Jan. 27, 1970 R. A. HELRIGEL ET AL 3,491,574

HORIZONTAL IRONING AND DOMING PRESS

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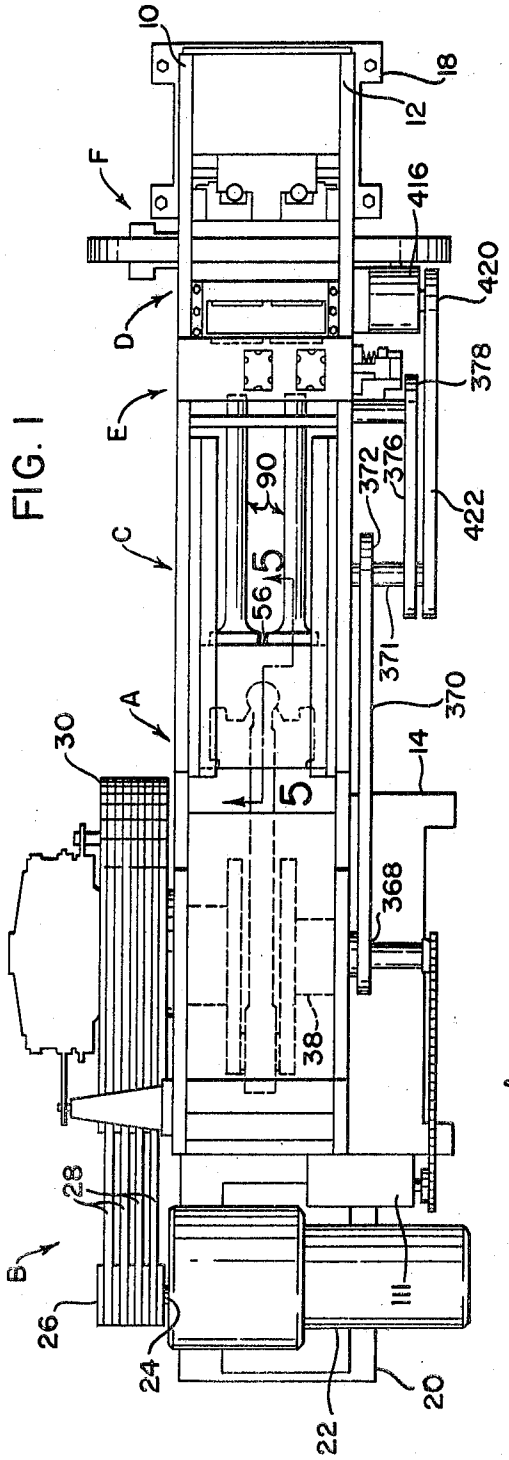

FIG. 1

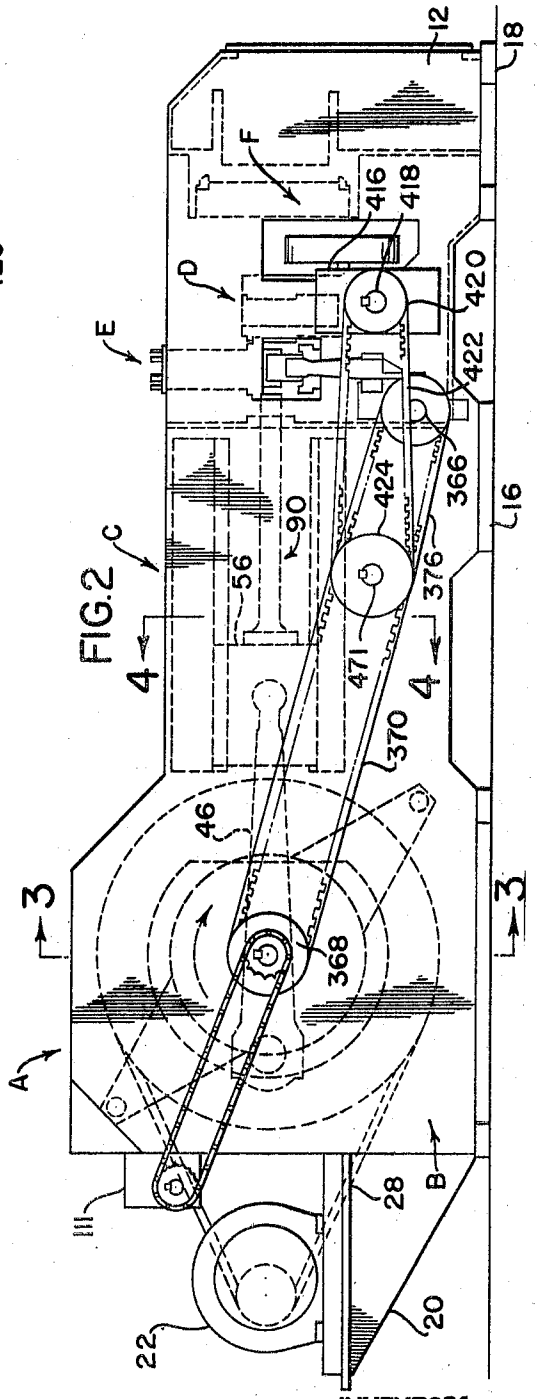

FIG. 2

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HORIZONTAL IRONING AND DOMING PRESS

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FIG. 3

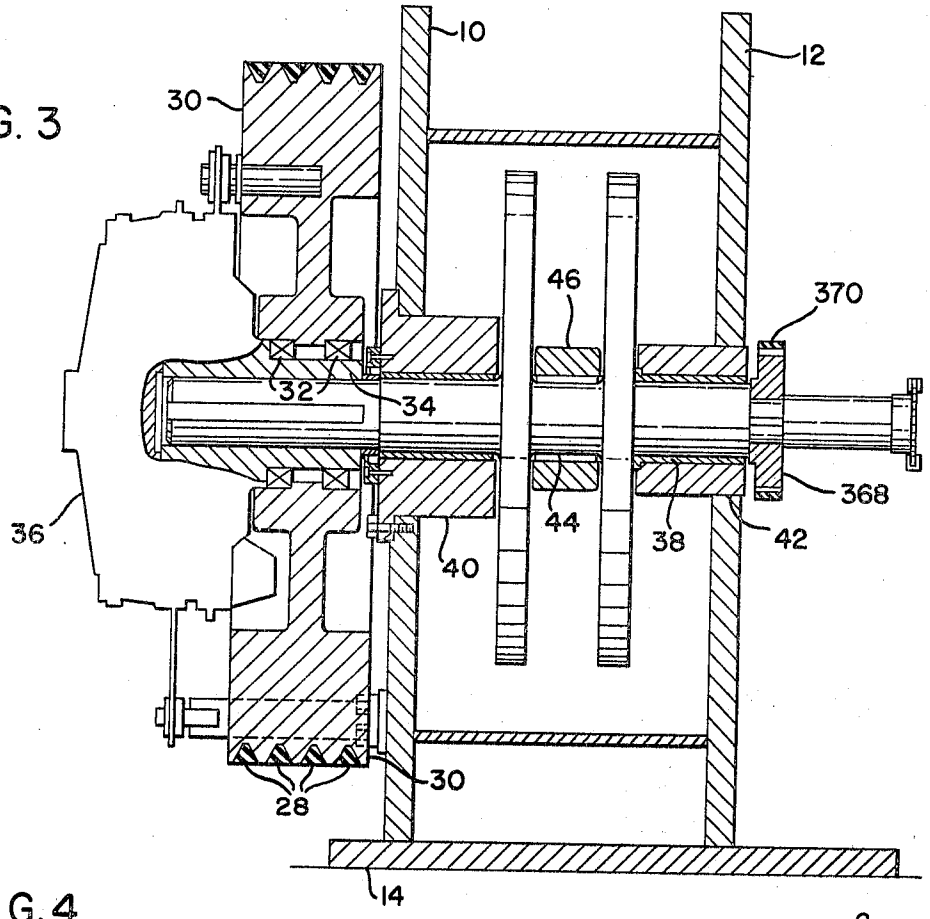
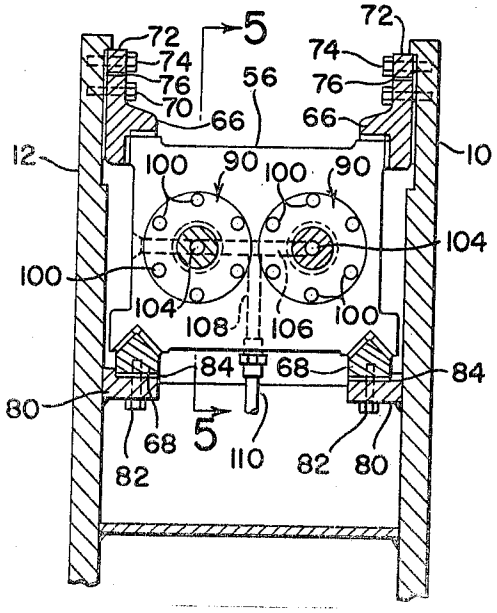


FIG. 4



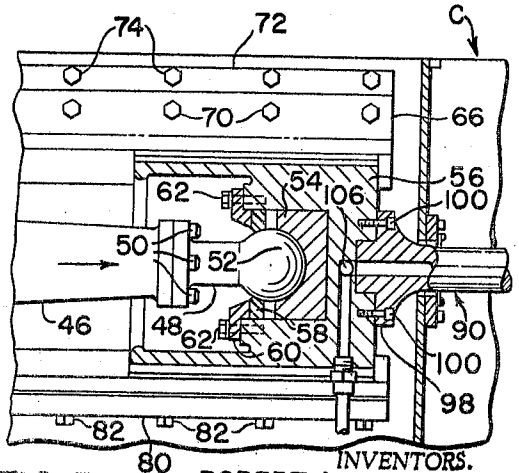


FIG. 5

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HORIZONTAL IRONING AND DOMING PRESS

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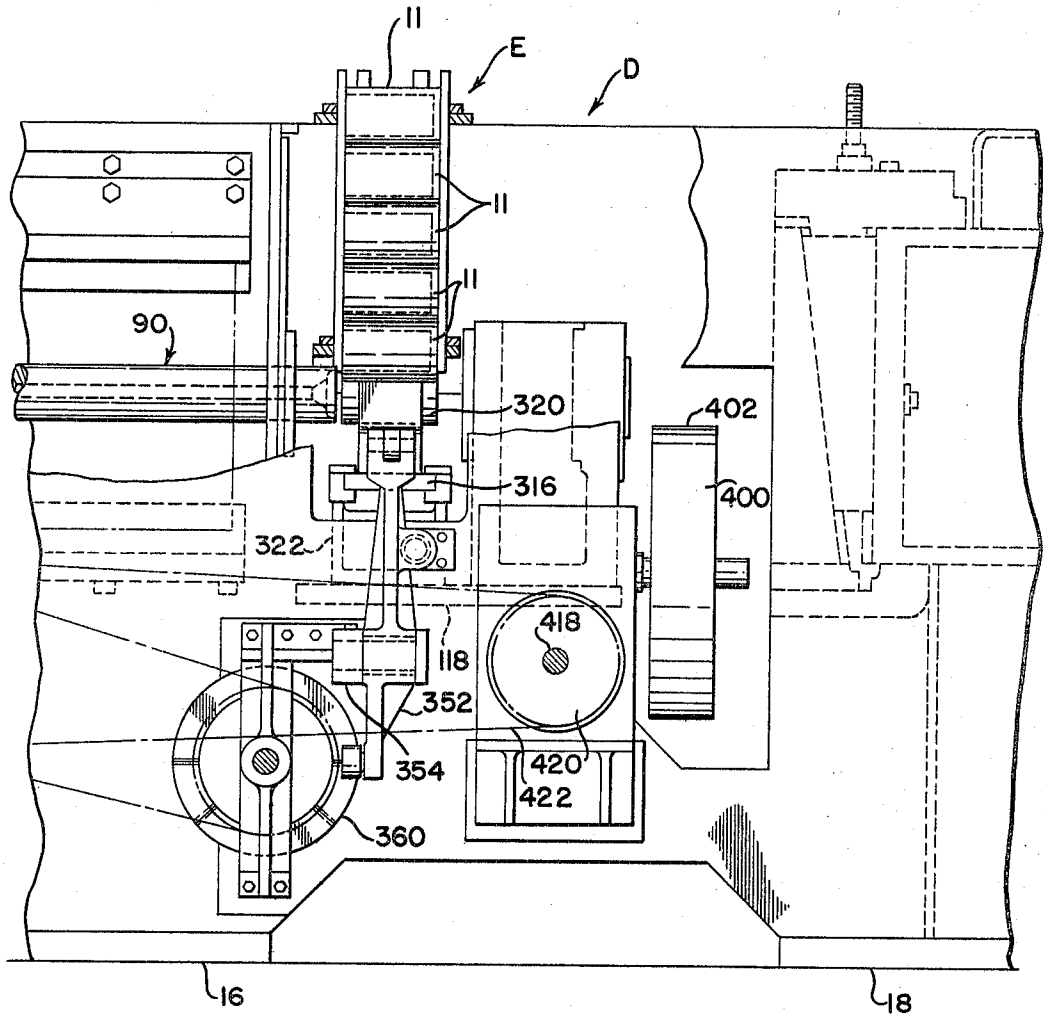

FIG. 6

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HORIZONTAL IRONING AND DOMING PRESS

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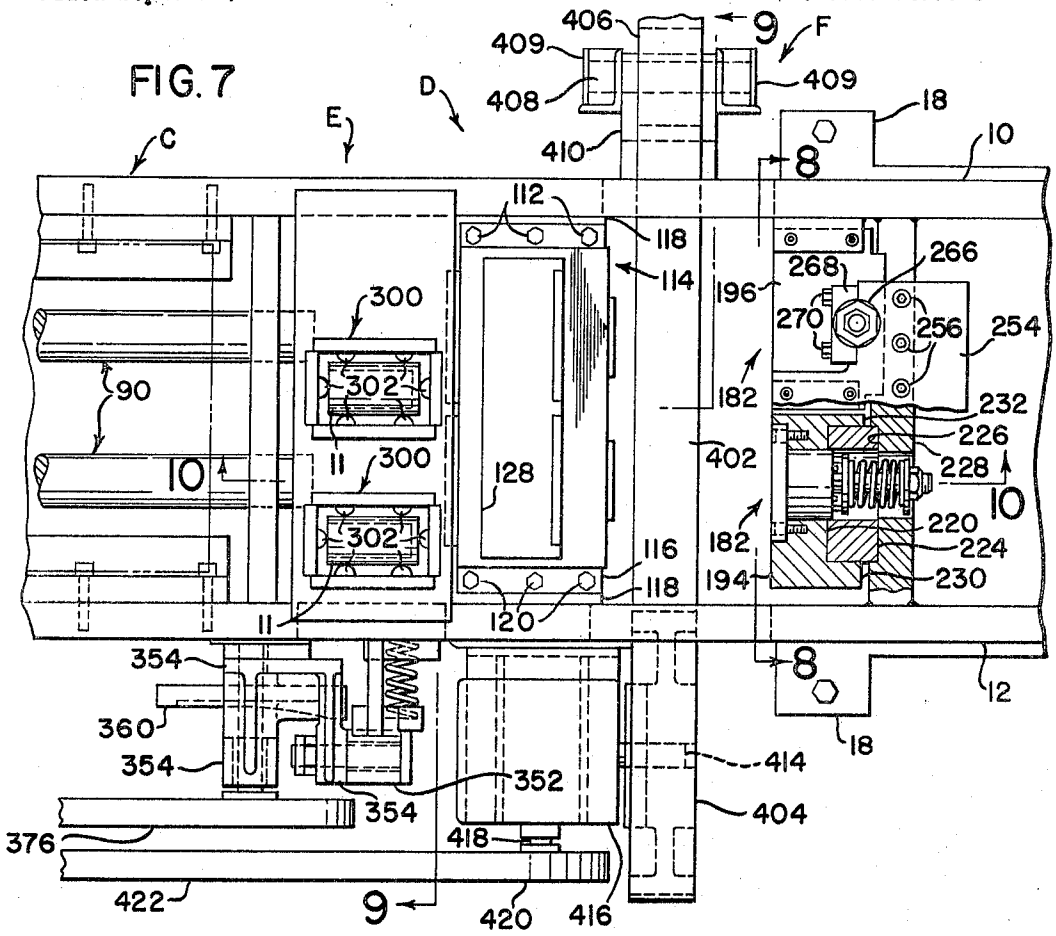
FIG. 7



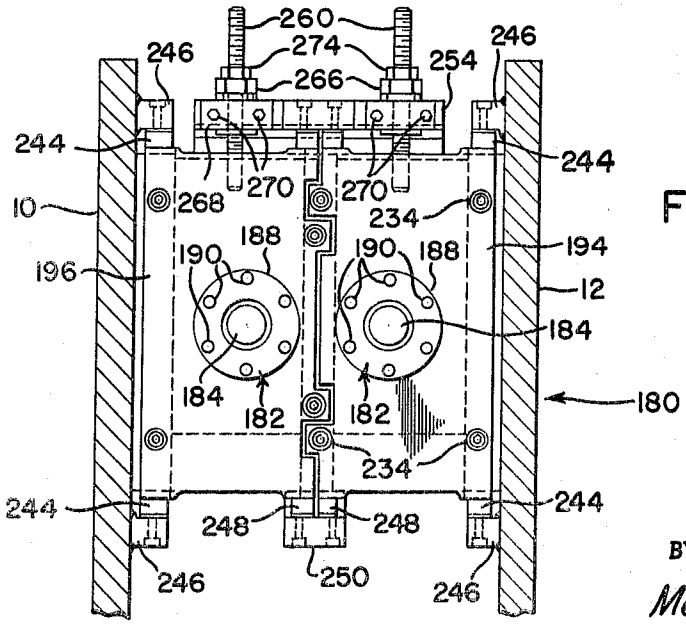


FIG. 8

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HORIZONTAL IRONING AND DOMING PRESS

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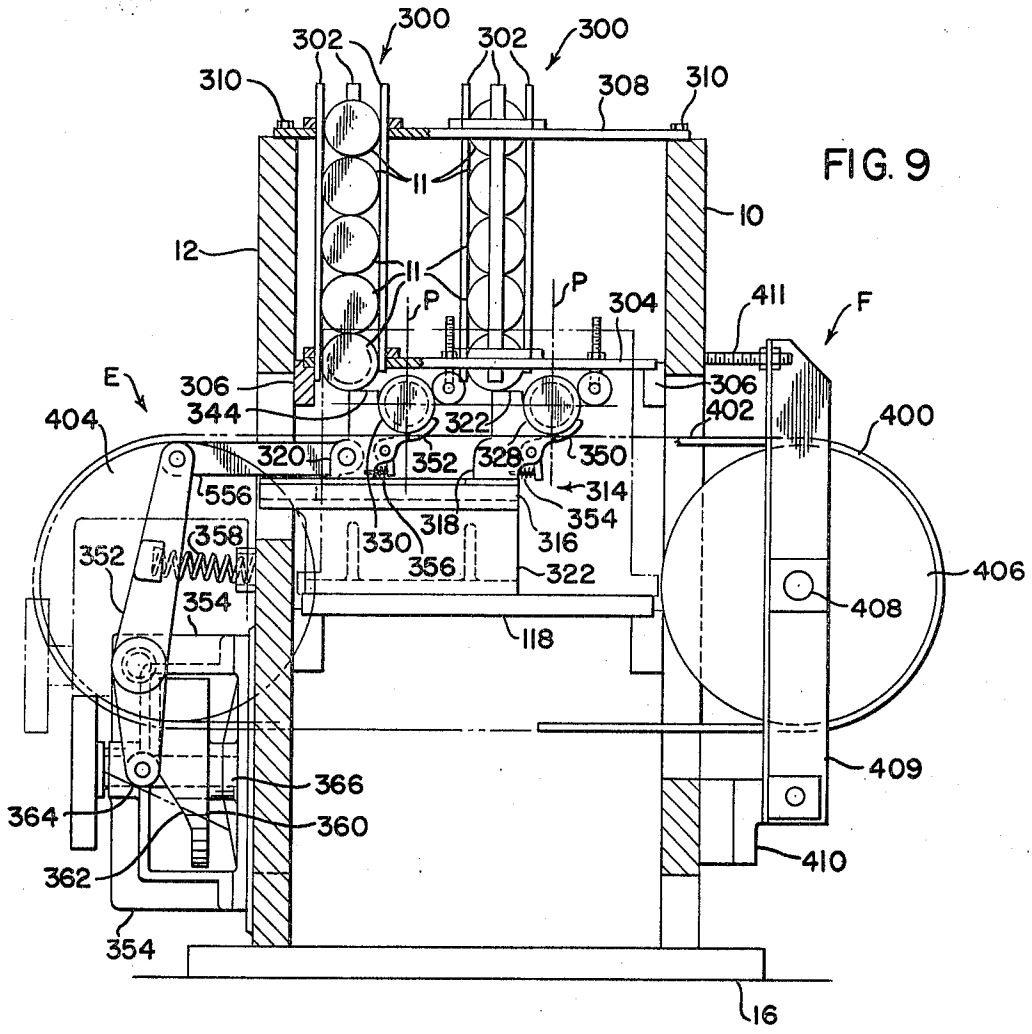

FIG. 9

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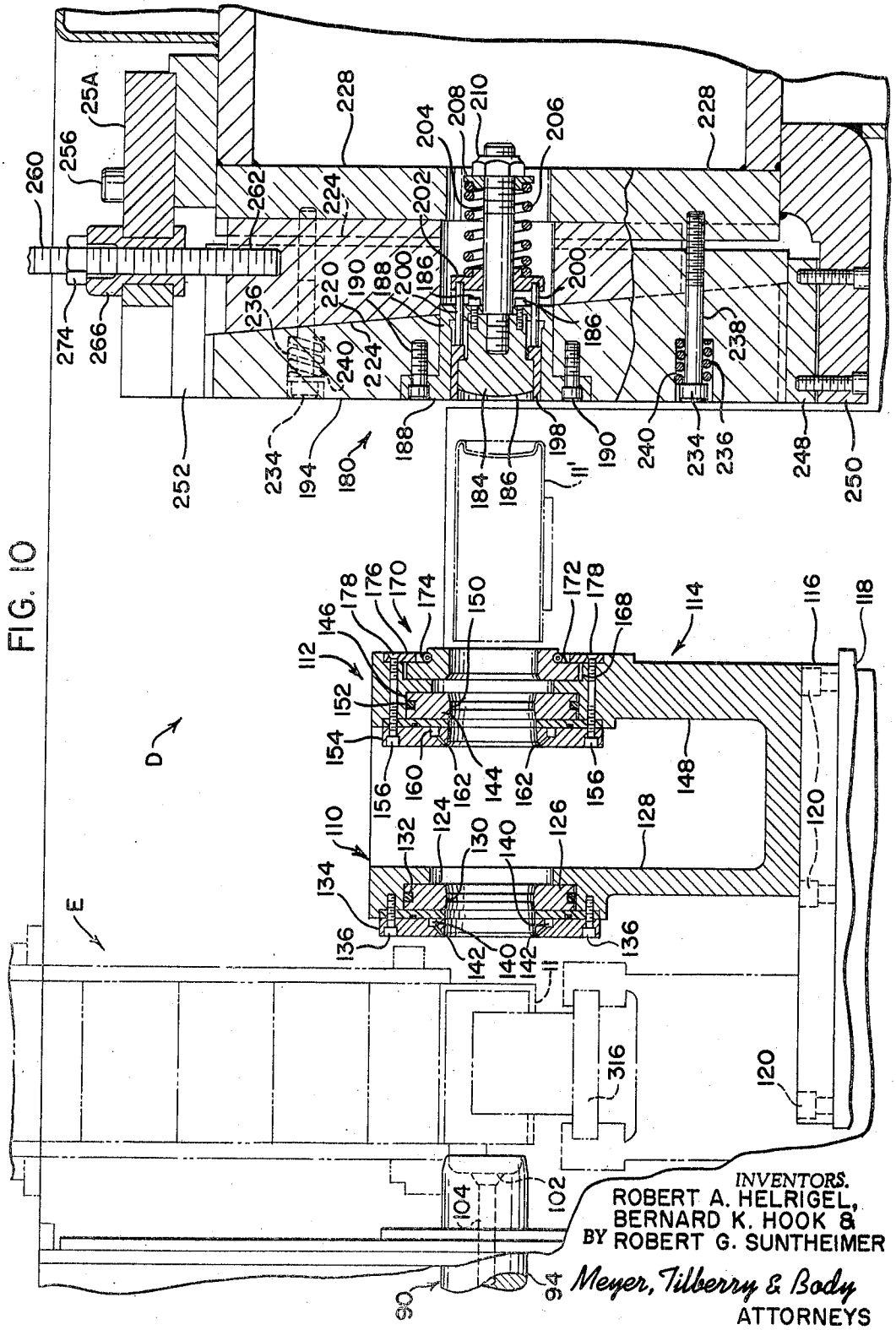
FIG. 10



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HORIZONTAL IRONING AND DOMING PRESS

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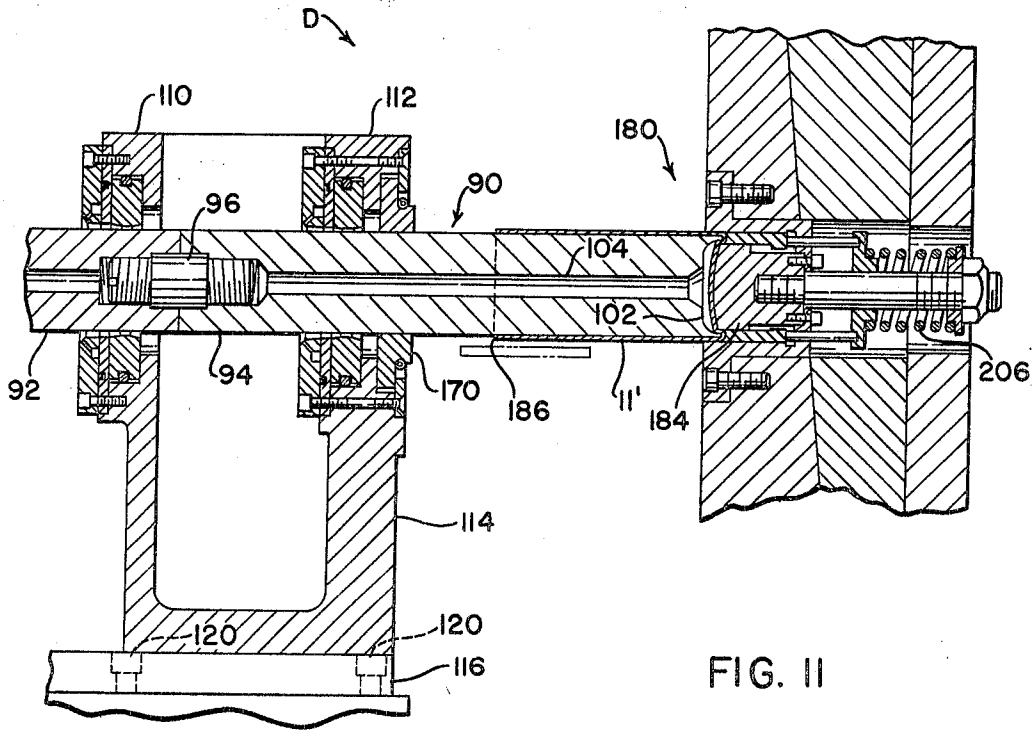

FIG. 11

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United States Patent Office

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Patented Jan. 27, 1970

3,491,574

HORIZONTAL IRONING AND DOMING PRESS

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Int. Cl. B21d *22/30, 43/04*

U.S. Cl. 72—348 6 Claims

ABSTRACT OF THE DISCLOSURE

An improved machine for forming a can body having a desired radially facing shape and a closed end. The machine includes a frame and a plurality of parallelly extending, horizontally positioned rams arranged to be simultaneously reciprocated along separate axes in first and second directions relative to the frame. First members forming extruding orifices having a peripheral shape generally corresponding to the desired radially facing shape of the can are positioned coaxial with each of the separate axes, and second members forming can end shaping abutments and defining stops for the rams in the first direction are also positioned coaxially with the separate axes. Feed means are provided for positioning cup-shaped can blanks intermediate the rams and their respective extruding orifices when the rams have been moved in the second direction. The feed means include head maintaining means for maintaining a head of cup-shaped can blanks closely adjacent each of the respective axes. A horizontally reciprocated carrier is provided for removing the lowermost blanks from each of the head maintaining means and aligning them with the adjacent respective ram axis when the rams are reciprocated in the second direction.

The present invention is directed toward the art of can making and, more particularly, to an improved forming press for making can bodies.

The invention is especially suited for making can bodies from aluminum and will be described with particular reference thereto; however, it is appreciated the invention is capable of broader application and could be used for making can bodies or similar members from a variety of materials.

One of the methods commonly employed for making aluminum can bodies includes deep drawing a circular blank into a cup-shaped member which is subsequently redrawn or ironed to elongate and thin its sidewalls to the desired dimensions. Normally, the bottom wall of the member is then domed inwardly and the sidewalls trimmed to the desired height to produce a can body having the required final size and configuration.

Because of the many steps involved in the process a variety of different machines and conveyor mechanisms are required. These factors tend to increase the resultant cost of the can bodies. Additionally, because of the many feeding and conveying steps the exterior surface of the bodies are often scratched or marred.

In order to simplify the process and reduce, as well as simplify, the handling and feeding mechanisms, machines have been designed for performing certain of the steps simultaneously. For example, in the commonly assigned copending application, Serial No. 575,387, filed Aug. 26, 1966, now Patent No. 3,446,167, there is disclosed a rotary turret type machine for simultaneously performing the final ironing and doming steps. Consequently, by the use of that machine, one handling and conveying step is eliminated. Additionally, there is a reduction in floor space required.

The present invention is directed to a machine which,

like the aforementioned machine, simultaneously performs the final ironing and doming steps; however, because of arrangement of the machine of the present invention, the feeding and discharge mechanisms are greatly simplified. Further, the machine itself is simplified and arranged so that necessary maintenance and repair can be more easily performed.

In accordance with the present invention there is provided an improved machine for forming a can body having a desired radially facing shape and a closed end. The machine includes a frame and a plurality of parallelly extending, horizontally positioned rams arranged to be simultaneously reciprocated along separate axes in first and second directions relative to the frame. First members forming extruding orifices having a peripheral shape generally corresponding to the desired radially facing shape of the can are positioned coaxial with each of the separate axes, and second members forming can end shaping abutments and defining stops for the rams in the first direction are also positioned coaxially with the separate axes. Feed means are provided for positioning cup-shaped can blanks intermediate the rams and their respective extruding orifices when the rams have been moved in the second direction. The feed means include head maintaining means for maintaining a head of cup-shaped can blanks closely adjacent each of the respective axes. A horizontally reciprocated carrier is provided for removing the lowermost blanks from each of the head maintaining means for aligning them with the adjacent respective ram axis when the rams are reciprocated in the second direction.

By having the rams positioned horizontally, the feed mechanism can be simplified in the manner described. That is, for example, the head maintaining means can be simple vertical chutes terminating intermediate the rams and feeding a short stroke slide-type feeder. This allows alignment and final positioning of the blanks to be readily accomplished with a minimum of mechanism. Further, becuse of this arrangement, the distance through which the blanks must be positively driven is short and the blanks can be moved into position more rapidly, thus decreasing the time required for a complete machine cycle.

In accordance with another aspect of the invention, means are provided for stripping the formed can bodies from the rams after engagement with the shaping abutment means, and conveyor means are positioned beneath the axes and intermediate the stripping means and the doming member for receiving the formed can bodies and discharging them from the machine.

Accordingly, a primary object of the present invention is the provision of an ironing and doming press arranged so as to simplify the required feeding and discharge mechanisms.

Another object of the invention is the provision of an ironing and doming press which is capable of producing can bodies at a high rate.

A further object is the provision of an ironing and doming press arranged so as to facilitate maintenance and repair.

Yet another object is the provision of a machine of the type described wherein the relationship between the rams and the ironing and doming members can be readily adjusted.

These and other objects and advantages will become apparent from the following description when read in conjunction with the accompanying drawings wherein:

FIGURE 1 is a plan view of an ironing and doming press formed in accordance with the preferred embodiment of the present invention;

FIGURE 2 is a side elevation of the press shown in FIGURE 1;

FIGURE 3 is a cross-sectional view taken on line 3—3 of FIGURE 2 and showing the main drive mechanism of the press;

FIGURE 4 is a cross-sectional view taken on line 4—4 of FIGURE 2 and showing in detail the press slide and gib arrangement;

FIGURE 5 is a cross-sectional view taken on line 5—5 of FIGURE 4;

FIGURE 6 is an enlarged elevational view of the right end of the machine as viewed in FIGURE 2;

FIGURE 7 is an enlarged plan view of the right end of the machine viewed in FIGURE 1;

FIGURE 8 is a cross-sectional view taken on line 8—8 of FIGURE 7 showing the arrangement of the doming members;

FIGURE 9 is a cross-sectional view taken on line 9—9 of FIGURE 7 and showing the feed and discharge mechanism;

FIGURE 10 is a cross-sectional view taken on line 10—10 of FIGURE 9 and showing in detail the drawing and doming elements for one of the rams; and,

FIGURE 11 is a cross-sectional view similar to FIGURE 10 but showing one of the rams at the end of a working stroke with the formed can body still in position on the ram.

Referring now to the drawings wherein the showings are for the purpose of illustrating a preferred embodiment of the invention only and not for the purpose of limiting same, FIGURES 1 and 2 show the overall arrangement of the press including a horizontally extending main frame A which supports a main drive assembly B for reciprocating a punch or ram assembly C in working relationship with an ironing and doming assembly D. The ram assembly C and the ironing and doming assembly R function to elongate the side walls of cup-shaped aluminum can blanks and dome in the bottom wall to form a can having the desired final configuration. The cup-shaped aluminum can blanks are sequentially fed in timed relationship between the punch assembly C and the ironing and doming assembly D by a feed assembly E. The formed can bodies are discharged from the machine by a conveyor assembly F positioned generally beneath the path of movement of the punch assembly C.

FRAME A

The specific construction and arrangement of frame A is not of particular importance to the invention; however, as shown, it comprises a pair of vertically positioned, horizontally extending side forming members **10** and **12** which are welded or otherwise positively connected to three horizontally extending base forming members **14**, **16** and **18**. Additionally, a plurality of plate members extend transversely between side forming member **10** and **12** and function to support various mechanisms in the machine and to provide a rigid frame. The position of these additional frame forming members will be discussed in conjunction with the detailed description of the various assemblies of the machine.

DRIVE ASSEMBLY B

Positioned at the left-hand end of the frame and supported by an outwardly extending bracket **20** is a variable speed motor and gear reducer unit **22**. Unit **22** serves as the primary source of power for driving the ram assembly C and the various feed and discharge assemblies. The output shaft **24** of the motor and gear reducer unit **22** has a pulley **26** keyed or otherwise positively connected thereto and, through a plurality of V-belts **28** is drivingly connected to a main flywheel **30**.

As best shown in FIGURE 3, flywheel **30** is mounted for free rotation on suitable bearings **32** which are carried on a sleeve **34** of a conventional air operated clutch **36** which functions to selectively connect the flywheel **30** with a crankshaft **38**. Sleeve **34** of clutch **36** is keyed to a horizontally extending crankshaft **38** rotatably mounted in suitable bearings **40** and **42** carried respectively by the side frame members **10** and **12**.

As is apparent, engagement of the clutch **36** causes the flywheel to be effectively engaged with crankshaft **38** causing it to rotate at the speed of the flywheel. The crankshaft **38** is a relatively conventional counterbalanced crank having a crank arm **44** which is connected in a conventional manner with a connecting rod **46**. As can be seen in FIGURES 2 and 5, the opposite end of crank **46** is connected to a ball unit **48** by a plurality of cap screws **50**. The ball portion **52** of ball unit **48** is received in a socket **54** in the press slide member **56**. The ball is retained in the socket by a split retainer ring and plate **58** and **60**, respectively. The retainer ring **60** is positively connected to the slide **56** in any convenient manner, such as through the use of a plurality of screws **62**.

As can readily be seen, rotation of the main crankshaft causes the slide member **56** to be reciprocated horizontally through a path the length of which is determined by the throw of the crankshaft **38**. The slide **56** is constrained for horizontal movement by adjustable upper and lower horizontally extending gibs **66** and **68**, respectively. As best shown in FIGURE 4 the upper gibs **66** are bolted to the side frame members **10** and **12** by a plurality of cap screws **70**. Conventional gib retainer members **72** are positioned above each of the gibs **66** and connected to the slide frame members by screws **74**. By varying the thickness of shim members **76** between the abutting surfaces of gib retainer **72** and gibs **66** the vertical position of the slide guiding surfaces of the gibs can be varied.

The lower gibs **68** are carried by brackets **80** welded to the side frame members **10** and **12**. Screws **82** serve to connect gibs **68** to their respective brackets **80** and to permit vertical adjustments of the lower gibs to be made simply by varying the thickness of shims **84** positioned between the mating surfaces of the gibs and their support brackets.

RAM OR PUNCH ASSEMBLY C

Carried at the right hand end of slide **56**, as viewed in FIGURES 1, 2 and 5 are a pair of elongated horizontally extending punch members **90**. Each of the punch members **90** are of identical construction, consequently, only one will be described in detail and this description is understood to be equally applicable to the other.

As shown, the punch members **90** have a cross-sectional configuration determined by the desired final internal configuration of the particular can bodies being formed. In the subject machine the punches are of circular configuration. As best shown in FIGURE 11, each punch member **90** includes a rear portion **92** and a forward portion **94**. Portions **92** and **94** are connected in axially aligned relationship by a connection screw **96**. This allows the forward portion **94** to be easily releasable from rear portion **92** so that it can be easily removed and replaced. The rear portion **92** has its leftmost end flared, as shown in FIGURES 4 and 5, to provide a flange **98** for connection of the slide through use of cap screws **100**.

The forward end of the punch member **90** is shaped as best shown in FIGURES 10 and 11. As can be seen, the end has a recess **102** of circular cross-section formed therein. This recess is arranged so as to allow the bottom of the can to be domed inwardly during the final movement of the rightward stroke of ram member **90**.

As is apparent from FIGURE 10, with the cup-shaped can blanks **11** axially aligned with the respective punch members **90** and the ironing and doming assembly B the rightward movement of the ram causes it to enter the can blank **11** and move it through the ironing members and into engagement with the doming member to form it to its final desired configuration as shown at **11'**.

Because the cup-shaped can blank **11** is imperforate and because the cross-section of the ram **90** is arranged to closely fit within the interior of the can blank **11**, means

must be provided to exhaust the air from the cup shaped blank **11** to prevent movement of the ram into the blank from causing the blank to be ruptured. For this reason, a longitudinally extending opening **104** is formed throughout the length of both portions of the punch member and then connecting screw. This opening **104** is connected to an opening **106** formed in the slide **56**. Opening **106** in turn is connected with a vertically extending opening **108** which connects with the lower surface of the slide **56**. If the machine were operated at a low rate the line **108** could simply serve as an exhaust to the atmosphere; however, because the machine is operated at an extremely high number of cycles per minute, line **108** is preferably connected through a flexible line **110** to a source of vacuum and a source of air pressure not shown. The control of air and vacuum through line **110** is accomplished in any convenient manner, such as for example, by solenoid valves actuated by a cam limit switch unit **111** driven from the main crankshaft **38**.

In operation, the valves are controlled so that as the punch member begins entering the can a vacuum is pulled on line **108** and, accordingly, on lines **104** to thereby exhaust the air from the can; however, after the finish of the working portion of the punch stroke the valves are operated to supply air under pressure through the same lines to assist in removing the formed can bodies from the ram.

IRONING AND DOMING ASSEMBLY D

The ironing and doming assembly D is best shown in FIGURES 10 and 11. This assembly functions in combination with the punch members **90** to form the cup-shaped can blanks **11** to their final desired form **11'**.

The portion of the assembly D which performs the ironing function includes a first ironing ring assembly **110** and a second ironing ring assembly **112**. Assemblies **110** and **112** are mounted in a common frame **114** which includes a horizontally extending base plate **116**. The base plate **116** is supported from inwardly extending brackets **118** which are welded to the side frame members **10** and **12**. The base plate is releasably connected to the brackets **118** by a plurality of screws **120**. This arrangement allows the ironing ring assemblies **110** and **112** to be readily removed from the machine as a unit for replacement or repair.

Referring specifically to ironing ring assembly **110** it is seen that the assembly includes a pair of ironing ring members **124** each adapted to cooperate with a separate one of punch members **90**. Each ring member **124** is identically formed and mounted. Consequently only one will be described in detail. As shown, ring member **124** is carried in a recess **126** formed in the left-hand portion **128** of support member **114**. The ring **124** has an extruding opening **130** formed centrally therein. The opening **130** is axially aligned with the path of movement of its respective punch member **90** and is of a diameter slightly larger than the desired finished diameter of the can body **11'**. As shown, the outer periphery of the ring member **124** is slightly smaller in diameter than the peripheral wall of the recess **126** and an O-ring **132** is received in an annular recess formed in the outer periphery of ring **124** to position the ring in the recess. This arrangement allows the ring to have some slight movement relative the ram so as to be somewhat self-centering.

The ring **124** is releasably retained in the recess by a retainer plate **134** which is connected to the support frame **114** by a plurality of screws **136**. The retainer plate **134** is of a two-part construction so as to provide an internal annular recess **140** to which lubricant is supplied. The lubricant is conducted from recess **140** to the exterior surface of the blank via a plurality of small openings **142**.

Referring now to assembly **112**, it is seen that the ironing ring portion of the assembly is generally the same as described with reference to assembly **110** and includes a pair of ironing rings **144** each adapted to cooperate with a separate one of punch members **90**. The rings are received in openings **146** formed in portion **148** of bracket **114**. Extending centrally through each of rings **144** is an extruding opening **150**. This opening is aligned with the path of movement of the respective punch member **90** and is of a diameter equal to the desired final diameter of the can body **11'**. Additionally, O-rings **152** extend in grooves formed in the outer periphery of the rings **144** so as to provide a degree of self-centering as described with reference to rings **124**. Rings **144** are retained in recesses **146** by retainer plates **154** connected to portion **148** of bracket **114** by a plurality of screws **156**. The retainer plates also include an annular lubricant receiving groove **160** which, through openings **162** supplies lubricant to the ironing ring assembly.

Positioned in recesses **168** formed in the opposite side of member **148** are stripping ring assemblies **170**. These assemblies function to remove the finished can bodies from the punch members **90** as the punches are reciprocated to the left as viewed in FIGURE 10. In particular, the two stripping ring assemblies **170** are formed in the same manner and each include a plurality of discrete ring sections **172** which are biased inwardly by a circumferentially extending garter spring **174**. The ring segments **172** are retained in their respective recess **168**, but permitted to have radial movement relative thereto by a circular retainer plate **176** connected to member **148** by a plurality of screws **178**.

Mounted at the right-hand end of the punches' path of movement is doming assembly **180**. This assembly is arranged to form the bottom wall of the can body to the desired final shape. Referring more specifically to FIGURE 8 it is seen that doming assembly **180** includes 2 doming units **182** each of which is aligned with a separate one of punch members **90**. Additionally, the doming units **182** are arranged for separate adjustment longitudinally of the path of movement of the rams by mechanism which will subsequently be described in detail; however, referring to FIGURE 10, it is seen that each of the units includes a doming member **184** which has an end surface **186** of a configuration desired to be imparted to the bottom wall of the can **11'**. Member **184** is connected by a plurality of cap screws **186** with a mounting sleeve **188**. The mounting sleeves **188** of the two respective doming units **182** are, as best shown in FIGURE 8, releasably connected by a plurality of screws **190** to independent support members **194** and **196**, respectively.

Referring again to FIGURE 10 it is seen that an ejector ring member **198** is positioned about each of the doming members **184**. This ejector ring is arranged so as to be slidable within the sleeve **188**. A plurality of rods **200** extend from the rear end of the ejector ring into engagement with a slide flange **202** carried on a stud **204** threadably connected to the rear end of the doming member **186**. A compression spring **206** surrounds stud **204** and functions to maintain a constant bias against the slide flange **202** to in turn bias the ejector ring **198** outwardly. Spring **206** is maintained in position by a washer and nut **208** and **210**, respectively.

Referring to FIGURE 11 which shows one of the punch members **90** at the rightward extent of its stroke, it is seen that at this time the can body **11'** is completely formed and the ejector ring has been force rightwardly against the bias of spring **206**. As the ram begins moving to the left, the outward bias against the ejector spring forces the can body **11'** away from the doming member **184**. Continued leftward movement of the ram causes the rear edge **186** of the can body **11'** to be engaged by the stripping ring assembly **170**. This, in combination with the pressurized air supplied through line **104**, causes the can to be stripped or removed from the punch. The can is then received on the discharge mechanism F and discharged from the machine.

As previously mentioned the doming units **82** are mounted for independent adjustment longitudinally of the axis of movement of the rams **90**. Referring specifically to FIGURES 7, 8 and 10, it is seen that the member **194** which carries the right-hand doming unit **182** (as viewed in FIGURE 8) has an inclined rear surface **220** which bears against a similarly inclined surface **222** of wedge member **224**. As seen in FIGURE 7, member **224** is mounted for vertical sliding movement in a recess **226** formed in a transversely extending frame or support member **228** which is welded between the side plates **10** and **12**. The doming unit support member **194** also has a pair of rearwardly extending portions **230** and **232** which further serve to guide member **224** and to prevent transverse movement of member **194**. As shown in FIGURES 8 and 10, member **194** is maintained in engagement with wedge member **224** by a plurality of screws and springs **234** and **236**, respectively. Screws **234** pass through horizontally extending openings **238** formed in the rearwardly extending portions **230** and **232** of member **194**. These screws are threadably engaged with the transversely extending frame member **228**. Springs **236** positioned between the head of screws **234** and the bottom of the recessed opening **240** function to maintain member **194** firmly biased into engagement with the wedge member **224**.

Although not shown, it is to be understood that the left-hand doming unit **182** and its support member **196** are adjustable by a mechanism identical to that disclosed with respect to the right-hand doming unit.

In order to restrain the members **194** and **196** from having any vertical movement while permitting them to move longitudinally of the path of movement of the ram, guide blocks **244** are positioned at the four outermost corners of the assembly as shown in FIGURE 8. These blocks engage the outer surfaces of the corners of members **194** and **196** and are connected by screws to inwardly extending support members **246** which are welded to the side frame members **10** and **12**. The inner lower corners of both of members **194** and **196** are similarly supported by guide blocks **248** which are carried by a support member **250** which extends forwardly from transverse frame member **228** in the manner shown in FIGURE 10. Similar guide blocks **252** engage the upper inner corners of members **194** and **196**. These members are supported from a main support plate **254** which is connected by a plurality of cap screws **256** to transversely extending frame member **228**.

The means for shifting wedges **224** vertically to vary the position of the doming units includes studs **260** which extend into threaded openings **262** formed in the wedges. The studs **260** are threadably received in a collar **266** which is releasably retained in member **254** by a plate **268** connected to plate **254** by screws **270**. The screws **260** are arranged to be locked in their adjusted position by a nut **274**.

FEED ASSEMBLY E

The details of feed assembly E are best shown in FIGURES 6, 7 and 9. Referring specifically to FIGURE 9, it is seen that the assembly includes a pair of vertically extending blank holding chutes **300**. These chutes are each offset slightly from a vertical line passing through the path of movement of each respective ram **90**. As shown, each of the chutes comprise **6** vertically extending guide members **302** which are shown as being half round members positioned as shown in FIGURE 7 so that their curved surfaces define a guideway for the cup-shaped can blanks **11**. The members **302** are connected at their lower end to a horizontally extending support plate **304** which is supported on blocks **36** connected to the inside of the respective frame forming members **10** and **12**. At their upper ends, the members **302** are connected to a similar horizontally extending plate **308** which is connected to the top surfaces of frame members **10** and **12** by screws **310**. This chute arrangement maintains a head of blanks closely adjacent the path of movement of each of the rams **90**.

The means for removing the bottom blank from each of the chutes and moving it into aligned position with the punch members **90** includes a horizontally reciprocated carrier unit **314**. Carrier unit **314** includes a slide plate **316** which supports two separate carrier members **318** and **320**. The slide plate **316** is mounted for horizontal movement in a guideway formed by a bracket **322** which is supported from plate **118** as best shown in FIGURE 6.

Referring again to FIGURE 9, it is seen that each of the carrier members **318** and **320** define an upwardly facing support surface **328** and **330**, respectively. Support surfaces **328** and **330** are arranged to conform to approximately ¼ of the blanks exterior surface. Additionally, the members **318** and **320** have a flat horizontally extending upper surface **332** and **334**, respectively. When the carriers are in the position shown, the blanks **11** that they are at that time supporting are aligned with the paths of movement of the two punch members **90**. The carriers are maintained in this position until the punches enter the blanks and begin moving them toward the ironing and doming assembly D. After the rams have entered the blanks and are supporting them the carriers **318** and **320** are reciprocated to the left as viewed in FIGURE 9. As the carriers are reciprocated back, the next can in the chutes drops down into the respective support surfaces **330** and **328**. Additionally, as can be seen in FIGURE 9, pivotally mounted fingers or plates **350** and **352** extend rightwardly from the respective carriers **318** and **320**. The fingers are biased into the position shown by respective compression springs **354** and **356**. As is readily apparent, this arrangement provides means for supporting the blanks as they are moved from the chutes to their aligned position with the rams while permitting the carriers to be reciprocated back to the left after the rams enter the blanks.

Although a variety of means could be utilized for reciprocating the carrier unit **314** in timed relationship with the operation of the rams, the preferred means include a cam actuated lever **352** which is supported by a bracket **354** extending outwardly from frame member **12**. The upper end of lever **352** is pivotally connected to a link **356** which in turn is pivotally connected to the carrier member **320**. Consequently, oscillation of the lever **352** produces a corresponding reciprocation of the carrier unit **314**. A compression spring **358** extends between frame member **12** and lever **352** to maintain the lever normally biased in a counterclockwise direction.

The means for oscillating the lever **352** includes a cam **360** having a camming surface **362** which engages a roller or cam follower **364** carried on the lower end of the arm **352**. Cam **360** is keyed or otherwise positively connected to a shaft **366** which is rotatably mounted in bracket **354**. The shaft **366** is driven in timed relationship with the main crank **38** through a positive drive belt system best shown in FIGURE 2. This belt system includes a pulley **368** which is connected to the outer end of crankshaft **38** and drivingly connected through a positive drive belt **370** with a second gear or pulley **372**. Pulley **372** is keyed to a shaft **371** which extends from suitable bearings mounted on the side of the main frame. The final drive connection with shaft **366** is through a belt **376** which engages a gear **378** keyed to the end of shaft **366**. Consequently, the carrier unit **314** is continuously reciprocated in exact timed relationship with the movement of the ram **90**.

DISCHARGE ASSEMBLY F

Because of the horizontal arrangement of the press the mechanism for discharging the finished cans from the machine is extremely simple. Referring particularly to FIGURES 6, 7 and 9 it is seen that the discharge assembly F consists primarily of an endless belt **400**

which is positioned so as to have a horizontally extending run **402** positioned directly subjacent the path of movement of the punches at a location corresopnding to the position of the cans after they have been stripped from the punch members **90**. Belt **400** is driven and guided in its movement by a pair of large diameter pulleys **404** and **406**. Pulley **406** is supported by a horizontally extending shaft **408** which is carried by a pair of generally vertically extending members **409** which are pivotally connected at their lower ends to a bracket **410** which extends outwardly from side frame member **10** (see FIGURE 9). The upper end of the member **409** carry an adjustable stud **411** which engages the side of frame member **10**. This stud provides means for adjusting the position of pulley **406** to maintain the desired tension on belt **400**.

Pulley **404** is the driven pulley and, as shown in FIGURE 7, is connected to an output shaft **414** of a right angle drive unit **416** which is mounted on side frame member **12**. The right angle drive unit **416** is driven from the main crankshaft **38** by having its input shaft **418** connected through a positive drive belt that includes a gear **420** keyed to the shaft **418** and driven through a belt **422** which is in turn driven by a pulley **424** which is keyed to the end of shaft **471**, (see FIGURES 1 and 2).

The invention has been described in great detail sufficient to enable one of ordinary skill in the can making art to make and use the same. Obviously, modifications and alterations of the preferred embodiment will occur to others upon a reading and understanding of the specification and it is our intention to include all such modifications and alterations as part of our invention insofar as they come within the scope of the appended claims.

Having thus described our invention, we claim:

1. An improved machine for forming a can body having a desired radially facing shape and a closed end, said machine including a frame, a plurality of parallelly extending horizontally positioned punch members arranged to be simultaneously reciprocated between first and second points along separate parallel axes; first members forming extruding orifices having a peripheral shape generally corresponding to the desired radially facing shape of the can positioned between said first and second points and coaxially with each of the said axes; second members positioned at said first point and coaxial with the separate axes and forming can end shaping abutments and defining stops for the punch members at said second point; feed means for positioning cup-shaped can blanks intermediate the punch members and their respective extruding orifices, when said punch members are at said first point, said feed means including upwarding extending guide means for supplying cup-shaped can blanks to first locations closely adjacent each of said axes and between said extruding orifices and said rams when said rams are at said first points, said guide means arranged so that the blanks at said locations extend parallel to said axes and, a horizontally reciprocable carrier means mounted subjacent said axes and said guide means for movement along a path generally perpendicular to said axes, said carrier means including means defining support surfaces for receiving blanks from said locations, means for reciprocating said carrier means along said path to move said support surfaces to transfer blanks from said first locations into alignment with said axes when said rams are in said first positions; said support surfaces defining means including a retractable portion arranged to permit the carrier to be moved back to said locations as said rams move from said first to said second points.

2. The improved machine as defined in claim **1** wherein the second members are independently adjustable longitudinally of the separate axes.

3. The improved machine as defined in claim **1** including discharge conveyor means positioned subjacent the axes and intermediate the first and second members.

4. The improved machine as defined in claim **1** wherein the guide means comprise vertically extending chutes for holding a plurality of cup-shaped can blanks.

5. The machine as defined in claim **1** wherein the ram members are carried on an adjustably mounted slide member driven by a rotatable crank.

6. The improved machine as defined in claim **1** wherein the extruding orifices are mounted on a common frame which is releasably connected to the main frame.

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