Feb. 22, 1949. G. C. ERB 2,462,080

APPARATUS FOR SHAPING CONTAINERS

Filed Dec. 28, 1944 3 Sheets-Sheet 1

Fig. 1

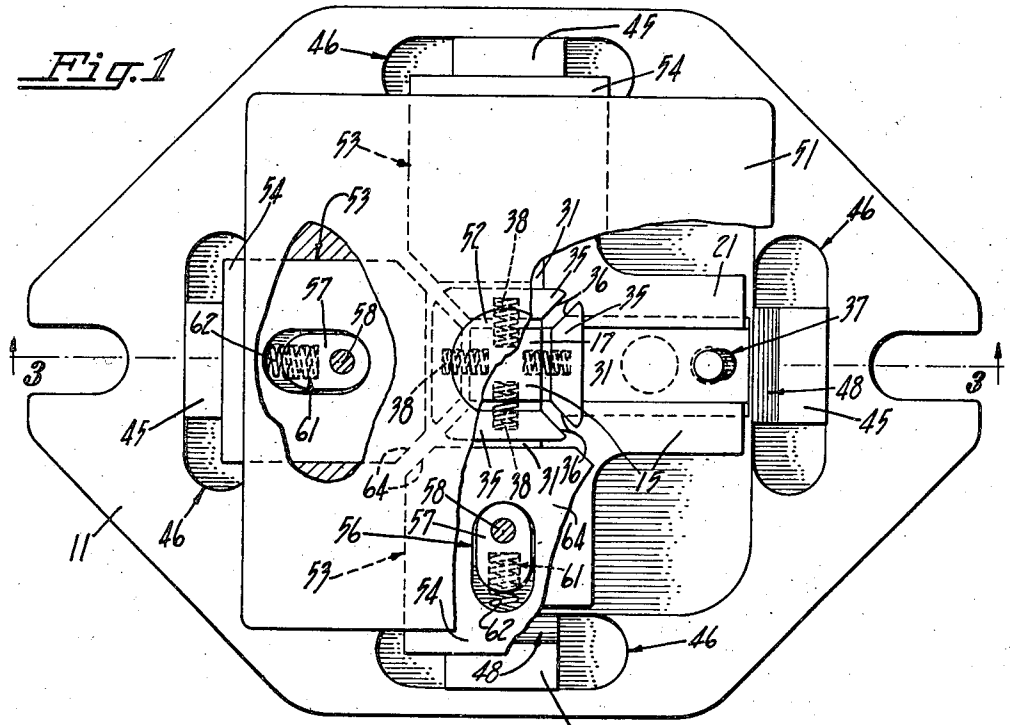
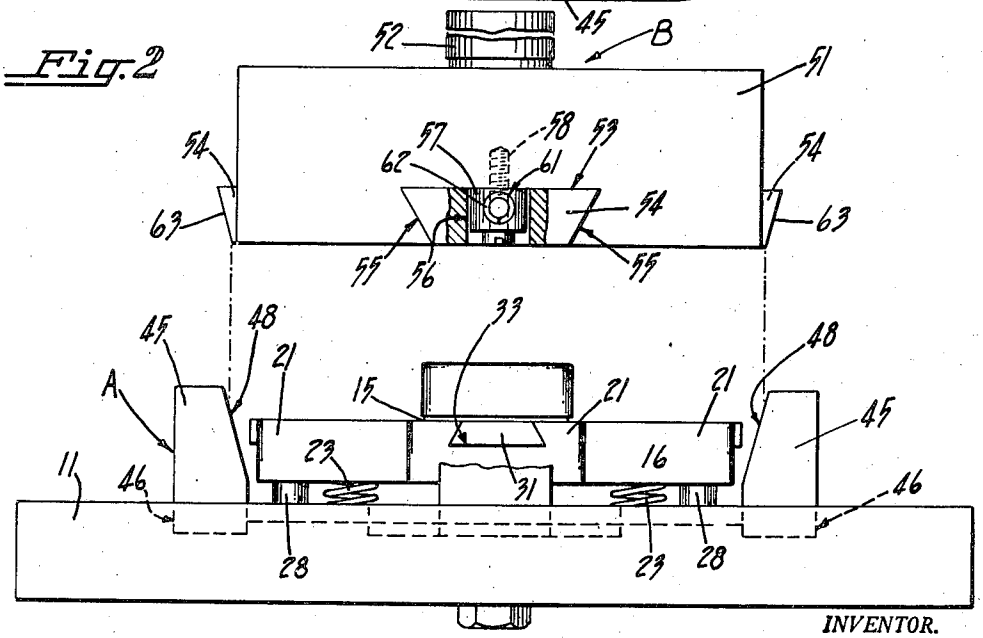


Fig. 2



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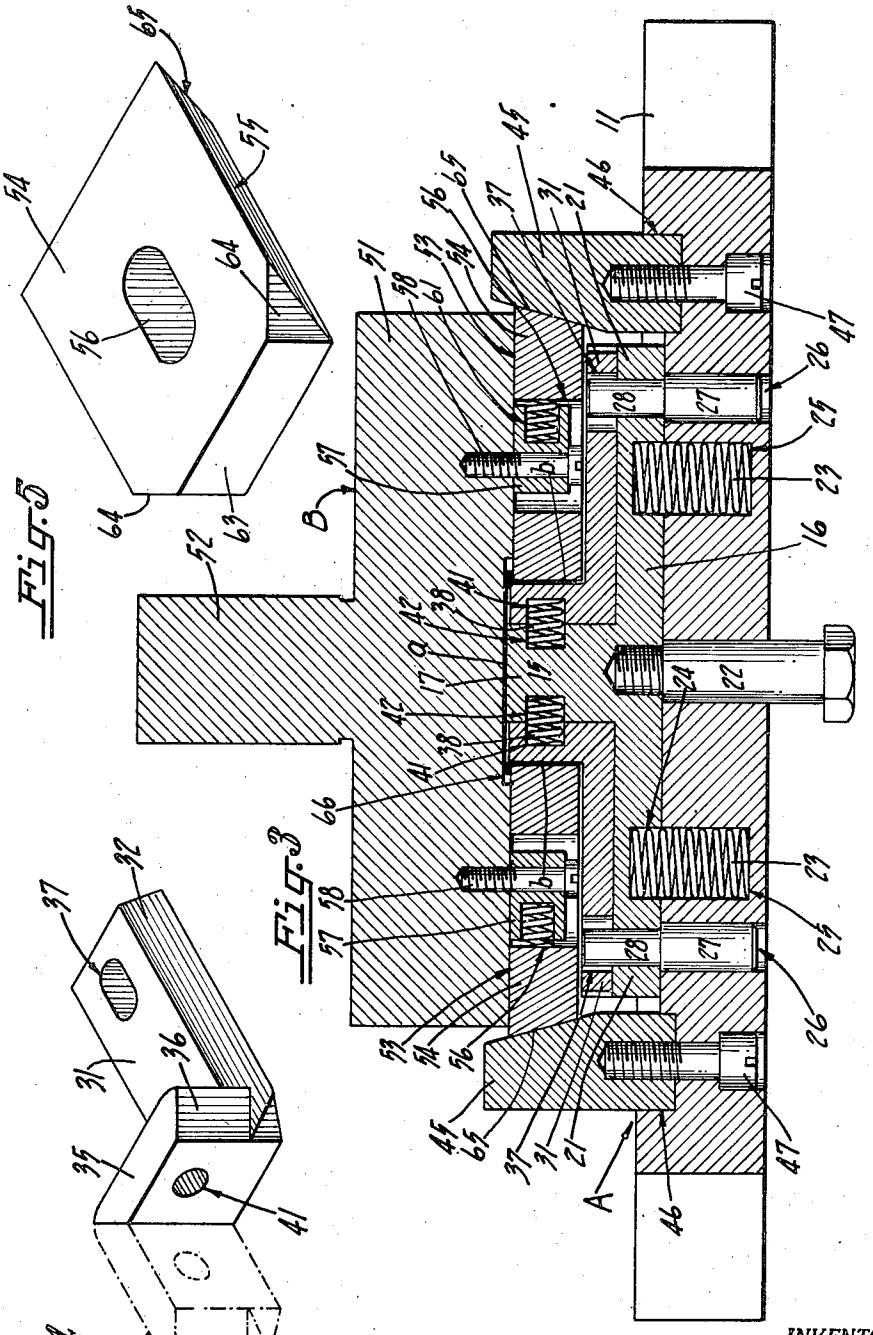


Fig. 5

Fig. 4

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APPARATUS FOR SHAPING CONTAINERS

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Fig. 6

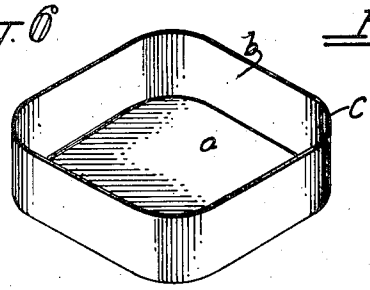


Fig. 7

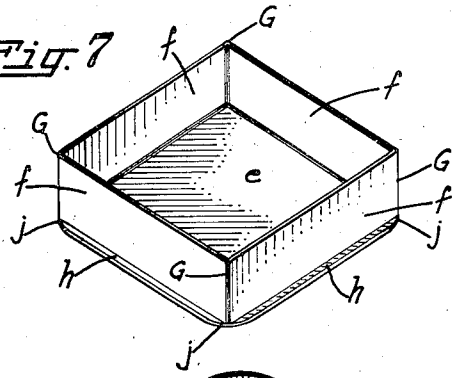


Fig. 8

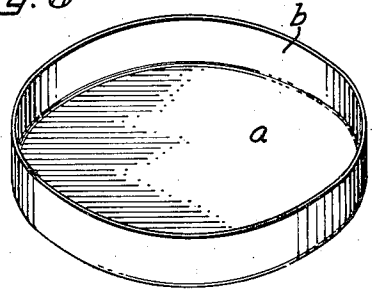


Fig. 9

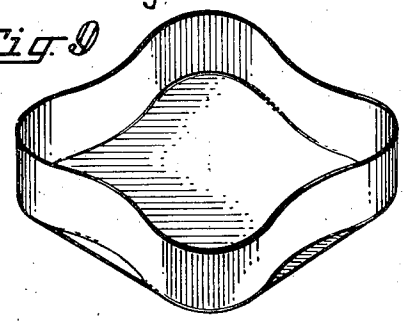


Fig. 10

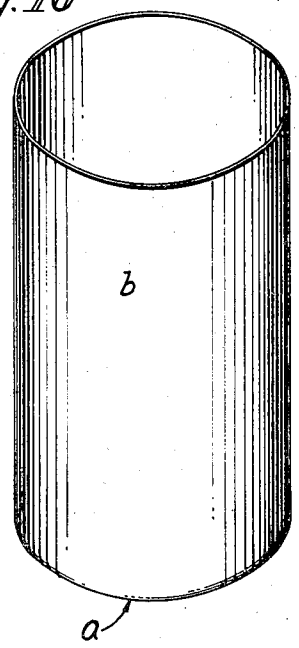
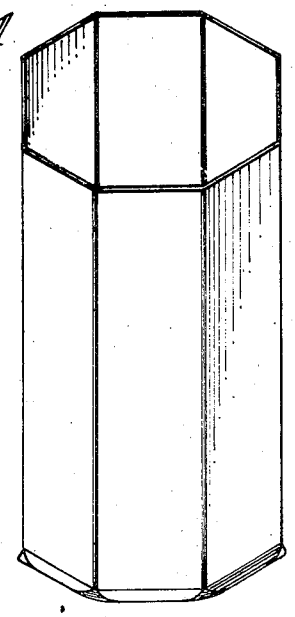


Fig. 11



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APPARATUS FOR SHAPING CONTAINERS

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Application December 28, 1944, Serial No. 570,148

5 Claims. (Cl. 153—25)

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The present invention relates to an apparatus for forming a container with distinct corners in the side walls and has particular reference to die mechanism for converting a drawn tubular member having no corners or only relatively large rounded corners into a container having relatively sharp corners by pressing inwardly parts of the side wall or walls while leaving the unpressed sections as corners for the newly shaped container.

This invention contemplates a die mechanism for reshaping the side wall or walls of drawn tubular members and converting the same into polygonal containers having distinct corners in the side walls. By the use of such a mechanism it is possible to make, for example, a sharp cornered square or oblong box from a drawn tubular member having no corners or having only relatively large rounded corners. The same kind of mechanism of the proper dimensions will produce a container with fluted side walls and a square or oblong base from a drawn cylindrical or similarly shaped member. Again, the same type of die mechanism may be so dimensioned as to produce a multiple sided container from a cylindrical shell, etc. Certain original drawn shells or tubular members and reshaped containers made from the same are abitrarily selected and will be illustrated and described as exemplary of the invention.

An object of the invention is the provision of a reshaping mechanism for reforming drawn tubular members into containers, such mechanism including a chuck for holding the tubular member during the reforming operation in which squeezing jaws engage the exterior surface of the sides of the member in spaced regions and press the engaged wall parts inwardly leaving certain unengaged or unpressed sections as corners for the resulting reformed container.

Another object of the invention is the provision of such a reforming die mechanism wherein excess metal resulting from such reshaping action is closely folded or doubled back adjacent the bottom of the container.

Yet another object is the provision of die mechanism of the character described which includes die parts for closely confining, both inside and out, the walls of the tubular member being operated upon.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying

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drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a plan view partially broken away of a die mechanism embodying the present invention;

Fig. 2 is a side view of the die mechanism shown in Fig. 1 with parts broken away and parts shown in section;

Fig. 3 is a longitudinal vertical sectional view of the die mechanism showing the parts in closed or final reshaping position, the view being taken substantially along the line 3—3 in Fig. 1;

Fig. 4 is a perspective view of one of the inside backing-up die parts, a second mating die part being indicated by dot and dash lines;

Fig. 5 is a perspective view of one of the outside squeezer jaws which form an important reshaping part of the die mechanism;

Fig. 6 is a perspective view of a tubular member adaptable for reshaping in die mechanism of the present invention such member being a drawn square shell having rounded corners;

Fig. 7 is a perspective view of the resulting reshaped container after action of the die mechanism, this finished container having relatively sharp corners and reenforced bottom edges;

Fig. 8 is a perspective view of a tubular member having the form of a drawn flat cylindrical shell;

Fig. 9 is a reshaped container in perspective drawn from the shell of Fig. 8;

Fig. 10 is a perspective view of a tubular member which is a deep drawn cylindrical shell; and

Fig. 11 is a perspective view of a reshaped polygonal container after reformation in the die mechanism.

The die mechanism of the present invention comprises a bolster plate 11 (Figs. 1, 2 and 3) which forms the principal support for a stationary or lower die mechanism A. Cooperating with this is an upper punch or die mechanism B. Such die parts A and B are mounted for operation in a press or other suitable apparatus wherein the upper punch part B is movable relative to the bolster plate 11 as in conventional press operation.

A chuck 15 is a work holding die part and is carried in a floating plate 16 having an upwardly extending central post 17. The plate 16 as well as the chuck 15 in form necessarily will vary with the type of work, i. e., with the kind of drawn shell to be converted. In Figs. 1 to 5, inclusive, the die mechanism shown is designed to operate on the drawn shell of Fig. 6. Such a shell as well

as the forms of Figs. 8 and 10 includes a bottom *a* and side walls *b*. The shell of Fig. 6 also has large rounded corners *c*.

The floating plate **16** has a raised and a lowered position and in the design or configuration illustrated for the drawn shell of Fig. 6, is formed with four outwardly extending arms **21** forming a Greek cross in plan view. A bolt **22** is threadedly secured to the floating plate at its center this bolt extending through and having a sliding fit within the bolster plate **11**. A head of the bolt is adapted to engage the under surface of the bolster plate when the floating plate **16** is in its raised position, shown in Fig. 2.

Coil springs **23** are interposed between the bolster plate and the floating plate and normally hold the floating plate and parts carried thereon in raised position (Fig. 2). Floating plate **16** is also counter-bored from below as at **24** and the bolster plate **11** is counter-bored in its upper surface at **25** to provide pockets for springs **23**.

The bolster plate **11** is also provided with partially disposed bores **26** in each of which an enlarged end of a pin **27** has sliding movement during the raising or lowering of the plate. Each pin is formed with a reduced upper neck **28** which extends through the floating plate, these pins having a tight fit in the plate. In this adaptation of the invention, as illustrated in Figs. 1 to 3, inclusive, the floating plate **16** carries four sliding backing-up slides **31** (see also Fig. 4).

Obviously other tubular member shapes will require other forms and numbers of slides. Each slide **31** is formed with tapered side walls **32** formed on opposite parallel sides of the slides. The slides have sliding movement in dovetail grooves **33** cut in the upper surface of the floating plate, each groove extending longitudinally of each arm **21**.

Each slide **31** at its inner end is provided with an upwardly projecting backing-up member **35**. The inner face of this member is parallel to a face of the central chuck post **17** which in this form is square as shown in Fig. 1. Each backing-up member on parallel opposite sides is formed with 45 degree side edges **36**. Each slide is formed with an elongated slot **37** to accommodate the upper reduced end **28** of one of the floating plate pins **27**. This construction allows for reciprocating inward and outward movement of the slides relative to the floating plate **16**.

The four slides **31** normally are held in separated position, as illustrated in Fig. 1, by springs **38** interposed between the upwardly projecting parts **35** of the four slides and the square post **17** of the chuck **15**. The inner face of each projected part **35** strikes against the corresponding face of the chuck post, when the die mechanism is in the closed position shown in Fig. 3. At such times the springs **38** are compressed and the angular side edges **36** of adjacent slides **31** are in close contact with each other, note the dot and dash position indicated in Fig. 4.

To permit this each inner face of the part **35** is counter-bored at **41** for the reception of one end of the associated spring. In similar manner the corresponding face of the post **17** is counterbored in axial alignment as at **42** to confine the opposite end of the spring **38**.

In the normal expanded position (Fig. 1) of the slides **31** the projecting ends **28** of the plate pins **27** engage against the inner ends of the slots **37** and form stops. In such position the combined outer periphery of the four projecting parts **35** of the four slides **31** present a properly dimensioned chuck member for a snug fit of the drawn shell or work to be reformed. It will be observed that this peripheral shape of the expanded part shown in Fig. 1 is proper for the reception of the tubular member of Fig. 6 when it is inverted and placed in position for operation of the die.

This constitutes all of the lower die mechanism A with the exception of certain cam members or keys **45** for operation of die parts in the upper die member B. Keys **45** are mounted in recesses **46** formed in the bolster plate, each key being held securely in its counterbored seat and in fixed position by a bolt **47** threaded into the bottom of the key and clamping the latter in the bolster plate. Each key **45** is provided with an inner tapered surface **48**, thus providing for operation of certain die parts of the punch member B, as will now be described.

The upper punch or die mechanism B is carried in a punch body **51**. This body in plan is square for use in reforming the tubular shell of Fig. 6. The punch body **51** is provided with a stem **52** for insertion in a regular punch slide of a conventional punch press. The under surface of the body **51** is cut across by two intersecting dovetail grooves **53**.

Grooves **53** provide slideways for four squeezer jaws **54** (Fig. 5), each jaw being formed with tapered walls **55**, on opposite parallel sides of the jaw. These jaws have sliding contact with the walls of the dovetail grooves **53** of the punch body and have a normal open or outer inoperative position and a closed operating position.

Each squeezer jaw **54** is cut through with an elongated slot **56** and a retaining block **57** (Fig. 3) is adapted to be located within each slot **56** to limit the sliding movement of the jaw. Each retaining block is held securely against the under face of the punch body **51** by a screw **58**. The outer face of each retaining block is recessed at **61** and a spring **62** is carried in the recess and extends out against the outer end wall of the elongated slot **56** of the jaw. The springs **62** normally keep the squeezer jaws **54** in their outer open position, as illustrated in Figs. 1 and 2. In such position the inner face of each retaining block **57** provides a limit stop for the inner end wall of the elongated slot **56** of the corresponding jaw.

Each squeezer jaw **54** (Fig. 5) has an inner vertical face or wall **63**, this being the active wall for the squeezing operation. At the two opposite ends of face **63** two angular corners **64** are formed. At its outer end each jaw is formed with a tapered outer wall **65** which preferably is of the same angle as the inner face **48** of an associated key **45** of the lower die mechanism A.

With the punch parts B in raised position relative to the stationary die parts A, as shown in Fig. 2, there is sufficient space between the lower face of the punch body **51** and the top of the chuck **15** to permit insertion of the drawn shell or work in its inverted position. The dimensions of this shell preferably are such as to put a slight compression on the springs **38** as the shell is inserted over the chuck. With this yielding spring action of the multiple part chuck the work is held in proper position for the beginning of the reshaping operation.

In operating the die mechanism of this invention it is only necessary to lower the punch unit B. Obviously the same operations will take place if the lower part A is the moving element. Thus as the parts A and B are brought together the

outer squeezer jaws 54 pass down outside of and along the sides *b* of the inverted shell but without touching it. In the center, the lower surface of the punch body 51 is recessed as at 66 forming a pocket which is larger than the area of the shell bottom *a*. The top wall of this pocket first engages the inverted bottom *a* following which the shell and chuck parts move down compressing the springs 23 as the floating plate 16 descends. This securely holds the work on the chuck.

Continued downward movement causes the tapered faces 65 of the squeezer jaws 54 to engage against and ride along the tapered faces 48 of the inserted keys 45. Owing to the angle of these tapered faces this sliding movement causes the jaws 54 first to move in against the side walls *b* of the shell and then to force the engaged walls inwardly, the jaw corners 64 of adjacent jaws coming together.

This displaces and reshapes the walls *b* and at the same time the backing-up slides 31 of the chuck are moved inwardly against the action of their springs 38. In other words, the chuck parts are moved from the open position in Fig. 1 into the closed position in Fig. 3, the inner faces of the projections 35 striking against the chuck post 17 and the projecting edges 36 coming together. This inward movement of the side walls *b* of the drawn shell is greatest along the straight sections of the wall and lessens at the rounded corners *c*.

In the fully collapsed position of the die mechanism, that is, after the operation of reshaping has been completed, the drawn shell or tubular member of Fig. 6 has been converted into the square sharp cornered container shown in Fig. 7. This container consists of a bottom *e*, four straight side walls *f*, interconnecting sharp corners G and an outwardly projecting peripheral ledge or heel *h* adjacent the bottom *e* of the container. The recessed pocket 66 in the lower face of the punch body 51 allows for this bending of the excess metal into the heels.

In the container under consideration there are four straight heel portions *h* each having an outer edge disposed substantially parallel to the side walls throughout the greater extent of the walls, but two adjacent edges merge into a curved connecting section *j* adjacent the corners G. The reason for this should be obvious since there is practically no reforming action of the wall at the corners G and therefore no excess metal and no formation of heels occurs at these corners.

After the die mechanism has been brought into its compact position at the end of the downward stroke of the punch element B, this element is returned into the normal raised position shown in Fig. 2. During this return stroke, the tapered faces 65 of the squeezer jaws 54 riding back over the faces 48 of the die keys 45 allow the springs 62 to return the squeezer jaws 54 until the parts are again brought into separated or outward position. The slides 31 remain in their collapsed position, thus holding the reformed container on the chuck. When the punch and die parts are fully separated the drawn container may be lifted from its position on the chuck in any suitable manner. The chuck parts becoming freed, the slides 31 spring back into their normal separated position preparatory to receiving a subsequent drawn shell.

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

I claim:

1. In a reforming die mechanism for converting a metallic tubular member having a side wall and a bottom into a cornered container, the combination of a vertically movable chuck disposed beneath and supporting the tubular member preparatory to reforming the same, a die part vertically movable towards and away from said chuck to clamp the bottom of the tubular member against the chuck, squeezer jaws carried by and movable with said movable die part and also individually movable relative thereto, said jaws being located exteriorly of the tubular member while the latter is supported by said chuck, means disposed in the path of vertical movement of said die part towards said chuck for engaging and moving said squeezer jaws inwardly relative to the die part to engage and reshape the side wall of the tubular member by pressing inwardly against peripherally spaced parts thereof, whereby to form corners at the unpressed portions of the tubular member, and means for limiting vertical movement of said chuck in opposite directions before and during the die reshaping operation.

2. In a reforming die assembly for converting a metallic tubular member having a side wall and a bottom into a multi-cornered container, the combination of a vertically movable multiple part chuck disposed beneath and supporting the tubular member in inverted position with its bottom resting on said chuck and with its side wall surrounding the chuck preparatory to reforming said member, means for normally yieldingly holding parts of said chuck in separated relation, a die part movable toward said chuck to clamp the bottom of the tubular member thereagainst, squeezer jaws carried by and movable with said die part and also having individual movement relative thereto, said jaws moving into position surrounding the side wall of said tubular member when the latter is clamped on said chuck, and means disposed in the path of movement of said die part towards said chuck for engaging and moving said squeezer jaws and a part of said chuck yieldingly inwardly relative to the die part to engage opposite sides of the tubular member to reshape the side wall thereof by pressing against peripherally spaced parts of the member, whereby to form corners at the unpressed intermediate portions of the tubular member.

3. In a reforming die apparatus for converting a metallic tubular member having a side wall and a bottom into a cornered container, the combination of a stationary die support, a chuck mounted on said support and having limited vertical and lateral movement relative thereto for engaging beneath and supporting the tubular member preparatory to reforming the same, fixed actuating members secured to said support on opposite sides of said chuck, a die member vertically movable relative to said chuck for clamping the bottom of the tubular member against the chuck and for holding the member during a reshaping operation, and a plurality of squeezer jaws carried by said movable die member and individually movable relative thereto, said jaws being disposed exteriorly of the tubular member while the latter is supported by said chuck, said fixed actuating members being operative to move said squeezer jaws inwardly during coincident downward movement of said die member

and vertical and lateral movement of said chuck with the tubular member supported thereby, whereby said jaws engage and reshape the side wall of the tubular member by pressing inwardly against peripherally spaced parts thereof to form corners at the unpressed intermediate portions of the said tubular member.

4. In a die mechanism for reforming a metallic drawn tubular member having side walls and a bottom into a cornered container, the combination of a stationary die support, a chuck mounted on said support and vertically movable relative thereto for engaging beneath and supporting the tubular member, said chuck including yieldable backing-up slidable elements for holding the tubular member by interiorly engaging the side walls thereof, a die member mounted above said support and vertically movable relative thereto for first engaging and clamping the bottom of the tubular member against the chuck and thereafter for moving said chuck with its clamped tubular member thereon toward said support during the reforming operation, a plurality of squeezer jaws carried by said vertically movable die member for surrounding the tubular member, and means fixed relative to said squeezer jaws for engaging and moving the jaws inwardly to engage and reshape the side wall of the tubular member by pressing inwardly against peripherally spaced parts thereof to form corners thereon, said backing-up slidable elements moving inwardly while internally supporting the inwardly pressed side walls of the tubular member intermediate said corners and during the reshaping operation, whereby to reform the tubular member into a rectangular container having relatively sharp corners located between adjacent side walls thereof.

5. In a reforming die assembly for converting a metallic drawn tubular member having

side walls and a bottom into a cornered container, the combination of a stationary die support, a chuck mounted on said support and having limited vertical movement toward the support for engaging beneath and supporting the tubular member preparatory to reforming the same, said chuck comprising a central post and a plurality of expandible backing-up slide members for yielding engagement within the tubular member, a die member vertically movable relative to said chuck to clamp the bottom of the tubular member thereagainst, said die member having a recess on its lower surface disposed in vertical alignment with the tubular member on said chuck, a plurality of squeezer jaws carried by said movable die member and laterally movable thereon, said jaws being disposed exteriorly of the tubular member while the latter is supported by said chuck, and means fixed relative to said squeezer jaws for moving the jaws inwardly to engage and reshape the side wall of the tubular member by pressing inwardly against peripherally spaced parts thereof to form corners thereon, the inward displacement of said tubular member side wall being accompanied by a retraction of said backing-up slide members to form a peripheral laterally extending heel of double thickness adjacent the bottom of the tubular member and disposed in said die member recess.

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