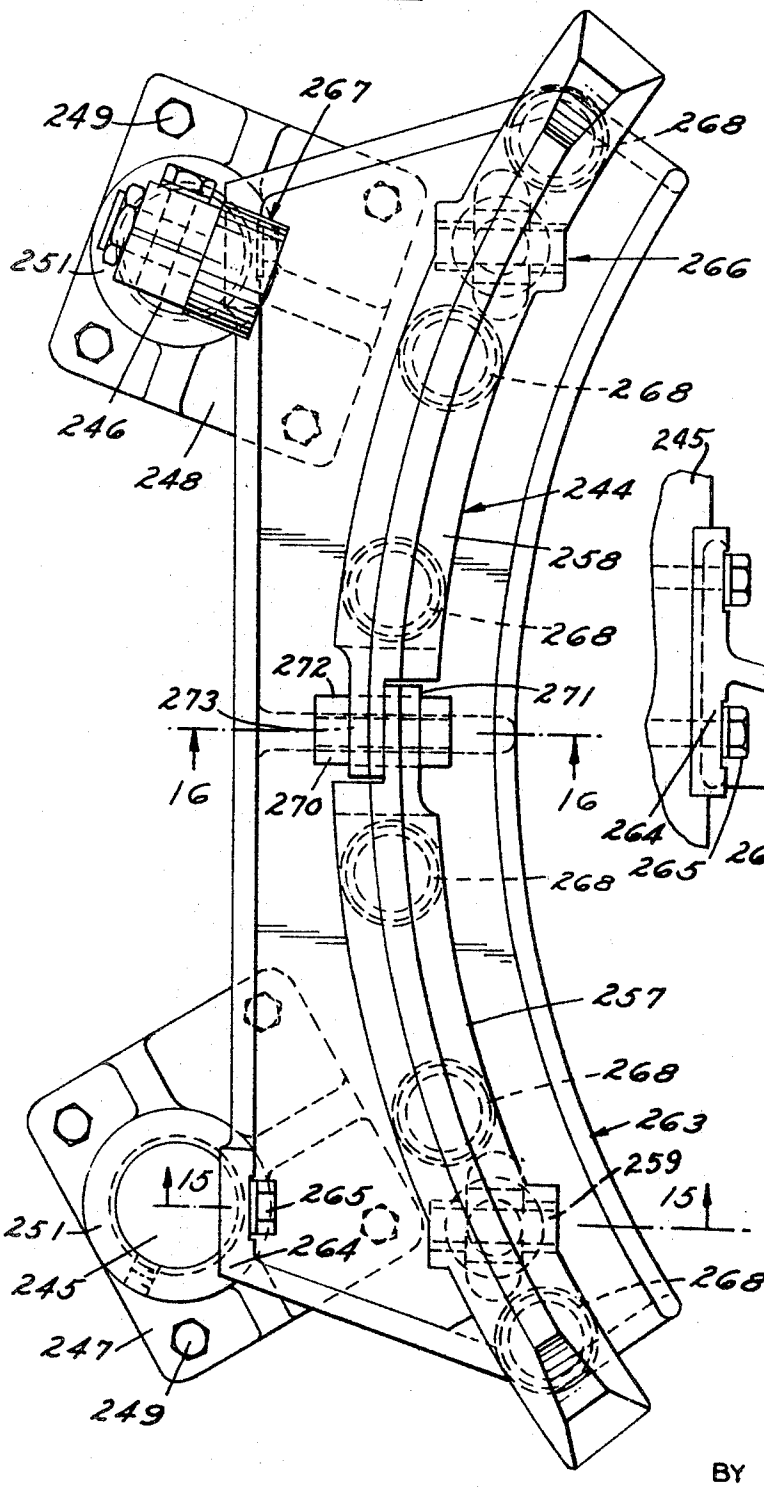
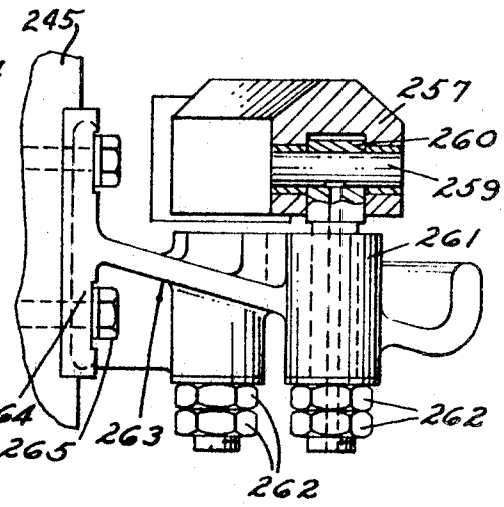


FIG. 15



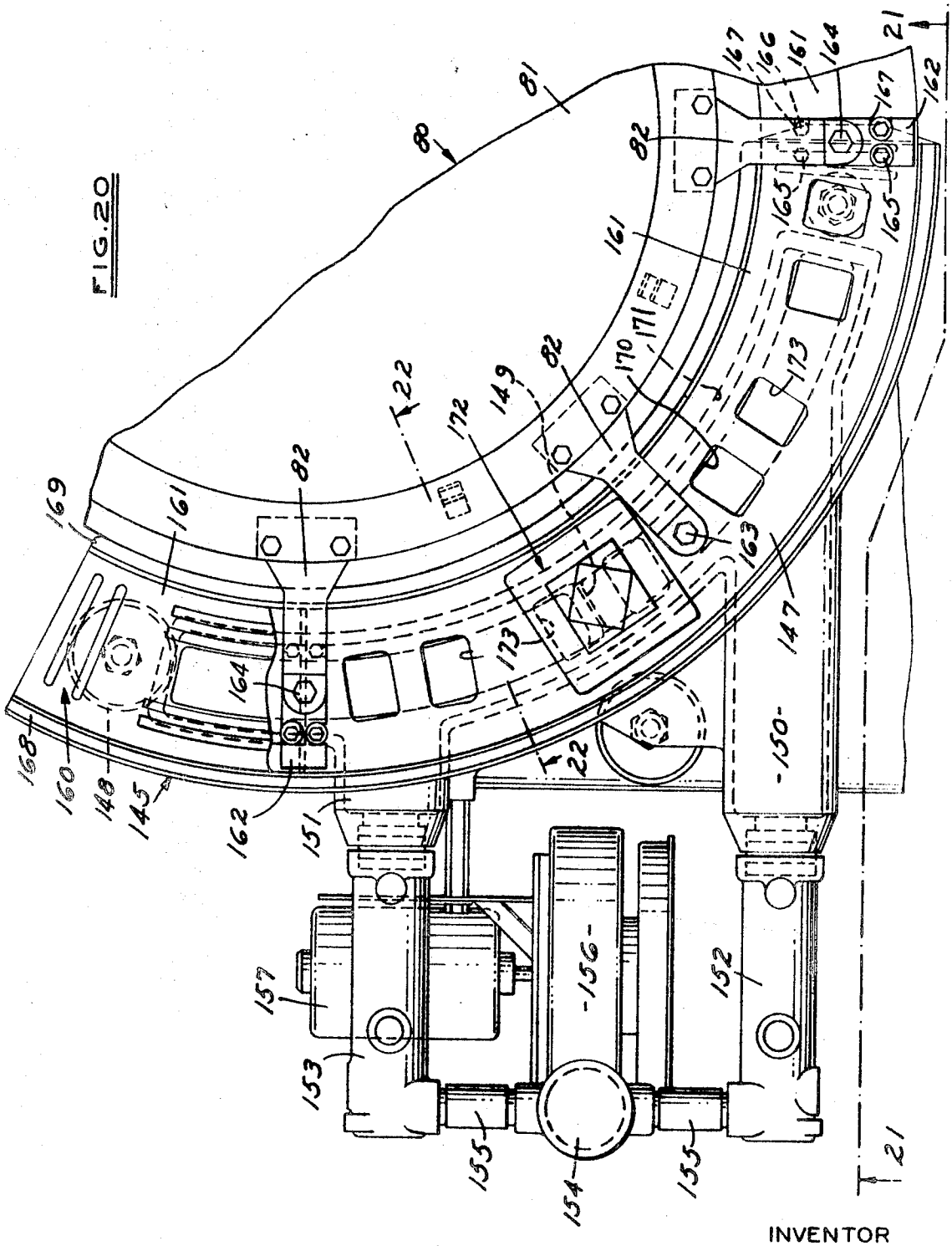
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FIG. 20



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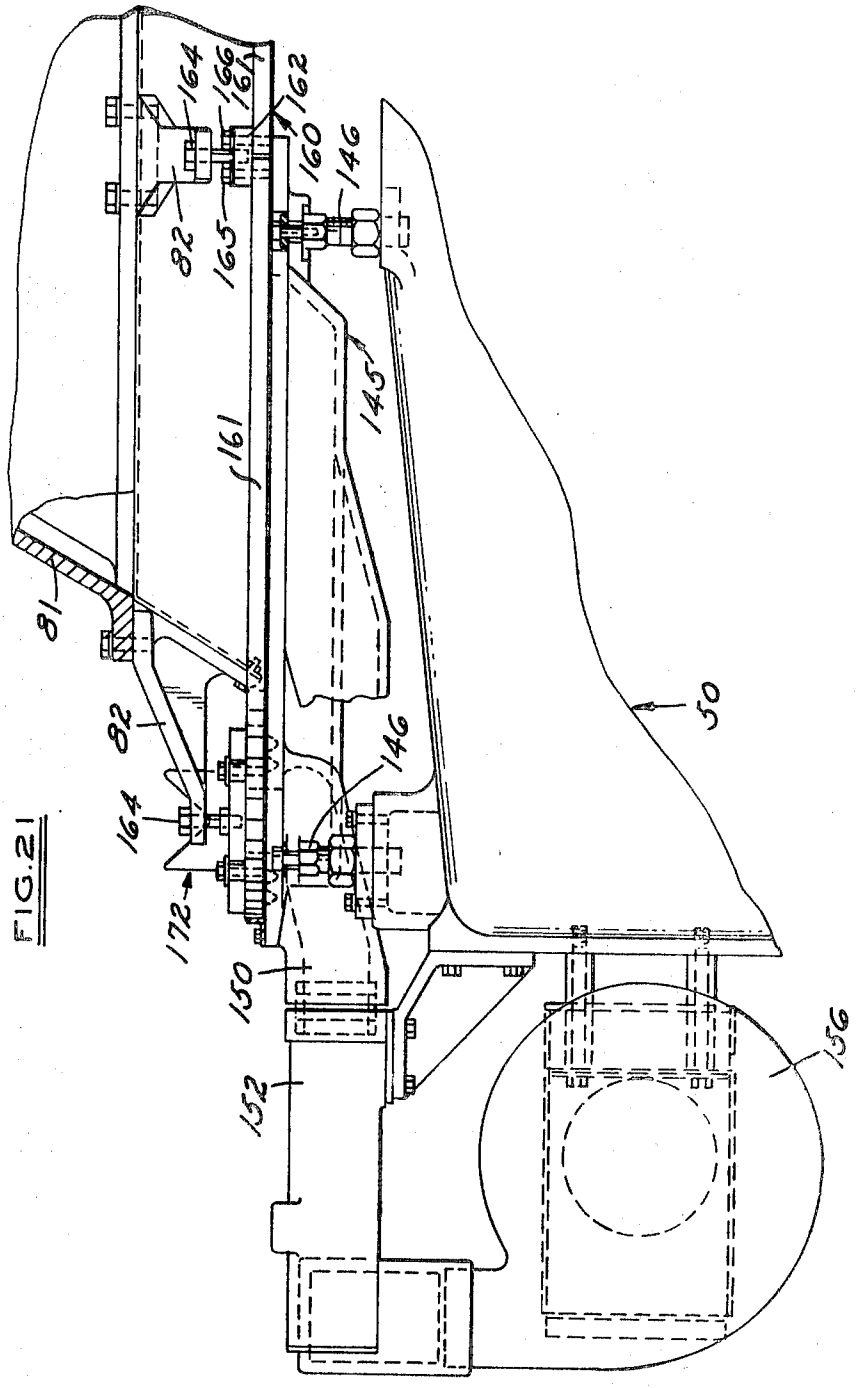


FIG. 21

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FIG. 24

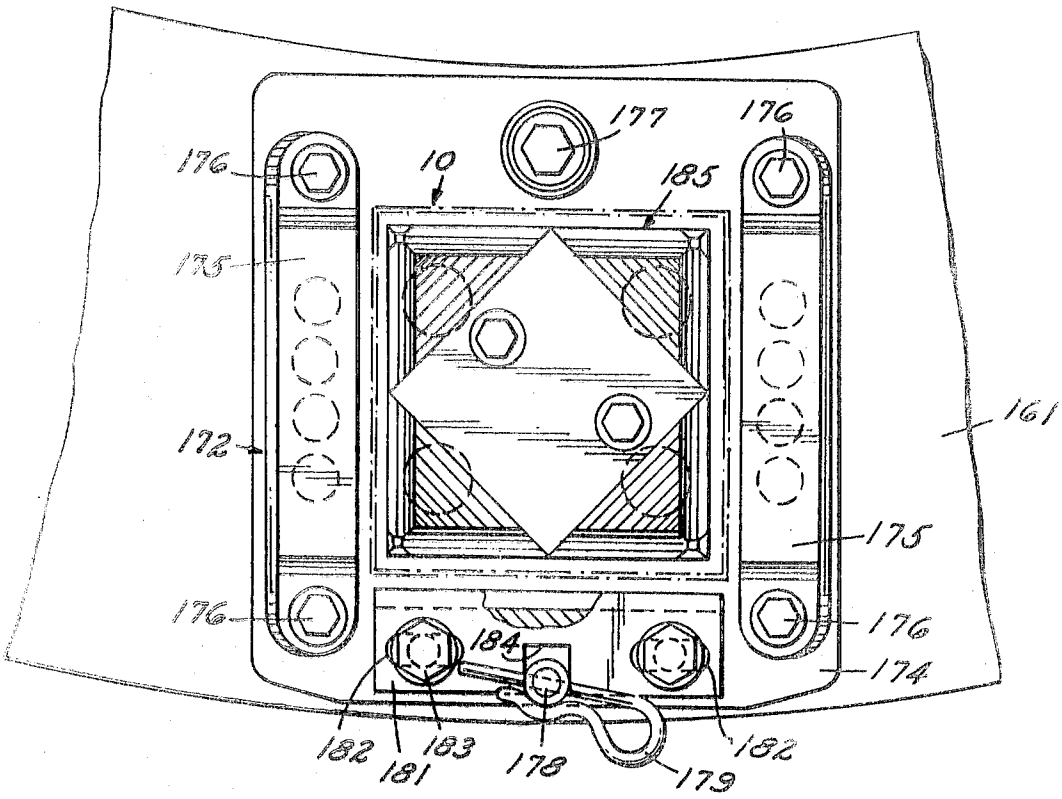
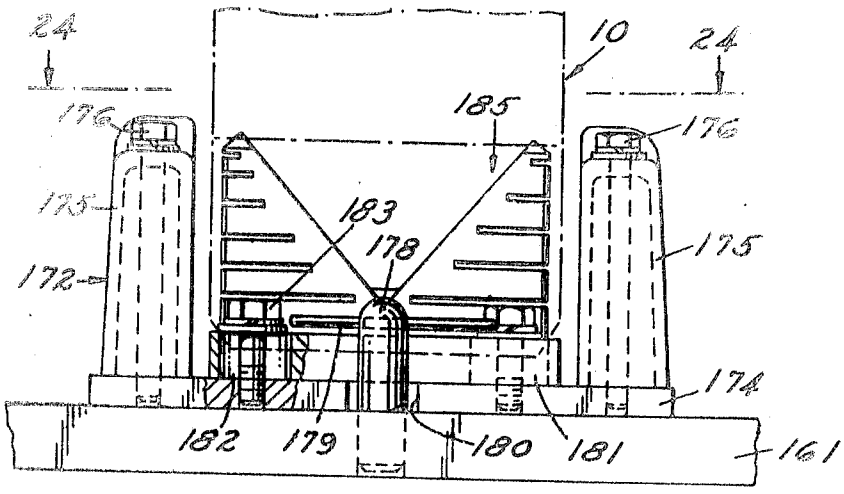


FIG. 23



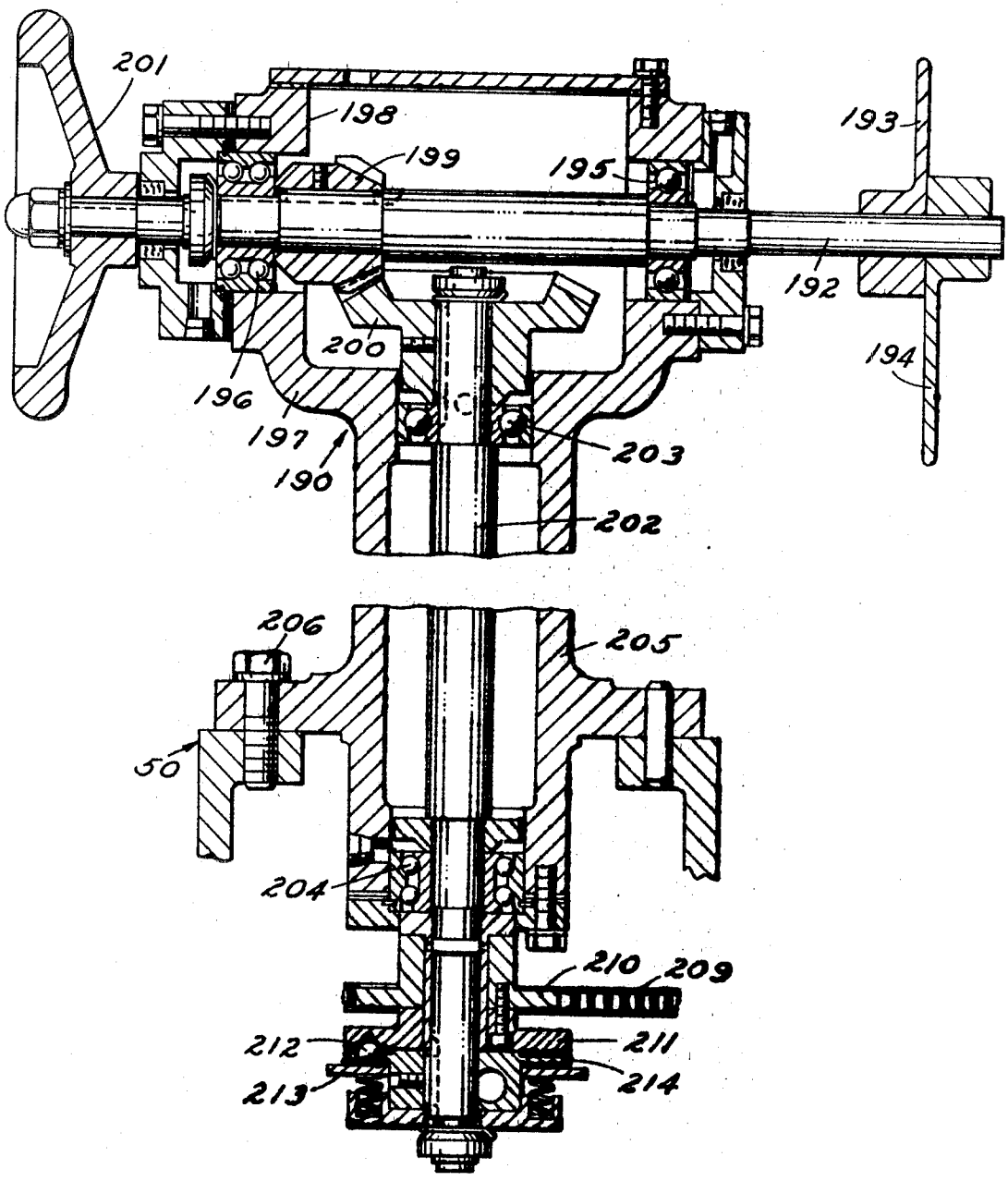
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FIG. 25



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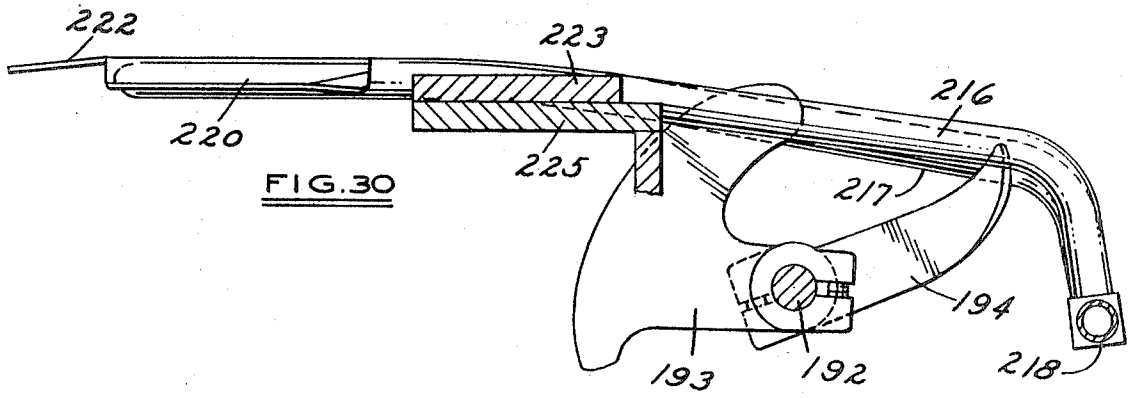
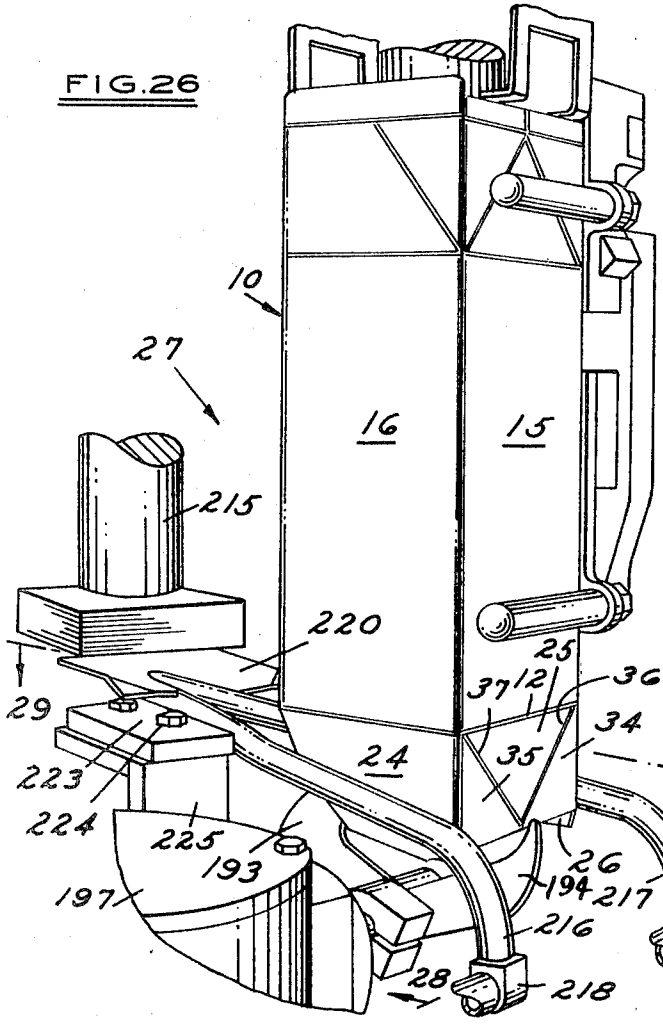


FIG.30

FIG.26



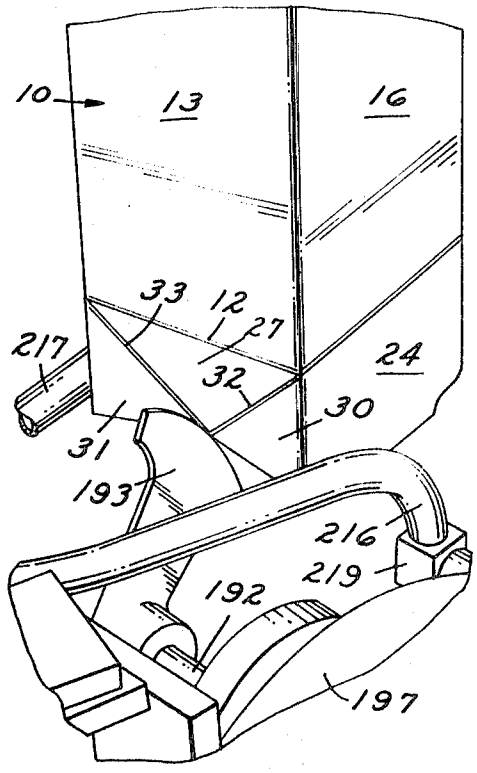


FIG.27

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FIG.29

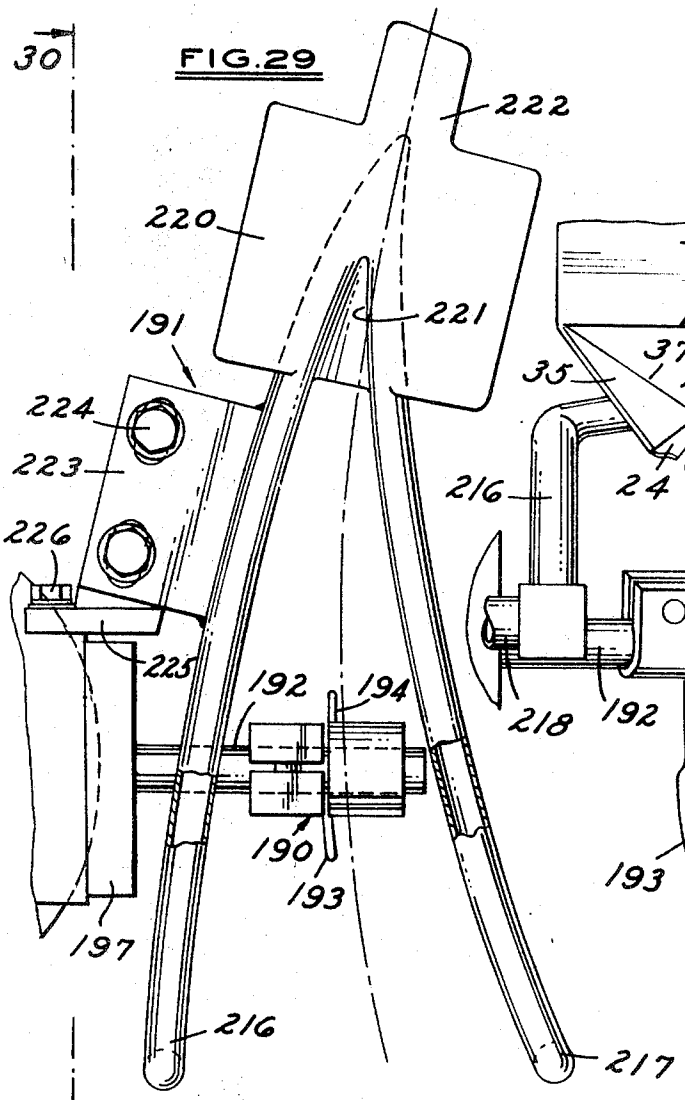


FIG.28

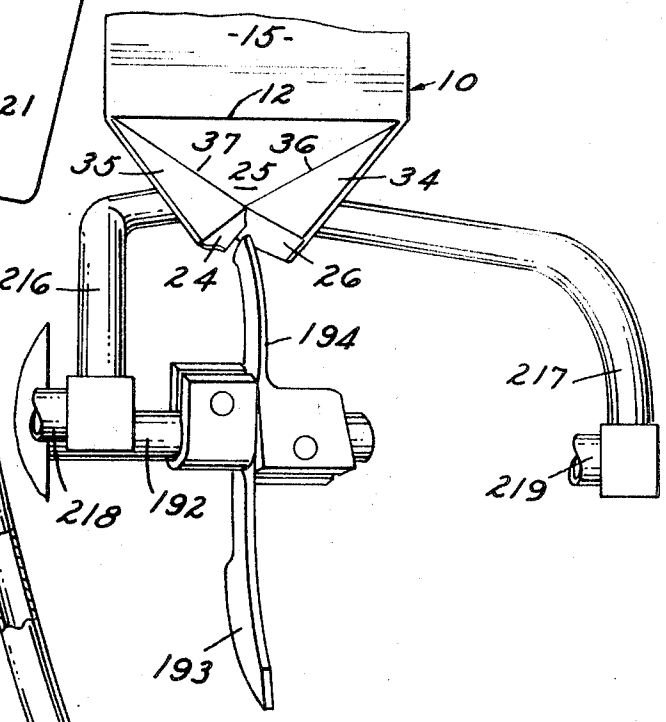
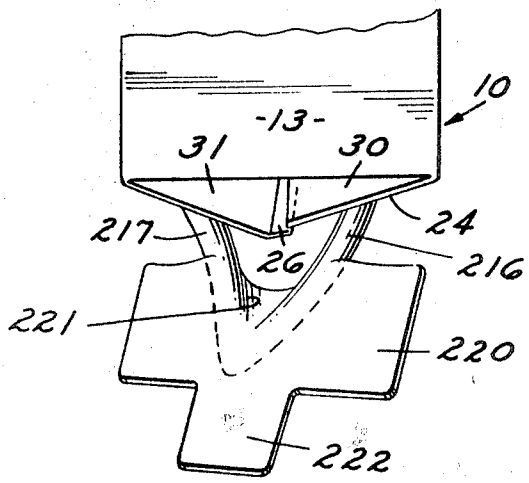


FIG.31



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MACHINE FOR FORMING PAPERBOARD CONTAINER BOTTOM CLOSURE

SUMMARY OF THE INVENTION

This invention relates generally to container-fabricating machines, and more particularly to a novel and improved continuous motion-type machine for forming paperboard container bottom closures.

Continuous motion-type machines for forming paperboard container bottom closures are known. However, the prior art machines have many disadvantages. For example, some of these machines incorporate a bottom closure heating system that includes a one-piece annular heater head metal carrier plate which is fixed to a rotating member, but which buckles during use due to the expansion and contraction of the metal, and which requires seals and packings to make them work. Another disadvantage inherent in the prior art machines is that they use a large number of springs in their pressure pads in order to generate a sufficient sealing force in conjunction with a fixed pressure rail. The use of a large number of springs in a pressure pad requires much machining, increases the number of the springs required, and it makes for a bulky machine. The prior art machines also require complicated apparatuses for moving the container carriers upwardly and downwardly. The prior art heater heads are fixed on the carrier plate and they are not adjustable.

In view of the foregoing, it is an important object of the present invention to provide a novel and improved continuous motion-type machine for forming paperboard container bottom closures which overcomes the aforementioned disadvantages of the prior art container-bottom-forming machines.

It is another object of the present invention to provide a novel and improved continuous motion-type machine for forming paperboard container bottom closures which incorporates a floating-type heater head carrier plate construction. The carrier plate or top plate of the heater plenum is made in a plurality of portions which are allowed to float to compensate for heat growth and alignment with the heater plenum. The floating function is provided by expansion joints which permit the carrier plate portions to expand and contract during heating operations. This floating function prevents buckling of the carrier plate portions and reduces heat loss.

It is another object of the present invention to provide a novel and improved folding and tucking apparatus for a continuous motion-type bottom-forming machine, and which comprises a pair of rotating breaker fingers or blades which rotate on a horizontal axis and in a vertical plane substantially aligned with the centerline of the path of travel of a container blank through the forming operation. The breaker fingers are independently and infinitely adjustable about said horizontal axis. Two water-cooled guide rails are disposed on opposite sides of the rotating breaker fingers for folding and tucking the bottom closure panels. The breaker fingers are power operated and manual control means is also provided.

It is still another object of the present invention to provide a novel and improved floating pressure rail for use on a continuous motion-type container-bottom-forming machine and which eliminates the need for a large number of springs in the pressure pad itself. The floating pressure rail is provided with a plurality of springs, and the pressure rail is at all times engaging three working stations. The pressure rail has two parts that are pivoted together in the center of the rail.

It is a further object of the present invention to provide a novel and improved adjustable heater head for use on a heater head floating carrier plate, and wherein no seals or packings are required, and which provides for added turbulence in the flow of hot air to provide better overall heat distribution.

It is still a further object of the present invention to provide an improved linkage cam structure for moving container carriers upwardly and downwardly and which includes a movable cam heat retract portion for lifting the carrier assemblies away from the heating system when required for idling, setup, changeover or emergency purposes.

While it will be apparent that the preferred embodiment of the invention herein disclosed is well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational perspective view of a continuous motion-type forming machine for forming container bottom closures and illustrating the principles of the present invention.

FIG. 2 is a right side elevational view of the illustrative machine shown in FIG. 1, taken from the right side of the machine as viewed in FIG. 1, and illustrating the container erecting, filling and closing structure of the machine.

FIG. 3 is a plan view of the illustrative machine of FIG. 2.

FIG. 4 is an enlarged, horizontal diagrammatic view of the structure illustrated in FIG. 2, taken along the line 4—4 thereof, looking in the direction of the arrows, and detailing various substructures of the bottom-forming machine.

FIG. 5 is a vertical, section view through the bottom forming turret, taken along the line 5—5 of FIG. 4, and looking in the direction of the arrows.

FIG. 6 is a plan view of the bottom-forming turret, with parts removed, taken along the line 6—6 of FIG. 5, and looking in the direction of the arrows.

FIG. 7 is a fragmentary, broken, elevational view of the structure illustrated in FIG. 5, taken along the line 7—7 thereof, and looking in the direction of the arrows.

FIG. 8 is a top plan view of the structure illustrated in FIG. 7, taken along the line 8—8 thereof, and looking in the direction of the arrows.

FIG. 9 is a developed view of the container carrier cam track shown in FIG. 5.

FIG. 10 is a fragmentary, enlarged, elevational, section view of the structure illustrated in FIG. 6, taken along the lines 10—10 thereof, and looking in the direction of the arrows.

FIG. 11 is a fragmentary, enlarged, elevational section view of the structure illustrated in FIG. 6, taken along the line 11—11 thereof, and looking in the direction of the arrows.

FIG. 12 is a fragmentary, enlarged, elevational section view of the structure illustrated in FIG. 4, taken along the line 12—12 thereof, and looking in the direction of the arrows.

FIG. 13 is a fragmentary, elevational view of the structure illustrated in FIG. 12, taken along the line 13—13 thereof, and looking in the direction of the arrows.

FIG. 14 is a fragmentary, horizontal section view of the structure illustrated in FIG. 5, taken along the line 14—14 thereof, and looking in the direction of the arrows.

FIG. 15 is a fragmentary, enlarged, elevational section view of the structure illustrated in FIG. 14, taken along the line 15—15 thereof, and looking in the direction of the arrows.

FIG. 16 is a fragmentary, elevational section view of the structure illustrated in FIG. 14, taken along the line 16—16 thereof, and looking in the direction of the arrows.

FIG. 17 is a perspective view showing the outer face of a container blank.

FIG. 18 is a plan view of a flat collapsed side seamed container blank in the form in which it is fed to the bottom-forming machine of FIG. 1, for a bottom-forming operation.

FIG. 19 is an enlarged, fragmentary, perspective view showing the bottom closure elements of the container blank of FIGS. 13 and 14.

FIG. 20 is an enlarged, partial horizontal view, with parts broken away, of the bottom-heating structure illustrated in FIG. 1.

FIG. 21 is a fragmentary, elevational section view of the heater structure illustrated in FIG. 20, taken along the line 21—21 thereof, and looking in the direction of the arrows.

FIG. 22 is a fragmentary, elevational section view of the structure illustrated in FIG. 20, taken along the line 22—22 thereof, and looking in the direction of the arrows.

FIG. 23 is a fragmentary, enlarged, elevational view of the structure illustrated in FIG. 22, taken along the line 23—23 thereof, and looking in the direction of the arrows.

FIG. 24 is a fragmentary, horizontal plan view of the structure illustrated in FIG. 23, taken along the line 24—24 thereof, and looking in the direction of the arrows.

FIG. 25 is a fragmentary, broken, enlarged, elevational section view of the structure illustrated in FIG. 4, taken along the line 25—25 thereof, and looking in the direction of the arrows.

FIG. 26 is a fragmentary, elevational section view of the structure illustrated in FIG. 4, taken in the direction of the arrow marked "26" in FIG. 4.

FIG. 27 is a fragmentary, perspective view of the structure illustrated in FIG. 26, taken in the direction of the arrow marked "27" in FIG. 26.

FIG. 28 is a fragmentary, elevational view of the structure illustrated in FIG. 26, taken along the line 28—28 thereof, and looking in the direction of the arrows.

FIG. 29 is a fragmentary, horizontal plan view of the structure illustrated in FIG. 26, taken along the line 29—29 thereof, and looking in the direction of the arrows.

FIG. 30 is a fragmentary, elevational view, partly in section, of the structure illustrated in FIG. 29, taken along the line 30—30 thereof, and looking in the direction of the arrows.

FIG. 31 is a fragmentary, perspective view showing a container approaching the last portion of the folding and tucking guide rails.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The bottom-forming machine of the present invention is particularly adapted to heat, form and seal the bottom end closures of cartons or containers of the type shown in U.S. Pat. Nos. 3,120,333, 3,185,375 and 3,185,376. For a complete description of a container which may be heated and sealed by the machine of the present invention, reference may be had to the aforementioned patents. The container described in this application is made from a paperboard having a suitable coating thereon, such as a polyethylene coating. It should be understood that any suitable plastic coating may be employed as a coating for the container.

FIGS. 17, 18 and 19 illustrate generally the type of container which may have its bottom end closure panel structure formed and sealed by the machine of the present invention. As shown in FIG. 17, the illustrative container is generally indicated by the numeral 10 and it shows the outer face of a container blank. The container blank is illustrated in the flat form and it is pressed with a pattern of appropriate score lines. The container blank is separated into three sections by the score lines 11 and 12. The material above the score line 11 is the top closure panels of the container. The material between the score lines 11 and 12 is the body group panels and it comprises the four panels 13, 14, 15 and 16, and a fifth panel called a side seam flap 17. The body group panels are bounded on the outer sides thereof by the edges 18 and 19. The body group panels are separated by score lines 20, 21, 22 and 23.

The material below the score line 12 is the bottom closure group and comprises the major bottom closure panels 24 and 26, fold-in panels 25 and 27, the gusset panels 30, 31, 34 and 35, and the side seam flap 17. The bottom closure group of panels are defined on the sides by the edges 18 and 19, and they are separated by the score lines 20 through 23. The major bottom closure panel 24 has an extended tuck-in flap and the major bottom closure 26 has an extended tuck-over flap. The bottom fold-in panel 27 is flanked by the triangular gusset panels 30 and 31 which are connected thereto by the score lines 32 and 33, respectively. Similarly, the bottom folding panel 25 is flanked by the triangular gusset panels 34 and 35 which are connected thereto by score lines 36 and 37, respectively.

In order to form the flat side seam blank of FIG. 18, which is fed to the forming machine of the present invention, the panel 13 and the side seam flap 17 are folded about the score line 20 until their inside surfaces contact the inside surfaces of panels 14 and 15, respectively. The panel 16 is folded about the score line 23 until it contacts the inside surface of panel 15 and the outside surface of the side seam flap 17. The surface along the edge 18, which will meet the outside edge of the side seam flap 17 will be heated together with the outside surface of the side seam flap 17 to activate their thermoplastic coating so that the two surfaces will be bonded together when pressed together and cooled. The edge 18 and the score line 20 appear as one line after the last-mentioned bonding step. The bottom closure portion of the flat container blank of FIG. 18 then looks like the side seam container blank shown in FIG. 18.

When the container 10 is loaded on a bottom-forming machine carrier it takes a tubular shape as illustrated in FIG. 19. To form the bottom initially, the triangular panels 25 and 27 are moved inwardly toward each other, after which the major panels 24 and 26 are also moved inward toward each other. This action causes the gusset panel 30 to rotate about the score line 32 so that the inside surface of panel 30 approaches the inside surface of tuck-in panel 24. At the same time, panel 30 is rotating about score line 32, the outside surface of panel 30 is approaching the outside surface of panel 27. The gusset or fold-under panels 31, 34 and 35 are also making the same movements as panel 30 with panels 26–27, 25–26, and 24–25, respectively. The bottom closure panel 24 moves toward bottom closure panel 26 at a faster closing speed than panel 26, so that the tuck-in flap on panel 24 is positioned between the fold-under panels 30 and 35, and panel 26. The bottom closure panels are then moved into their final position and bonded in place by the bottom-forming machine of the present invention.

GENERAL MACHINE DESCRIPTION

Referring now to the drawings, and in particular to FIGS. 1, 2 and 3, the numeral 40 generally indicates a bottom-forming machine made in accordance with the principles of the present invention. The bottom-forming machine 40 is a continuous motion machine which is adapted to be supplied with flat folded tubular container blanks 10 from a suitable container loader magazine generally indicated by the numeral 41. The container blanks 10 are successively withdrawn by means of a suitable rotary feeder means which erects the containers into an open-ended tubular form and loads them onto a continuously rotating bottom-forming apparatus, generally indicated by the numeral 43, which heats, folds and seals the container bottom closure. As illustrated in FIG. 3, after the container bottom closure is formed the container is transferred by a suitable rotary transfer unit 44 to a suitable rotary turret filler 45 where it is filled and thence transferred by a rotary transfer unit to a rotary heating and top-sealing turret 47. The filled and sealed containers are then conveyed by a rotary transfer unit 48 and delivered to a conveyor 49 for discharge in a continuous manner from the machine. It will be understood that the bottom-forming apparatus 43 of the present invention may be used with any suitable container filling and sealing machine. In the present instance, the bottom-forming apparatus 43 is shown in conjunction with the Container Top Sealing Apparatus as shown and described in copending U.S. Pat. application, Ser. No. 448,545 of H. B. Egleston, filed Apr. 15, 1965, which issued as U.S. Letters Pat. No. 3,370,399 on Feb. 27, 1968.

The bottom-forming machine 43 is provided with a base 50 that is supported on a plurality of legs 51. The machine 43 is supplied with the necessary utilities, such as electric power, compressed air and cooling water from suitable external sources. The container magazine 41 is adapted to be mounted on top of the base 50 at the front end of the machine 40 and it is operatively associated with the rotary feeder mechanism 42. A general type of container magazine 41 and rotary feeder 42 is illustrated in U.S. Pat. No. 3,398,659.

Referring now to FIG. 4, it will be seen that the rotary feeder mechanism 42 is illustrated diagrammatically as operating to withdraw the front container blank from the magazine 41 and move it through a squaring operation by a continuously rotating turret 54. The feeder turret 54 advances

the container blank counterclockwise, as viewed in FIG. 4, into contact with the guide rails 55 which square the container blank along its prescored lines and apply reverse bends to the scores so that the container retains its shape when it is introduced into the bottom forming mechanism 43.

The rotary feeder turret 54 delivers the squared container blank to a container carrier 56 (FIG. 1) on the bottom-forming apparatus 43 at a load or feeding station, generally indicated by the numeral 57 in FIG. 4. The square tubular containers are reciprocated vertically by their individual carriers 56 as they are revolved in a circular, clockwise direction, as viewed in FIG. 4, during which time the containers go through a bottom closure heating operation at a station indicated by the numeral 58 in FIG. 4. The containers next go through a bottom folding or tucking operation at a station generally indicated by the numeral 59, and a pressure-sealing operation at a station indicated by the numeral 60. The bottom-formed containers are then stripped from the container carriers 56 at a mandrel stripping station generally indicated by the numeral 61. The bottom-formed containers are then discharged from the bottom-forming machine 43 at a station 62 at which point they are transferred by the rotary transfer unit 44 to the rotary turret filler and sealing machine 45.

THE BOTTOM FORMING TURRET

The bottom-forming unit 43 comprises a pedestal 65 which is shown in FIG. 5 as being fixedly mounted on the machine base 50. The pedestal 65 supports a circular pressure pad cam track member 66. Operatively supported in the base 50 is the vertically disposed stationary tubular shaft 67. Fixed on the upper end of the shaft 67 by any suitable means, as by welding, is a vertically disposed stationary tubular cam support shaft 68 which carries a condensation shield 69. Fixedly mounted by means of machine screws 71 on the upper end of the shaft 68 is a circular carrier lifter cam, generally indicated by the numeral 70. The cam 70 has an enlarged periphery 72 in which is formed an outwardly opening peripheral slot which forms a cam track 73. A rotary assembly 76 is mounted on the shaft 67 so as to be freely rotatable about the vertical axis of the shaft 67. The rotary assembly 76 includes a center column 77. The center column 77 is rotatably mounted on the shaft 67 by suitable bearings, indicated by the numerals 78 and 79. The rotary assembly 76 includes a housing turret 80 which is provided with a tapered web 81, to the lower edge of which is fixedly mounted heater plate carrier members 82, as more fully described hereinafter. The housing turret 80 is supported from the center column 77 by the upper housing ring 83 which is secured, as by bolts, upon the center column flange 84 so that it rotates as part of the rotary assembly 76.

The upper end portion of the rotary assembly 76 comprises a circular plate 85, which is secured together with the water manifold 86 and the vacuum manifold 87 by means of clamping blocks 88. A stationary vacuum control plate 89 is positioned on the camshaft 68 such that the control plate 89 is in abutting engagement with the lower surface of the vacuum manifold 87. The vacuum control plate 89 communicates with suction devices on each carrier 56 through individual flexible conduits as 90. The vacuum control plate 89 communicates with a suitable vacuum pump and either an atmospheric or greater than atmospheric pressure source by means of a supply pipe as 91. Coolant water is supplied by the conduit 92 and is exhausted by a conduit 93. The water supply conduit 92 is connected by suitable flexible lines 94 to portions of the apparatus and it is exhausted by suitable flexible return lines as 95 which communicate with the conduit 93.

Disposed around the outer periphery of the plate 85 are a plurality of fixedly mounted round vertical guideposts 98. The upper ends of the guideposts 98 are fixed to the plate by any suitable means, as by the machine screws 99. The lower ends of the guideposts 98 extend into aligned sockets 100 formed through the housing ring 83. As shown in FIG. 7, the lower ends of the guideposts 98 are secured to the housing ring 83 by any suitable means, as by the attachment plate 101 and the machine screws 102. There are sixteen guideposts 98 in the illustrative embodiment of the present invention.

CARRIER LIFTING ASSEMBLIES

Each of the container carriers 56 is adapted to be raised and lowered as required during a container-bottom-forming operation. Each of the container carriers 56 is provided with a quick-acting lever assembly 103, as shown in FIG. 7. As shown in FIG. 7, a carrier lifting bracket 104 is slidably mounted on each guidepost 98 for vertical reciprocation thereof.

As shown in FIG. 6, a cam follower roller 105 is rotatably mounted on the inner side of each of the carrier lifting brackets 104. The cam roller 105 rides in the stationary cam track 73. As shown in FIG. 7, a carrier lifter shaft 106 is slidably supported in a suitable bearing 107 and is operatively supported in the housing ring 83. The bearing 107 is provided with a pair of oppositely disposed flat guiding surfaces 108 in which are slidably mounted a pair of retainer plates as 109 that are secured together at one end by the bolt 110 and which are secured at the other end by the bolts 111 to the carrier lifter bracket 104 to keep the bracket 104 from turning on the guide post 98.

Fixedly attached to the upper end of the lifter shaft 106 is a lifter arm 114. A ball slide collar 115 is slidably mounted on the guide post 98 and one end of the lifter arm 114 is secured to the ball slide collar 115 by a collar bracket 116. A long rod link 117 is connected at its upper end by a pivot pin 118 to the other end of the lifter arm 114. The lower end of the rod link 117 is pivoted by means of the pivot pin 119 to the lower end of the long arm portion 120 of the lever 121. The lever 121 is pivotally secured by the pivot pin 122 to the bracket 104 for oscillation about the pivot pin 122. The upper short arm portion 123 of the lever 121 is pivotally secured by the pivot pin 124 to the upper end of a short rod link 125. The lower end of the rod link 125 is connected by the pivot pin 126 to a bracket 127 that is secured to the housing ring 83 by any suitable means, as by the machine screws 128 (FIG. 8).

It will be seen that each carrier shaft 106 is thus free to move vertically on its associated guide post 98. The radial inner end of the pivot pin 122 supports the cam roller 105 that rides in the cam track 73 formed in the fixed cam 70. It will be seen that as each cam follower 105 is moved upwardly and downwardly by the cam 70 in its circular movement about the cam 70, its carrier lifting bracket 104 together with its oscillating lever 121 is moved upwardly and downwardly in response to the configuration of the cam track 73. The link 117 is moved upwardly as the guide bracket 104 is moved upwardly so as to move the lifter arm 114 upwardly to carry the lifter shaft 106 upwardly. The last described structure provides a multiplication factor in the order of about 3½to 1 when the lever 121 is moved from the solid line position shown in FIG. 7 to the broken line raised position indicated by the numeral 129. The bottom-forming machine of the present invention is provided with an automatic vertical movement for each container carrier 56 when the machine is stopped or for other emergencies. The rotary motion of the housing turret 80 normally permits the lever arm 120 to pivot downwardly and to move its associated carrier 56 toward its aligned heater unit. In accordance with the present invention, when a loss of air pressure occurs, each carrier 56 is raised so that its container 10 is raised vertically away from its heater unit to prevent overheating of the container. The carriers 56 are also retracted when the machine is idling or being warmed up.

As shown in FIG. 6, the cam track 70 is provided with a retractable heater cam insert or lift plate means, generally indicated by the numeral 132. The retractable heater lift cam insert 132 is positioned over the bottom closure heating station 58 between substantially the 358° angular position and the 16° angular position of travel as illustrated in the developed view of the cam 70 in FIG. 9.

As illustrated in FIG. 6, the retractable heater lift cam insert 132 is movably mounted on two vertical bosses as 133 and 134 carried on the stationary cam 70. As shown in FIG. 10, one end of the retractable heater lift cam 132 is slidably mounted on a post 135 in the boss 134. A similar post movably mounts the other end of the retractable heater lift cam insert in the boss 133. As shown in FIG. 11, the retractable heater lift cam insert 132 includes a pair of vertical plates 136 and 138 which form in the space 137 therebetween a cam track for the rolling reception of the cam follower 105. The lower lift plate 138 is carried on a support bar 139 that is fixed by a suitable tie tolt 140 to the upper plate 136.

As shown in FIG. 5, the retractable heater lift cam insert 132 is adapted to be moved upwardly and downwardly by a suitable air cylinder generally indicated by the numeral 141 which is fixed on the stationary cam 70. As shown in FIG. 10, a spring 142 assists in raising the lift cam insert 132. It will be understood that the lift cam insert 132 is normally in the down position shown in FIG. 5, but that during idling, warmup, and emergency situations the air cylinder 141 operates to raise the cam insert 132 upwardly to move the container carriers 56 away from the heat of the heating station 58. It will be seen that the cam track 73 is enlarged vertically in the heating station area to permit the movement of the cam roller 105 upwardly and downwardly, and this enlarged track is illustrated in FIGS. 5 and 9. The heater lift cam insert 132 may be made to lift any desired distance, as for example between 2 and 3 inches to clear the heater.

HEATING STATION

The heating station 58 is of the general type illustrated in detail in U.S. Pat. No. 3,392,458 and reference to this patent may be had for a detailed description of the heating station. The heating station 58 of the present invention, however, does differ in some particular improved structure and this improved structure is described hereinafter in detail together with a general description of the heating station. As illustrated in FIG. 20, the heating station 58 at which the bottom closure heating operation is carried out, comprises an arcuate heater housing or plenum generally indicated by the numeral 145. As illustrated in FIG. 21, the plenum 145 is secured upon three vertically movable and extendible support shafts 146. As illustrated in FIG. 20, the plenum 145 is provided with two chambers 147 and 148 which are separated by a dividing wall 149. Both of the chambers 147 and 148 supply hot air under pressure at a high enough temperature for activating the thermoplastic on a container bottom closure. Hot air is supplied to the chambers 147 and 148 by the inlet plenum chamber extensions 150 and 151, respectively. The inlet chamber extension 150 is connected to a suitable burner barrel 152. The inlet chamber extension 151 is connected to a suitable burner barrel 153. The barrels 152 and 153 are connected to a distributor 154 by the tubes 155. A suitable air supply blower 156 is supported by the machine frame 50. The blower 156 is operatively driven by a motor 157.

As illustrated in FIG. 21, the housing web 81 carries a plurality of heater hangers 82 which operatively support a heater head carrier plate generally indicated by the numeral 160. The heater carrier plate 160 comprises four arcuately formed plates 161, as shown in the diagrammatic view of FIG. 4. The arcuate plates 161 are secured to the rotating turret web 81 by expansion joint means to permit the carrier plates 161 to expand during use to prevent warpage of these plates.

One of the arcuate plates 161 is illustrated in FIG. 20, and it is shown as being secured at a central position by a bolt 163 to a hanger member 82. Both ends of the plates 161 in FIG. 20 are secured to a hanger 82, but by an expansion-type construction in relation to the adjacent plate 161. The hanger 82 at the end of a plate 161 is secured by a bolt 164 to an expansion joint plate 162. The plate 162 overlaps the joint gap between the adjacent plates 161 and it is secured fixedly to one of the plates 161 and movably to the other of the plates 161. As best seen in FIG. 20, the plate 162 is fixedly secured by the bolts 165 to one of the plates 161. The plate 162 is also secured by the two bolts 166 to the adjacent plate 161, but the bolts 166 pass through U-shaped slots 167 which are open to the side of the plate 162 to permit the bolts 166 to slide in the slots 167 with the adjacent plate 161 for expansion and contraction of the plates 161.

As shown in FIGS. 20 and 22, the plenum chamber 145 carries a pair of baffles 168 and 169 on the edges thereof within which is movably mounted the annular carrier plate 160. As shown in FIG. 22, the hot air passes from the plenum chambers through an elongated opening 170 and thence through the openings 173 into the heads or units generally indicated by the numeral 172 which are carried on the carrier plate 160. As shown in FIGS. 20 and 22, the plenum 145 is provided with open face passages 171 which feed hot air between the moving circular carrier plate 160 and the baffles 168 and 169 and which also serve to provide turbulence in the hot airflow to the heater heads 172 and thus provide a more efficient distribution of the heat. The last mentioned structure also eliminates the need for any sliding seal means between the stationary plenum 145 and the movable carrier plate 160.

FIGS. 23 and 24 illustrate the novel and improved structure of the heater heads 172. The improved heater heads comprise a base plate 174 on which is fixedly mounted the usual side baffle heaters 175 by the bolts 176. As shown in FIG. 24 the inner end of the plate 174 is rotatably mounted at a center point on its respective carrier plate 161 by a suitable pivot bolt 177. As best seen in FIG. 23, the outer end of the base plate 174 may be shifted sidewardly because of its novel retainer structure. A pin 178 extends through an enlarged open slot 180 formed in the outer side of the plate 174 whereby the plate 174 may be shifted sidewise for aligning the heater head 172 relative to its coacting mandrel 215. A retainer key 179 extends through a suitable hole in the pin 178 and bears against a baffle plate 181 that is carried on the front or outer side of the plate 174. The plate 181 may also be shifted sidewise. Plate 181 is secured to the base plate 174 by a pair of bolts 183 which extend through elongated slots 182. An enlarged slot 184 is also formed in the plate 181 to provide movement of the plate 181 relative to the pin 178, as desired. The heater head 172 is provided with the usual central heater 185 which is described in detail together with the side baffle heaters 175 in the aforementioned Eric A. Braun patent. As shown in FIGS. 23 and 24, the containers 10 are moved into a position over the central heater 185 during the heating operation at the heating station 58.

FOLDING STATION

The breaking, folding and tucking station 59 includes a breaker means generally indicated by the numeral 190 in FIG. 29, and a folding and tucking means generally indicated by the numeral 191. As shown in FIG. 25, the breaker means 190 includes a horizontally disposed shaft 192 which has adjustably mounted on the inner end thereof a pair of breaker blades or fingers 193 and 194. The outer end of the shaft 192 is rotatably mounted in suitable bearing means 195 and 196 which are carried in a gear housing 197. The housing 197 is provided with a chamber 198 in which is disposed a first gear 199 that is secured to the shaft 192. A second gear 200 is meshed with the gear 199 and it is also fixed on a second shaft 202. The first shaft 192 is provided on the outer end thereof with a suitable handwheel 201. The shaft 202 is disposed in a vertical position and it is rotatably mounted in suitable bearings 203 and 204 in a vertical tubular housing 205. The housing 205 is secured by any suitable means as by the screws 206 on the machine base 50. The breaker means 190 is also illustrated generally in FIGS. 1 and 4.

As shown in FIG. 25, the drive shaft 202 is adapted to be driven by a chain 209 that is in turn driven from a suitable power source as the main power source of the machine 10. The chain 209 drives a sprocket 210 which in turn drives a

plate 211. Plate 211 drives a plate 214 attached to shaft 202, through a detent ball 212 which is carried by the plate 214 and which is normally biased into driving connection with the plate 211 by a spring-biased pressure plate 213. The last-described detent means provides a safety connection between the drive chain 209 and the drive shaft 202 to permit overriding of the plate 211 in emergency situations.

As illustrated in FIG. 4, the rotary turret 80 carries 16 mandrels 215 which each carry a container 10 in cooperative engagement with the breaker means 190 and the folding and tucking means 191. The folding and tucking means 191 is illustrated in FIGS. 26 through 31. The folding and tucking means 191 includes a pair of guide rails which are illustrated in the form of water-cooled tubes 216 and 217. As best seen in FIG. 29, the guide rails 216 and 217 are disposed in a V-shaped substantially horizontal plan configuration with the leading ends spaced apart and the trailing or exit ends being connected together to form a V. As best seen in FIG. 30, the outer guide rail 216 is slightly higher than the guide rail 217 so as to move the tuck-in flap 24 sideward inwardly at a faster rate than the tuck-out flap 26. As indicated in FIG. 28, the guide rails 216 and 217 are adapted to be secured to a suitable source of cooling water by the inlet tubes 218 and 219, respectively.

As shown in FIGS. 26, 29 and 31, a flat mandrel or plow 220 is secured, as by welding, to the upper side of the guide rails 216 and 217 at the junction point or exit end of the guide rails. A V-shaped groove 221 is formed in the leading end of the mandrel 220 between the guide rails 216 and 217 for sliding reception of the closing bottom closure members as a container 10 is moved over the guide rails and onto the mandrel 220. The mandrel 220 is provided on the exit and thereof with a longitudinally extended pad 222 which extends forwardly and in the direction of travel of the containers 10. The pad 222 is flat and it assists in maintaining the closed or folded bottom closure members in the folded position until the very last instant when the hereinafter described pressure pad 232 moves up to engage the folded bottom closure members. As shown in FIGS. 26 and 29, a mounting bracket 223 is secured as by welding to the guide rail 216 for supporting the guide rails 216 and 217 in an operative position in the travel path of the containers. The mounting plate 223 is secured by the screws 224 to one leg of an angle bracket 225 which is in turn secured by the screws 226 (FIG. 29) to the breaker means housing 197.

It will be seen that in operation the shaft 192 of the breaker means 190 is continuously rotating the breaker fingers 193 and 194 in a vertical plane substantially in alignment with the travel path of the containers 10. As shown in FIG. 27, the breaker finger 193 is formed with a curved back face and the rotation of the shaft 192 is so timed with movements of the containers through the rails 216 and 217 so that the closure panel 27 is moved against or into contact with the curved back face of the finger 193 as it is rotating counterclockwise as viewed in FIG. 27. Continued movement of the container forwardly against the breaker finger 193 foreces the closure panel 27 inwardly and the panels 30 and 31 are also moved into a closing action. As shown in FIG. 26, after a short time interval, the container 10 has moved inwardly along the guide rails 216 and 217 so as to cam the tuck-in panel 24 and the tuck-over panel 26 inwardly, and the other breaker finger 194 is revolved upwardly into breaking engagement with the closure panel 25. FIG. 28 shows the container 10 moved forwardly after the panel 25 has been broken by the finger 194 and the tuck-in panel 24 is shown moving into the tuck-over panel 26. FIG. 31 shows a continued movement of the container 10 as the tucking panels move into a closed position. Further movement of the container 10 then moves it onto the pad 222 and thence onto a pressure pad 232, as described in detail hereinafter.

PRESSURE SEALING STATION

After the bottom closure has been folded and tucked at the folding station 59, a pressure arm sealing assembly (FIG. 12) is moved into operative sealing engagement with the closed bottom of the container. A separate pressure arm sealing assembly 231 is operatively mounted at each of the 16 working stations, and accordingly, each mandrel 215 has its own coacting pressure-sealing assembly 231 which is actuated by the cam 66.

The pressure arm sealing assembly 231 includes a pressure pad 232 of the general type disclosed in U.S. Pat. No. 3,207,049. The pressure pad 232 is resiliently mounted on a support plate 233 which is suitably secured to the foot portion 234 of a sealing arm 235. As shown in FIG. 13, the upper end of the sealing arm 235 is formed as a fork or clevis 236 which is rotatably mounted on a transverse pin 237 on the roller cam arm 238. As shown in FIG. 12, the cam arm 238 extends through an opening 239 formed through the housing ring 83. The roller cam arm 238 operatively carries on its inner end a cam roller 240 which is operatively engaged in the track of the cam 66. The track of the cam 66 is formed so as to cam the pressure arm assembly 231 upwardly and outwardly from the inoperative broken line position as shown in FIG. 12 to the solid line operative position in the proper sequence.

As illustrated in FIGS. 1, 4 and 12, the mandrels 215 carry the containers 10 from the folding mandrel pad 222 over a pressure rail generally indicated by the numeral 244 which forces the pressure pad 232 into operative engagement with the closed bottom of the container 10. The pressure rail 244 is mounted on the floating structure as described hereinafter. As shown in FIG. 14, the pressure rail is carried on a pair of vertical pressure cam posts 245 and 246. The lower ends of each of the posts 245 and 246 are similarly mounted and the mounting of the post 246 is shown in FIG. 16. In FIG. 14, the posts 246 and 247 are shown as being operatively mounted in the foot brackets 247 and 248, respectively. Brackets 247 and 248 are secured by any suitable means as by the screws 249 to the machine base 50. As shown in FIG. 16, the lower end of the post 246 is slidably mounted in suitable bearings 250 which are supported in a vertical sleeve retainer 251. The retainer 251 is integrally formed on the foot bracket 248.

As shown in FIG. 16, a cam follower 252 is operatively mounted on the upper end of the post 246 by means of a mounting arm 253. The cam follower 252 is rotatably mounted on a cam track 254 that is fixed on the outer periphery of the housing ring 83. The aforedescribed floating pressure posts 245 and 246 provide for accurate and constant positioning of the arcuate pressure rail assembly 244.

As shown in FIG. 14, the pressure rail assembly 244 includes a first rail portion 257 and a second rail portion 258. Each of these rail portions is floatably mounted by spring means. As shown in FIG. 15, the outer end of the pressure rail portion 257 carries a cross pin 259 which is attached to the head of a vertical shaft 260. The lower end of the shaft 260 is slidably mounted in a boss 261 that is carried on a support bracket generally indicated by the numeral 263. The shaft 260 is provided on the lower end thereof with a pair of lock nuts 262 to limit the upward movement of the rail portion 257 by the aforementioned spring means. The support bracket 263 is provided with a vertical plate 264 which is secured by the screws 265 to the two pressure posts 246 and 247 (FIG. 14). It will be seen in FIG. 14 that the outer end of the rail portion 258 is also provided with a similar floating attachment means, as described for the outer end of the rail portion 257, as indicated by the numeral 266. The attachment of the bracket vertical plate 264 to the post 246 is also indicated in FIG. 14 by the numeral 267.

As shown in FIG. 14, three springs 268 are mounted below the rail portion 258 and an additional three springs 268 are also mounted below the rail portion 257. As shown in FIG. 12, the springs 268 are mounted in suitable bores 269 formed in the lower side of the pressure rail portions 257 and 258. The

springs **268** are seated on the bracket **263** and bias the rail portions **257** and **258** upwardly into operative engagement with the rollers on the lower end of the pressure pads **232**.

As illustrated in FIGS. **14** and **16**, the pressure rail portions **257** and **258** are hingedly connected together at their inner ends. The inner end of the rail portion **258** is provided with a reduced tongue portion or arm **270** which is disposed adjacent a similar arm portion **271**. The two arm portions **270** and **271** are hingedly connected by a yoke **272** and a transverse hinge pin **273**. As shown in FIG. **16**, the yoke **272** is carried on a shaft **274** which is slidably mounted in a boss **275** formed in the bracket **263**. The shaft **274** is limited in its upward movement by the locknuts **276**.

OPERATION

The general operation of the bottom-forming machine of the present invention has been described hereinbefore. However, a brief summary of the operation is now set forth. As pointed out hereinbefore, the bottom-forming machine **43** rotates continuously at a high speed and the tubular containers **10** are loaded or fed onto one of the container carriers **56**. The containers **10** are loaded onto one of the container carriers **56** during a 27° angular dwell travel shown in FIG. **4**. The square tubular container blanks are then lowered by the carriers **56** during an 18° fall cycle at which time the bottom closures are subjected to heat as they pass through the heat station **58** and go through a travel of approximately 78° angular dwell travel. Each of the containers is heated by a separate heater head **172**. It will be understood that there is a separate heater head **172** for each of the 16 working stations.

After the container bottom closure is heated to activate its thermoplastic coating, the carrier **56** is cammed upwardly and rises during the next 43° angular travel to load the container onto its individual mandrel **215** which is fixed in spaced relation to the carrier **56** on the rotating turret **80**. When the carrier **56** has reached its elevated position at the end of the 43° rise, the container closure is at the folding station **59** where the bottom closure panels are next closed by the breaking, folding and tucking apparatuses **190** and **191**, which are positioned at the beginning of the next 109° dwell cycle. After the closure panels are folded, the container **10** remains at its elevated position during the remainder of the 109° cycle. Within this 109° dwell cycle, the pressure-sealing operation takes place at the station **60**. The containers **10** are stripped from the mandrels **215** during the next 34° fall cycle of the carriers after which the containers continue around the turret in an approximate 36° dwell cycle until they are delivered to the rotary transfer unit **44** which delivers the containers to the rotary filler **45**.

It will be understood that the carrier, mandrel and mandrel stripping structure is of conventional construction and function, and such structure is common in the art and illustrative examples of the same are disclosed in U.S. Pats. Nos. 3,398,659 and 3,393,458. It will also be understood that the machine of the present invention may be adapted to operate on containers of different capacities.

While it will be apparent that the preferred embodiment of the invention herein disclosed is well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change.

What is claimed is:

1. In a continuous motion container-fabricating machine for receiving, treating and discharging a coated container, the combination comprising:

a. support means;

b. a rotary turret operatively mounted on said support means and being provided with a plurality of working stations at each of which is operatively mounted a container carrier means;

c. heating means operatively mounted on said machine for heating the bottom end closures of a coated container on a container carrier means;

d. forming means carried on said support means for forming the bottom end closure panels of a container;

e. sealing means operatively mounted on said machine for sealing engagement with the bottom end closures of a coated container after the panels have been heated and formed;

f. a stationary hot air plenum mounted on said machine;

g. an annular heater head carrier means mounted on said rotary turret and being adapted to revolve over said plenum;

h. a plurality of hot air heater heads carried on said heater carrier means and having one of said heads disposed at each of said working stations for coaction with the carrier means at said station;

i. said heater carrier means comprising a plurality of arcuate plates which are innerconnected by expansion connection means to permit expansion of the plates relative to each other during a heating operation, and said plates being adapted to convey hot air to said heater heads from said plenum;

j. each of said arcuate plates is connected to said rotary turret by,

1. a first hanger having one end fixed to said plate at a central point thereon and the other end thereof fixed on said rotary turret, and,

2. a second hanger fixed to a first end of said plate and to said rotary turret and movably attached to the second end of a first adjacent plate; and

k. a third hanger movably attached to the second end of said plate and fixed to the first end of a second adjacent plate and to said rotary turret.

2. In a continuous motion container-fabricating machine for receiving, treating and discharging a coated container, the combination comprising:

a. support means;

b. a rotary turret operatively mounted on said support means and being provided with a plurality of working stations at each of which is operatively mounted a container carrier means;

c. heating means operatively mounted on said machine for heating the bottom end closures of a coated container on a container carrier means;

d. forming means carried on said support means for forming the bottom end closure panels of a container;

e. sealing means operatively mounted on said machine for sealing engagement with the bottom end closures of a coated container after the panels have been heated and formed;

f. a stationary hot air plenum mounted on said machine;

g. an annular heater head carrier means mounted on said rotary turret and being adapted to revolve over said plenum;

h. a plurality of hot air heater heads carried on said heater carrier means and having one of said heads disposed at each of said working stations for coaction with the carrier means at said station;

i. said heater carrier means comprising a plurality of arcuate plates which are innerconnected by expansion connection means to permit expansion of the plates relative to each other during a heating operation, and said plates being adapted to convey hot air to said heater heads from said plenum; and,

j. said plenum is provided with baffles disposed along the opposite sides thereof to enclose the sides of the travel path of the heater head carrier means over the plenum.

3. A continuous motion container-fabricating machine as defined in claim **2**, wherein:

a. said plenum is provided with an elongated opening, over which the heater head carrier means passes, for passage of hot air from the plenum through openings in the carrier means and to the heater heads carried on the carrier means;

b. said plenum being provided with at least one elongated open-faced passage on each side of said elongated opening for conveying hot air over the underside of the heater head carrier means as it passes over the hot air plenum and between said baffles and carrier means.

4. In a continuous motion container-fabricating machine for receiving, treating and discharging a coated container, the combination comprising:

a. support means;

b. a rotary turret operatively mounted on said support means and being provided with a plurality of working stations at each of which is operatively mounted a container carrier means;

c. heating means operatively mounted on said machine for heating the bottom end closures of a coated container on a container carrier means;

d. forming means carried on said support means for forming the bottom end closure panels of a container;

e. sealing means operatively mounted on said machine for sealing engagement with the bottom end closure of a coated container after the panels have been heated and formed;

f. a stationary hot air plenum mounted on said machine;

g. an annular heater head carrier means mounted on said rotary turret and being adapted to revolve over said plenum;

h. a plurality of hot air heater heads carried on said heater carrier means and having one of said heads disposed at each of said working stations for coaction with the carrier means at said station;

i. said heater carrier means comprising a plurality of arcuate plates which are innerconnected by expansion connection means to permit expansion of the plates relative to each other during a heating operation, and said plates adapted to convey hot air to said heater heads from said plenum; and,

j. each of said arcuate plates has one end fixed to said rotary turret and the other end movably connected to an adjacent plate.

5. A continuous motion container-fabricating machine as defined in claim 4, wherein each of said heater heads comprises:

a. a base plate adjustably mounted on said carrier means; and,

b. a plurality of hot air distributor members carried on said base plate.

6. A continuous motion container-fabricating machine as defined in claim 5, wherein:

a. at least one of said hot air distributor members is adjustably mounted on said base plate.

7. A continuous motion container-fabricating machine as defined in claim 4, wherein:

a. each of said heater heads is adjustably mounted on said carrier means.

8. In a continuous motion container-fabricating machine for receiving, treating and discharging a coated container, the combination comprising:

a. support means;

b. a rotary turret operatively mounted on said support means and being provided with a plurality of working stations at each of which is operatively mounted a container carrier means;

c. heating means operatively mounted on said machine for heating the bottom end closures of a coated container on a container carrier means;

d. forming means carried on said support means for forming the bottom end closure panels of a container;

e. sealing means operatively mounted on said machine for sealing engagement with the bottom end closures of a coated container after the panels have been heated and formed;

f. a closure panel breaker means;

g. a closure-panel-folding means adapted to coact simultaneously with said breaker means;

h. said closure panel breaker means comprises a pair of rotatable breaker finger disposed in the path of movement of a container carrier means for operatively engaging first one set of closure panels and then secondly for operatively engaging a second oppositely disposed set of closure panels; and,

i. said closure-panel-folding means comprises a pair of guide rails disposed on opposite sides of said pair of rotatable breaker fingers.

9. A continuous motion container-fabricating machine as defined in claim 8, wherein:

a. said pair of rotatable breaker fingers are adapted to rotate on a horizontal axis and in a vertical plane substantially in alignment with the central axis of the path of movement of a container carrier means; and,

b. said breaker means includes power means for rotating said breaker fingers at a predetermined angular speed to correspond with the angular speed of the rotary turret.

10. A continuous motion container-fabricating machine as defined in claim 8, wherein:

a. said pair of guide rails comprise a pair of cooled conduits.

11. A continuous motion container-fabricating machine as defined in claim 8, wherein:

a. said pair of guide rails are disposed with their leading ends spaced apart and their trailing ends connected together.

12. A continuous motion container-fabricating machine as defined in claim 11, wherein:

a. the trailing ends of said guide rails are connected to provide a V-shaped plan configuration whereby when a container is moved between the guide rails, the bottom closure tuck-in panel will be engaged by one of the guide rails and folded toward a closed position, and the bottom closure tuck-out panel will be engaged by the other of the guide rails and folded toward a closed overlapping position relative to said tuck-in panel.

13. A continuous motion container-fabricating machine as defined in claim 12, wherein:

a. the guide rail engaging said bottom closure tuck-in panel is disposed at a higher elevation than the guide rail engaging the tuck-out panel.

14. A continuous motion container-fabricating machine as defined in claim 12, wherein:

a. said closure-panel-folding means includes a mandrel attached to the trailing ends of said guide rails for providing a final folding action to the container closure panels.

15. A continuous motion container-fabricating machine as defined in claim 14, wherein:

a. said mandrel is provided with a flat extension in the direction of travel of the carrier means to assist in transferring the closed container panels to operative engagement with the sealing means.

16. In a continuous motion container-fabricating machine for receiving, treating and discharging a coated container, the combination comprising:

a. support means;

b. a rotary turret operatively mounted on said support means and being provided with a plurality of working stations at each of which is operatively mounted a container carrier means;

c. heating means operatively mounted on said machine for heating the bottom end closures of a coated container on a container carrier means;

d. forming means carried on said support means for forming the bottom end closure panels of a container;

e. sealing means operatively mounted on said machine for sealing engagement with the bottom end closures of a coated container after the panels have been heated and formed;

f. a pressure arm sealing assembly including a pressure pad for sealing engagement with the closed bottom end closures of a container;

g. said pressure pad being provided with a roller; and,

h. a floating pressure rail means operatively mounted on said machine and engageable by said pressure pad roller for exerting a sealing pressure on the container bottom end folded panels for sealing the same.

17. A continuous motion container-fabricating machine as defined in claim **16**, wherein said floating pressure rail means comprises:

a. a pressure rail support bracket operatively mounted on said machine; and,

b. a spring-biased pressure rail operatively mounted on said support bracket.

18. A continuous motion container-fabricating machine as defined in claim **17**, wherein said pressure rail comprises:

at least two rail sections;

b. means hingedly connecting the adjacent ends of said two rail sections;

c. a plurality of springs disposed on said support bracket and engageable with said rail sections for biasing the rail sections into engagement with the roller on the pressure pad; and,

d. means for attaching said rail sections to said support bracket to permit movement of the rail sections relative to the support bracket and to limit movement of the rail sections away from the support bracket.

19. A continuous motion container-fabricating machine as defined in claim **18**, wherein:

a. said support bracket is carried on a plurality of posts;

b. said rotary turret is provided with a cam track on the outer periphery thereof; and,

c. each of said posts has its lower end slidably mounted in a vertically disposed retainer fixed on said support means and its upper end provided with a cam roller carried on said cam track on the rotary turret.

20. In a continuous motion container-fabricating machine for receiving, treating and discharging a coated container, the combination comprising:

a. support means;

b. a rotary turret operatively mounted on said support means and being provided with a plurality of working stations at each of which is operatively mounted a container carrier means;

c. heating means operatively mounted on said machine for heating the bottom end closures of a coated container on a container carrier means;

d. forming means carried on said support means for forming the bottom end closure panels of a container;

e. sealing means operatively mounted on said machine for sealing engagement with the bottom end closures of a coated container after the panels have been heated and formed;

f. a stationary hot air plenum mounted on said machine;

g. an annular heater head carrier means mounted on said rotary turret and being adapted to revolve over said plenum;

h. a plurality of hot air heater heads carried on said heater carrier means and having one of said heads disposed at each of said working stations for coaction with the carrier means at said station;

i. said heater carrier means comprising a plurality of arcuate plates which are innerconnected by expansion connection means to permit expansion of the plates relative to each other during a heating operation, and said plates being adapted to convey hot air to said heater heads from said plenum;

j. means for reciprocating each of said container carrier means between container receiving, treating and discharging positions at predetermined intervals, and including

1. a cam fixed on said support means,
2. a guide post on said rotary turret,
3. a lifter bracket slidably mounted on said guide post,
4. a cam roller on said lifter bracket and operatively engaged with said cam on said support means,
5. said container carrier means including a vertically movable shaft,
6. link means innerconnecting said lifter bracket and said container carrier means shaft whereby when said lifter bracket is moved upwardly and downwardly by said cam acting on said cam roller said container carrier means shaft is moved upwardly and downwardly, and,
7. means innerconnecting said lifter bracket and said shaft to restrict rotation of said lifter bracket.