

March 12, 1968

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DIE TO FORM AND TRIM A ROUND TAPERED
CONTAINER IN ONE OPERATION

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2 Sheets-Sheet 1

Fig. 2

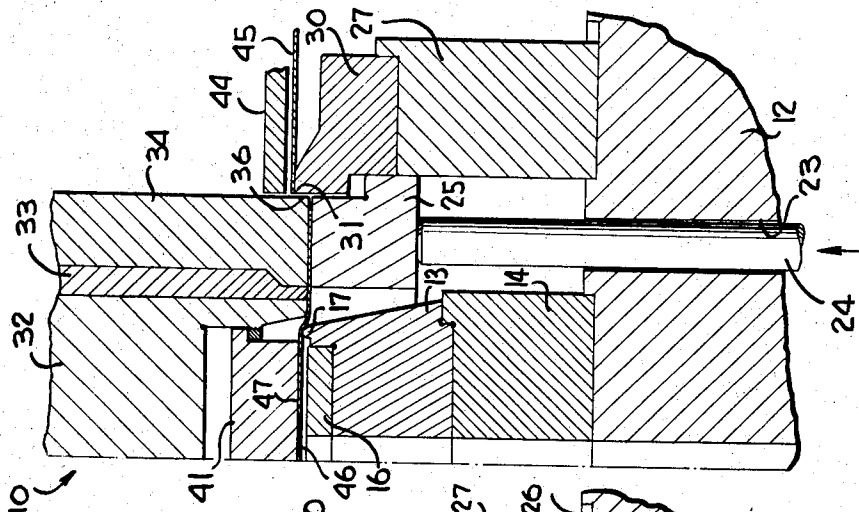
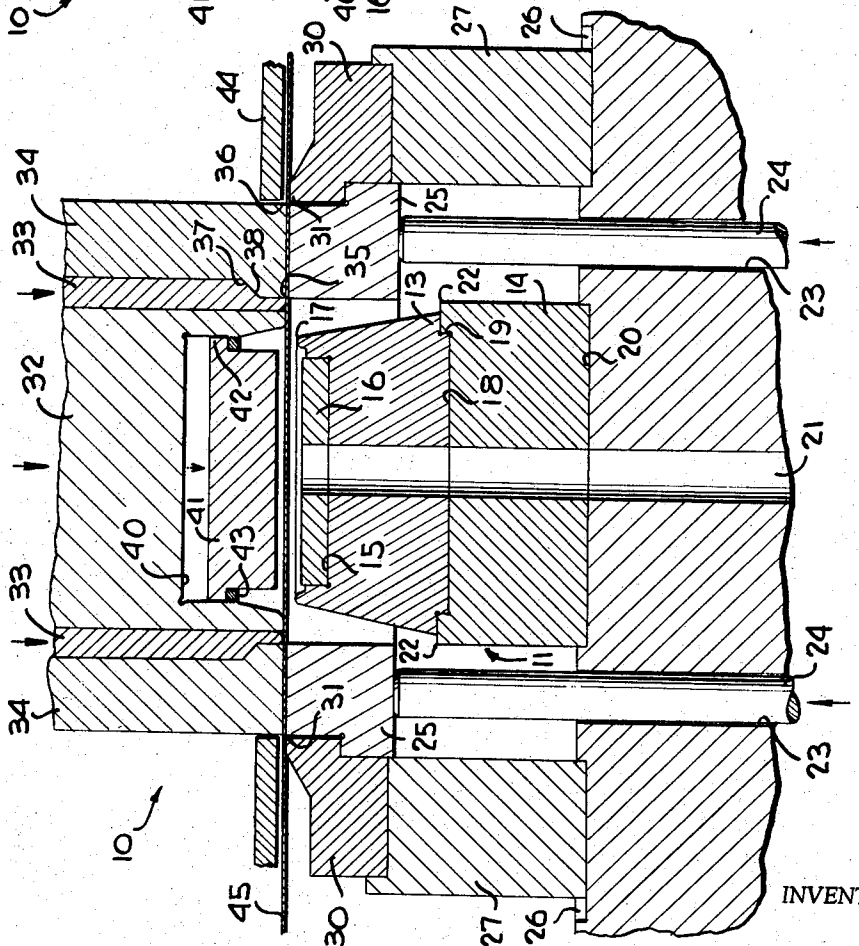


Fig. 1



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Fig. 4

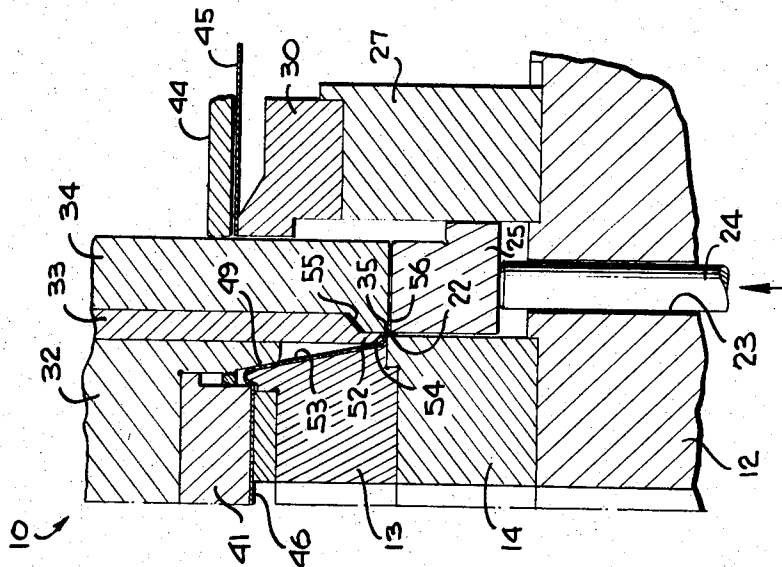
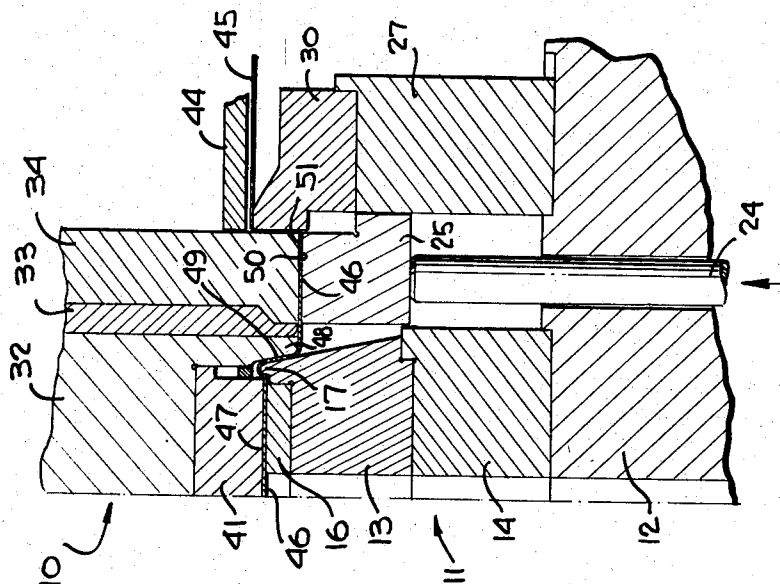


FIG. 3



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1

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DIE TO FORM AND TRIM A ROUND TAPERED CONTAINER IN ONE OPERATION

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This invention relates to an apparatus and method for forming and trimming a round tapered container in one operation.

It is old in the prior art to form round tapered containers, however, it is customary to form the containers by performing four separate and distinct operations. These four operations usually include the steps of cutting a container blank from a sheet of stock, forming a container body from the blank, forming a flange on the container body and finally trimming the flange to provide a finished container mouth.

It is an object of this invention to provide a die for forming and trimming a round tapered container in one quick, economical and efficient operation.

Another object of this invention is to provide a die for forming a container wherein the die includes a center die element and a plurality of die parts opposed to the center die element, the die parts including a draw ring which is disposed in cooperative alignment with the center die element for shaping the container and a punch which cooperates with the die element for trimming the container.

Another object of this invention is to provide a die which utilizes telescoping inner and outer draw rings for performing deep drawing operations in sequence, and in addition, to provide die means for forming a recessed bottom panel in the container.

Another object of this invention is to provide a blanking punch in telescoping relationship with the inner and outer draw rings, which blanking punch is disposed adjacent to and cooperates with a lower pressurized draw ring to grip a marginal portion of a container blank for drawing the container blank about a center die member to form a container.

Another object of this invention is to provide a blanking member which is fixedly mounted upon a die shoe and is disposed adjacent to the blanking punch and has a cutting edge which cooperates with a cutting edge on the blanking punch to sever the container blank from a sheet of stock.

Another object of this invention is to provide a center die member comprising a stationary one-piece male die element mounted upon the die shoe by a trim punch, which trim punch includes a cutting edge disposed in cooperative alignment with the blanking punch for trimming the container.

Another object of this invention is to provide a container forming die which includes a male die member having a container forming portion and a cutting edge, a telescoping assembly including an inner draw ring, an outer draw ring and a blanking punch which are concentrically aligned and circumscribe the male die member, said blanking punch and inner and outer draw rings being mounted for sliding movement relative to the male die member, the blanking punch and the outer draw ring having opposed faces for gripping a container blank whereby the container blank is drawn over the male die member during the relative movement, and the blanking punch having inner and outer cutting edges thereon which cooperate with the cutting edge on the male die member to trim a formed container and with a cutting edge on an adjacent blanking member for cutting a container blank from a piece of stock.

Another object of this invention is to provide a meth-

2

od of forming a container in one continuous operation, which method comprises the steps of providing a container blank, bending the blank to define the outline of a bottom of a container, drawing the blank to form a first portion of a container side wall, gripping the first portion and drawing the remainder of the blank to form a second portion of the container side wall, and trimming the blank to finish the container.

A further object of this invention is to provide a method of forming a container of the type having a countersunk, recessed bottom panel, which method includes the steps of providing a container blank, shaping the blank to define the outline of a bottom of a container, pressing on the bottom to form a recessed panel therein, drawing the blank to form a first portion of a container side wall, gripping the first portion and drawing the remainder of the blank to form a second portion of the container side wall, and trimming the blank to finish the container.

Another object of this invention is to modify the above described method by including the additional step of forming a peripheral flange on the second portion prior to trimming of the blank.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claimed subject matter and the several views illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a vertical, cross-sectional view which is taken axially of the die of the present invention and illustrates a stationary one-piece male die element fixedly mounted on a stationary die shoe by a trim punch having a peripheral cutting edge thereon, a telescoping assembly disposed above the male die element and including inner and outer draw rings slidably disposed within a blanking punch, a central recess formed in the inner draw ring, a pad or panel former slidably disposed within the central recess, draw pins slidably mounted within the die shoe and resiliently supporting a lower draw ring in cooperative alignment with the blanking punch for gripping therebetween a marginal portion of a container blank, a pedestal mounted on the die shoe and supporting a blanking member which has a cutting edge thereon that cooperates with the blanking punch to cut the container blank from a thin sheet of stock, and a stationary stripper member disposed adjacent to the blanking punch and above the sheet of stock.

FIGURE 2 is a fragmentary, vertical, cross-sectional view of the die of FIGURE 1 and illustrates the position of the various parts after the blanking punch has moved past the cutting edge of the blanking member to cut the container blank from the sheet of stock, and shows the pad in engagement with the blank prior to forming of a bottom panel of the container, and the blanking punch and lower draw ring cooperating to yieldably grip a marginal edge of the container blank.

FIGURE 3 is a fragmentary, vertical, cross-sectional view, similar to FIGURE 2, and illustrates the position of the parts subsequent to the formation of the bottom panel, and shows the inner draw ring cooperating with a top portion of the male die element to form a first portion of the container.

FIGURE 4 is a fragmentary, vertical, cross-sectional view, similar to FIGURES 2 and 3, and illustrates the position of the parts subsequent to the completion of the container, and shows the outer draw ring cooperating with the trim punch to grip a flange of the container as the blanking punch and trim punch cooperate to trim the container.

Referring to the drawings in detail, there is shown in FIGURE 1 a die, generally indicated by the numeral 10 which is mounted on a punch press (not shown) and

which includes a male die member, generally indicated by the numeral 11, fixedly mounted upon a die shoe 12 which is fixedly attached to the bed of the press (not shown) in a usual manner.

The male die member 11 includes a stationary one-piece male die element 13 which is centrally mounted on a trim punch 14. The die element 13 is preferably frusto-conical in shape with a central recess 15 therein for receiving a hardened face plate 16 and is provided with an annular upstanding rim 17 for a purpose to be later described. The trim punch 14 is preferably annular in shape and has a recess 18 for receiving a central portion 19 of the die element 13. A recess 20 is formed in the die shoe 12 for receiving the trim punch 14. A central aperture 21 is formed in the die shoe 12, the die element 13 and the trim punch 14 for slidably receiving a conventional knock-out rod, not shown. The trim punch 14 is also provided with an annular cutting edge 22 which is outwardly spaced from the die element 13.

The die shoe 12 has a plurality of apertures 23 for slidably receiving pressurized draw pins 24 for upwardly biasing a pressurized lower draw ring 25. An annular recess 26 is formed in the top surface of the die shoe 12 for receiving therein an annular pedestal 27. The pedestal 27 is fixedly positioned in the recess 26 by any suitable means such as cap screws which are not shown, and supports an annular blanking member 30 which is provided with an annular cutting edge 31.

The die 10 also includes a first side shaper or inner draw ring 32, a second side shaper or outer draw ring 33 which circumscribes the inner draw ring 32, and a gripping or blanking punch 34 which circumscribes the outer draw ring 33 and is concentric with the inner draw ring 32. The blanking punch 34 is provided with an inner annular cutting edge 35 which cooperates with the cutting edge 22 on the trim punch 14, and an outer annular cutting edge 36 which cooperates with the cutting edge 31 on the blanking member 30. The blanking punch 34 also has an inner annular shoulder 37 which cooperates with a shoulder 38 on the outer draw ring 33.

The first side shaper or inner draw ring 32 has a central recess 40 for slidably receiving therein a pressurized pad 41. The pad 41 has an annular shoulder 42 which abuts against a threaded locking ring 43 to limit the sliding movement of the pad 41.

A stationary stripper member 44 is fixedly mounted adjacent to the blanking punch 34 and is spaced above the blanking member 30 for receiving therebetween a sheet or strip 45 which may be of any ductile metal such as tin plate or aluminum. The blanking punch 34 is solidly mounted on the ram of the punch press (not shown) for vertical reciprocation between fixed limits.

The operation of the invention will now be described in detail. The lower draw ring 25 has an upward pressure exerted thereon by the pins 24, as indicated by the upwardly directed arrows directed axially along the pins 24. The pressure may be obtained by suitably resiliently biasing the pins 24 with means including spring means, air cushions or fluid pressure means, not shown. The first side shaper or inner draw ring 32 and the second side shaper or outer draw ring 33 have a downward pressure exerted thereon, as indicated by the downwardly directed arrows shown in FIGURE 1, which pressure is also conventionally obtained by spring means, air cushions or fluid pressure means, not shown. The pad 41 is also preloaded with a downwardly directed pressure, as indicated by the arrow in FIGURE 1, which preload is conventionally obtained by spring means, air cushions or fluid pressure means, not shown.

FIGURE 1 is an illustration of the arrangement of the die 10 at the beginning of a container forming operation and shows the thin sheet 45 disposed above the die element 13, the lower draw ring 25 and the blanking member 30 and being disposed below the inner draw ring 32, the outer draw ring 33, the blanking punch 34 and the

stationary stripper member 44. A comparison of the views of FIGURE 1 and FIGURE 2 will show that in FIGURE 3 the inner draw ring 32, outer draw ring 33, blanking punch 34 and pad 41 have moved simultaneously downwardly into engagement with the sheet 45 such that the cutting edge 36 on the blanking punch 34 and the cutting edge 31 on the blanking member 30 first cooperate to sever the sheet 45 and thus provide a container blank 46 which is yieldingly gripped between the blanking punch 34 and the lower draw ring 25. It is also shown in FIGURE 2 that the inner draw ring 32, the outer draw ring 33 and the blanking punch 34 have travelled past the upstanding rim 17, on the die element 13, such that the container blank 46 has been shaped about the rim 17 to define a bottom 47 of a container.

In FIGURE 3 there is shown the position of the die 10 after the pad 41 has been engaged by the inner draw ring 32 and has been pressed against the container blank 46 to countersink the bottom 47 by bending it about the rim 17 into engagement with the plate 16. A depending first shaper member 48, which is integral with the inner draw ring 32, has cooperated with a first portion of the die element 13 to form a first portion 49 of a container. The pad 41 and the shaper member 48 of the inner draw ring 32 are solidly engaged with the die element 13 and further movement of these members is precluded. It will also be noted, by comparing FIGURES 2 and 3, that the marginal edges of the container blank 46 has shifted somewhat between the gripping face 50 on the blanking punch 34 and the gripping face 51 on the lower draw ring 25. Thus, it can be seen that as the blank 46 is drawn to form the first portion 49 of the container, the blank 46 is only yieldably gripped between the gripping faces 50 and 51.

FIGURE 4 illustrates the arrangement of the die 10 upon completion of the container forming operation. As can be seen by a comparison of FIGURES 3 and 4, a second shaper member 52 which is integral with the outer draw ring 33 has cooperated with the die element 13 to draw the blank 46 and thus form a second portion 53 of the container. The flange 54 has also been formed, at the bottom extremity of the second portion 53, by peripheral engagement of the second shaper member 52 with the top of the trim block 14. After the peripheral flange 54 is formed, further movement of the outer draw ring 33 is precluded. The blanking punch 34 continues downwardly for a very short distance, as is indicated by the small space 55 between the outer draw ring 33 and the blanking punch 34, such that the inner cutting edge 35 cooperates with the cutting edge 22, on the trim punch 14, to trim a small piece of scrap 56 from the container blank 46 along the peripheral flange 54.

The die 10 is then opened by vertical movement of the blanking punch 34 with the ram of the press and a knock-out rod (not shown) travels within the aperture 21 to force the finished container from the die element 13. If desired, the face plate 16 may be attached to the knock-out rod for vertical movement; this being especially desirable if the containers are of thin, weak material. As the die 10 is being opened, the lower draw ring 25 is raised by the resiliently biased pins 24 and the piece of scrap 56 is raised by the lower draw ring 25 up into alignment with the sheet 45. The piece of scrap 56 is then either blown off or slides off as the sheet 45 is positioned for the next container forming operation.

The function of the stationary stripper member 44 is obvious in that it prevents upward movement of the sheet 45 during the upward movement of the blanking punch 34.

While a preferred form of a container forming die and a preferred method of forming a container have been disclosed in detail, it is to be understood that variations in the arrangement of parts and in the series of method steps may be provided without departing from the scope

5

of the invention as defined in the appended claimed subject matter.

I claim:

1. In a die for forming a container, a center die element and a plurality of die parts opposed to said center die element; said die parts including a draw ring disposed in cooperative alignment with said center die element for shaping said container, an outer draw ring disposed about said first mentioned draw ring and slidable thereon, and a blanking punch disposed about and slidable on said outer draw ring; said center die element including a stationary trim punch having a cutting edge thereon, said blanking punch and said cutting edge cooperating to trim a container.

2. In a die for forming a container, a center die element and a plurality of die parts opposed to said center die element; said die parts including a draw ring disposed in cooperative alignment with said center die element for shaping said container, and a blanking punch disposed about said draw ring; a blanking member having a first cutting edge thereon, said center die element including a stationary trim punch having a second cutting edge thereon, said blanking punch cooperating with said first cutting edge to form a container blank, and said blanking punch cooperating with said second cutting edge to trim said container.

3. In a die for forming a container, a fixedly mounted male die member having a container forming portion and a cutting edge, a draw ring circumscribing said male die member, a blanking punch circumscribing said male die member, said blanking punch and said draw ring being mounted for sliding movement relative to said male die member, said blanking punch and said draw ring having opposed faces for gripping a container blank whereby said container blank is drawn over said male die member during said relative movement, said blanking punch having an edge thereon which cooperates with said cutting edge on said male die member to trim a formed container, an intermediate draw ring circumscribing said male die element and spacing said blanking punch therefrom, said intermediate draw ring including a shaper member thereon for forming a flange on said container.

4. A device as defined in claim 3 further characterized by said intermediate draw ring cooperating with said male die member to grip said flange when said blanking punch cooperates with said cutting edge to trim said container.

5. In a die for forming a container, a die shoe, a trim punch mounted on said die shoe, a stationary male die element mounted on said trim punch and having a recessed portion, a pad cooperating with said die element and being disposable in said recessed portion thereof to countersink a bottom of a container; an inner draw ring having a central recess therein, said pad being slidably receivable within said central recess, said inner draw ring having a first shaper member thereon for cooperating with a portion of said die element to perform a first shaping operation; an outer draw ring circumscribing said inner draw ring and being slidably mounted thereon, a second shaper member on said outer draw ring for co-

6

operating with said die element to perform a second shaping operation; a blanking punch slidably mounted on and circumscribing said outer draw ring and having an inner cutting edge and an outer cutting edge; a blanking member fixedly mounted on said die shoe, the outer cutting edge of said blanking punch being cooperative with said blanking member to cut a container blank, the inner cutting edge of said blanking punch being cooperative with said trim punch to trim a container.

6. A device as defined in claim 5, further characterized by a draw pin slidably mounted within said die shoe, a lower draw ring disposed between said draw pin and said blanking punch, said blanking punch and said lower draw ring being cooperative to yieldingly grip a container blank therebetween to draw said container blank over said die element, and a stationary stripper member disposed above said blanking member.

7. A method of forming a container in one continuous operation comprising the steps of: providing a container blank, shaping said blank to define the outline of a bottom of a container, pressing on said bottom for forming a recessed panel therein, drawing said blank to form a first portion of a container side wall, gripping said first portion and drawing the remainder of said blank to form a second portion of said container side wall, and trimming said blank to finish the container, said pressing on said bottom being constantly maintained during the steps of drawing, gripping and trimming.

8. The method as defined in claim 7 plus the additional step of forming a peripheral flange on said second portion prior to trimming said blank.

9. A method of forming a container in one continuous operation comprising the steps of: providing a thin sheet of stock, cutting said sheet of stock to provide a container blank, shaping said blank to define the outline of a bottom of a container, pressing on said bottom for forming a recessed panel therein, drawing said blank to form a first portion of a container side wall, gripping said first portion and drawing the remainder of said blank to form a second portion of said container side wall, and trimming said blank to finish the container, said pressing being constantly maintained during the steps of drawing, gripping and trimming.

10. The method as defined in claim 9 plus the additional step of forming a peripheral flange on said second portion prior to trimming said blank.

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