July 5, 1966 S. W. DENNIS 3,258,954

CONTAINER CLOSURE FORMING APPARATUS AND METHOD

Original Filed Nov. 13, 1959 3 Sheets-Sheet 1

FIG. 1.

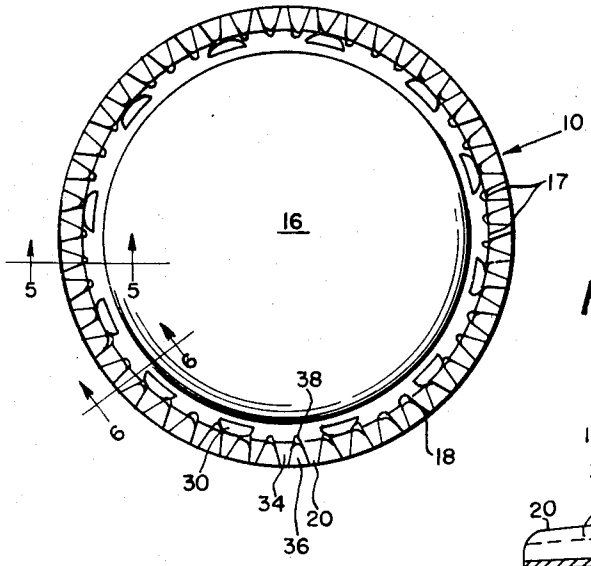


FIG. 2.

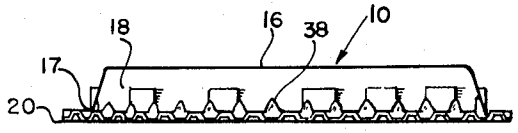
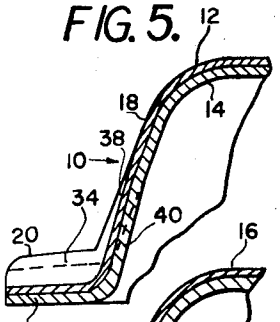


FIG. 5.



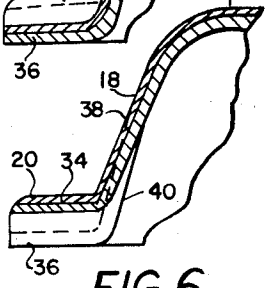


FIG. 6.

FIG. 4.

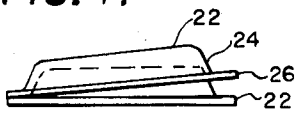
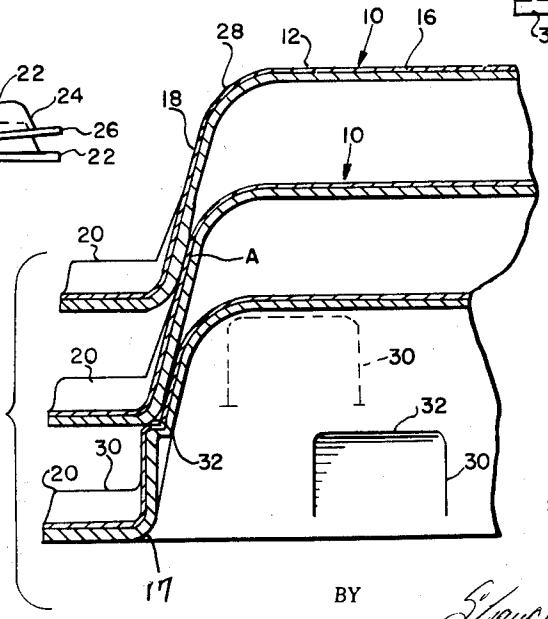


FIG. 3.



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CONTAINER CLOSURE FORMING APPARATUS AND METHOD

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FIG. 7.

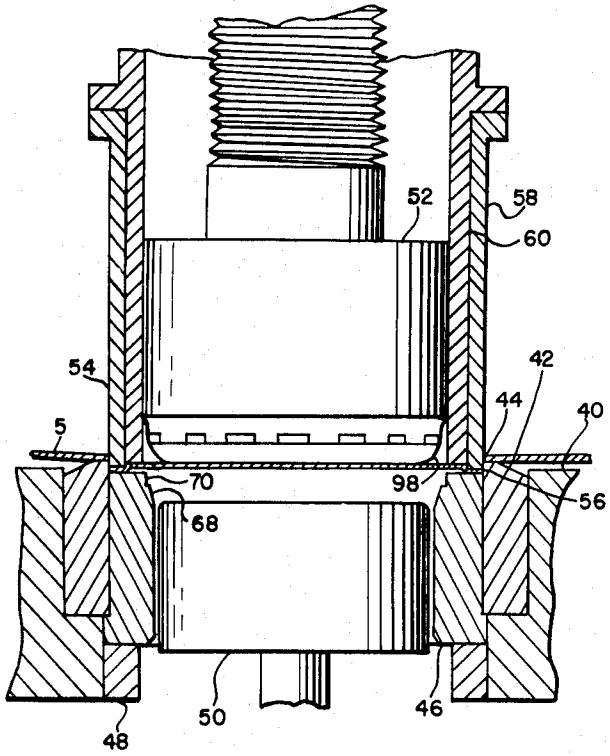


FIG. 8.

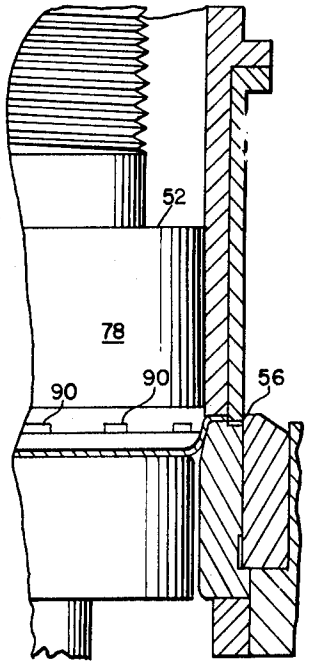
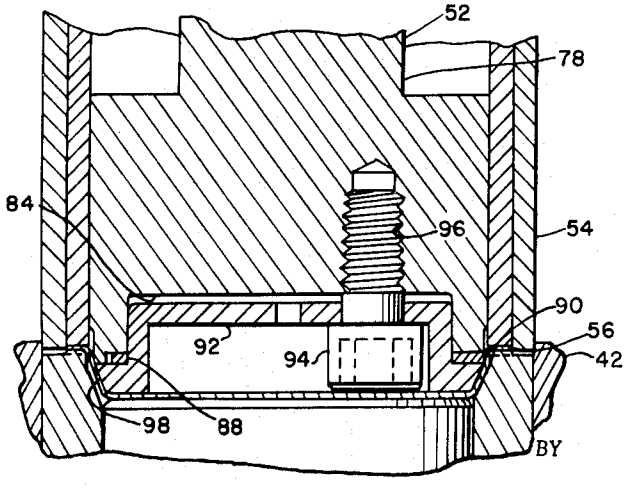


FIG. 9.



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CONTAINER CLOSURE FORMING APPARATUS AND METHOD

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FIG. 10.

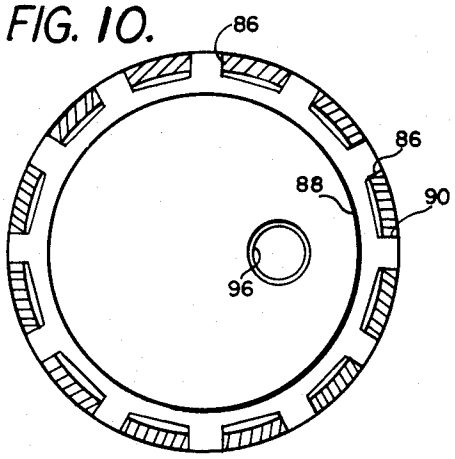


FIG. 13.

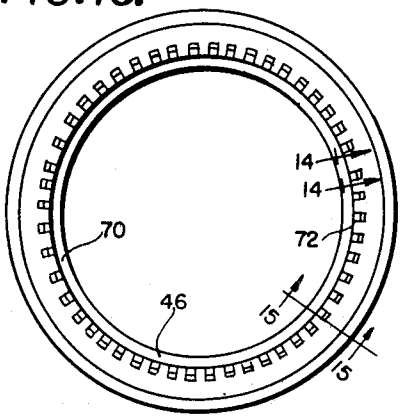


FIG. 16.

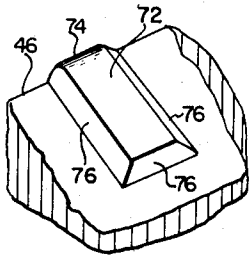


FIG. 11.

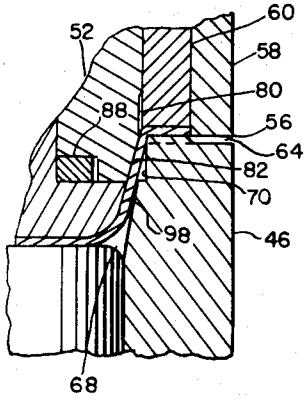


FIG. 14.

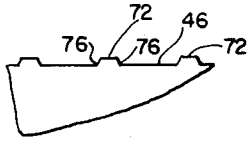


FIG. 15.

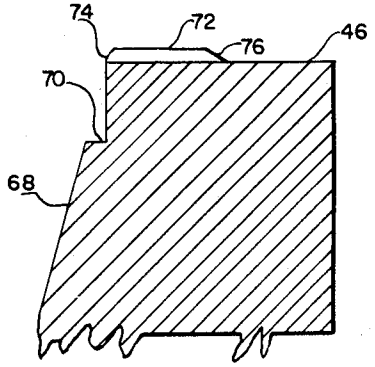
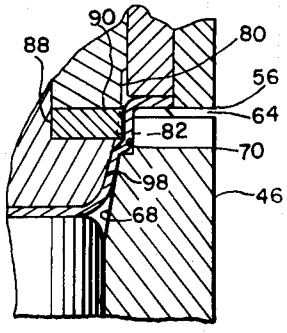


FIG. 12.



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United States Patent Office 3,258,954 Patented July 5, 1966

3,258,954

CONTAINER CLOSURE FORMING APPARATUS AND METHOD

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Original application Nov. 13, 1959, Ser. No. 852,652. Divided and this application Nov. 24, 1961, Ser. No. 154,751

20 Claims. (Cl. 72—294)

This is a division of my copending application Serial No. 852,652 filed November 13, 1959, now abandoned, for Container Closure, and is directed to novel apparatus and methods for forming the closures claimed in said application.

This invention relates to apparatus and methods of forming container closures of the type adapted to be applied over the openings in thin-walled glass containers such as bottles and the like for packaging milk, fruit juices and similar liquids. These closures are usually stacked in nested relation in an automatic closure applying apparatus of the type shown in Dennis Patents No. 2,518,294 and 2,533,437. The closure is attached over the open mouth of the bottle by deforming the skirt flange downwardly in close conformity to the sealing bead of the bottle.

It is the major object of the invention to provide a novel apparatus and method for forming special closure member from a sheet of ductile material, such as laminated paper and metal foil, comprising special die structures and methods.

These and other objects of the invention as well as advantages and inherent functions will become more apparent as the invention is more fully understood from the following specification, claims and accompanying drawings wherein:

FIGURE 1 is a top plan view of a closure in accordance with the present invention;

FIGURE 2 is a side elevational view of the closure of FIGURE 1;

FIGURE 3 is an enlarged vertical sectional view of a plurality of closures of the present invention in nested relation in a stack;

FIGURE 4 is an elevational view of a pair of closures of the prior art and having a sloping or tapered skirt, the view illustrating a difficulty obviated by the present invention;

FIGURE 5 is an enlarged fragmentary sectional view taken on the line 5—5 of FIGURE 1;

FIGURE 6 is an enlarged fragmentary sectional view similar to FIGURE 5 but taken on the line 6—6 of FIGURE 1;

FIGURE 7 is a sectional view partly in elevation showing the cutting punch, cutting die, draw punch and draw die at the conclusion of the cutting operation and just prior to the drawing operation;

FIGURE 8 is a fragmentary view on a scale slightly larger than FIGURE 7 but showing the successive drawing operation;

FIGURE 9 is an enlarged fragmentary sectional view showing the details of the draw punch with its removable insert ring for forming lugs on the closure;

FIGURE 10 is a bottom plan view of the insert ring in position on the draw punch with the cap of the draw punch omitted for the purpose of clarity;

FIGURES 11 and 12 are enlarged fragmentary sectional views showing the drawing operation of the draw punch and its removable insert ring;

FIGURE 13 is a plan view of the draw die;

FIGURE 14 is an enlarged fragmentary view taken on the line 14—14 of FIGURE 13;

FIGURE 15 is an enlarged fragmentary view taken on the line 15—15 of FIGURE 13;

FIGURE 16 is an enlarged fragmentary perspective view of one of the corrugating lugs on the draw die.

The closure of the present invention as shown in FIGURES 1 to 3 is a cap 10 which may be made from a laminated sheet consisting of a metal layer 12 such as aluminum foil or the like and a paper layer 14 adhesively united thereto as is well known in the prior art. The cap 10 comprises a flat circular top 16, a depending tapered skirt 18 and a substantially horizontally extending flange 20. In the form shown in FIGURES 1 to 3 and 5, the cap is preformed to this configuration and is, thus, referred to as a partially prefromed cap. In other words, when the cap is manufactured and sold to the dairy, it is in the shape shown in the above-mentioned figures. After being partially preformed, the caps are packaged in tubes in nested relationship to each other and shipped to the dairy. Stacks of caps such as shown in FIGURE 3 are received in a feed magazine of a container closing machine of the type shown in the afore-mentioned Patent Nos. 2,518,294 and 2,533,437. The machine strips a cap from the bottom of the stack and applies it to the mouth of a bottle by a final forming operation which consists of deforming the horizontal flange 20 downwardly in close conformity to the sealing bead of the bottle to thereby seal the cap thereon.

The configuration of the cap is such as to provide for easier stacking of the caps in nested relationship with the caps being accurately controlled to prevent them from tilting or cocking relative on another.

Referring now to FIGURE 4 which shows a prior art cap 22 having a tapered skirt 24 and a horizontal flange 26, it will be noted that this type of cap can be stacked in a nested relationship because of the tapered skirt 24. However, when a great number of such caps are placed in a stack there is always the tendency of one cap tilting or cocking with respect to another cap and such a situation results in jamming of the container closing machine which must pick off the bottom most cap of the stack and apply it to a container. In other words, when such a condition occurs as shown in FIGURE 4, the lower cap 22 may be wedged into the upper cap 22 and the finger which picks the lower cap off may also remove the upper cap so that both caps are applied to the bottle. Of course, if two caps are applied to the bottle, the portion of the closing machine conforming the horizontal flange of the cap to the sealing bead may not be able to form the cap with a proper seal. A condition as shown in FIGURE 4 may also result in jamming of the container closing machine should the pick off finger engage the lower cap and the upper cap at a point where their horizontal flanges are in close contact with one another. In the high speed capping of containers, such conditions must not occur as it slows down the production line and causing an increase in the operating cost.

Referring now in more detail to the cap 10, the flat circular top 16 is connected to the tapered skirt 18 by a gently rounded circular marginal portion 28 which is shaped in cross section to conform to the standard cross sectional curve of the locking bead of a bottle. The skirt 18 depends downwardly and outwardly and in effect is substantially a frustum of a right circular cone. By controlling the slope or taper of skirt 18, the caps 10 when nested in a stack as shown in FIGURE 3 will have their horizontal flanges 20 separated or spaced apart from one another a sufficient distance to permit the pick-off finger of a container closure machine to enter therebetween and pick off the lower most cap. The angle of taper is so controlled that the inside diameter of the skirt 18 substantially at an imaginary circular line 17 of junction between the skirt 18 and the flange 20 is equal

to the outside diameter of the skirt **18** in a plane parallel to a plane through the top **16** at a point substantially above the horizontal flange **20**. This results in one cap **10** being supported on another cap **10** at a point A, FIGURE 3, with the flanges **20** of the caps separated a vertical distance substantially equal to the vertical distance between the imaginary circular line **17** of junction and the afore-mentioned outside diameter of the skirt which is equal to the inside diameter of the skirt at the circular line of junction.

Although the provision of the cap **10** with the frusto-conical shaped skirt **18** provides for spacing between flanges **20** of adjacent caps when in nested position, the present cap contemplates the provision of additional means to prevent one cap from tilting or cocking with respect to another cap. As clearly shown in FIGURES 1, 2 and 3, the cap **10** is provided on its skirt **18** with a plurality of circumferentially spaced arcuate lugs **30**. The lugs **30** which are formed in the wall of the skirt and extend vertically upwardly from the imaginary line **17** of junction between the skirt **18** and the flange **20** provide an offset shoulder **32** substantially equal to the thickness of the material of the cap. The shoulder **32** extends outwardly of the outer surface of skirt **18** at a vertical height above the circular line **17** of junction of the skirt and flange no greater than the vertical distance between flanges **20** of caps **10** stacked in nested relationship to each other. In other words, the shoulder **32** is slightly below the outside diameter of the skirt **18** which is substantially equal to the inside diameter of the skirt at the circular line **17** of junction.

By accurately controlling the position of the offset shoulder **32** of the lugs **30** the caps **10** may be nested in a stack with the shoulders **32** of one cap being positioned immediately below the horizontal flange of the cap nested thereabove. It is not necessary for the shoulder to touch the bottom of the flange **20** on a cap immediately thereabove because as previously explained, the frusto-conical shape of the skirt **18** provides for the support of one cap on the other. The shoulder **32** of lug **30** prevents a cap nested immediately thereabove from cocking with respect to the cap therebelow as the shoulder will abut the lower surface of the flange **20** of the cap thereabove should there be a tendency of one cap to tilt. The provision of lugs **30** thereby maintains the caps in proper orientation to each other whereas the angle of taper of the skirt maintains a proper distance between flanges of the cap when nested in a stack.

As is shown in FIGURE 1, the lugs **30** are preferably circumferentially spaced apart no greater than 30° to insure effectiveness of the lugs in preventing the caps from tliting. Such spacing also makes the drawing operation easier to perform. In addition, it will be noted that each lug **30** must have a width sufficient to span the space between a corrugation on the skirt **18** as well as the corrugation on the flange **20** so that the corrugations do not interfere with the function of the lugs, namely, to prevent the caps from tilting or coking when in nested relationship to each other.

Referring now to FIGURES 1, 5 and 6, it will be noted that the horizontal extending locking flange **20** is connected to the lower edge of the skirt **18** at the imaginary circuular line **17** of junction. The locking flange **20** includes a plurality of horizontal and radially outwardly projecting substantially straight line sections **34** and a plurality of immediate sections **36** deflected downwardly therefrom, the sections **34** and **36** defining radial corrugations extending inwardly of the circular line of junction. FIGURES 5 and 6 which show the corrugations in exaggerated section for purpose of description, also show that the depress sections **36** extend from the line of junction **17** upwardly on the skirt **18** and fade into the wall thereof as indicated at **38**. Since the cap is formed by a draw die and draw punch, the depress sections **36** which are in the skirt **18** will form slight projections or axially extending ribs **40** on the inner surface of the skirt. The provision of corrugations on the flange is necessary in locking the flange about the sealing bead of a bottle and the extension of the corrugations upwardly on the skirt assist and provide a better seal between the skirt **18** and the sealing bead of a bottle as ribs **40** hold the cap tightly on the bottle. The skirt **18**, by being tapered as shown in FIGURE 2, provides an excellent means of obtaining greater conformity of closure to the contour of the sealing bead of a bottle when the closure is applied resulting in a positive seal. Ribs **40** also add utility to the cap after it is first removed from a bottle as they increase the resealability of the cap on the bottle.

Referring now to FIGURES 7 to 16 inclusive, a preferred form of draw punch, draw die, cutting punch and cutting die is disclosed. The entire press apparatus is not disclosed as such apparatus is fully shown in FIGURE 7 of the Dennis Patent 2,605,730, it being understood that the die and punch elements particular to the present invention could be utilized in the press of the prior art.

In more detail, a bed **40** is adapted to support a circular cutting die **42** in a fixed position with respect thereto, the cutting die **42** having its cutting edge **44** spaced slightly above the surface of the bed. A circular draw die **46** is mounted interiorly of the cutting die in a fixed position with respect thereto by means of a retaining ring **48** carried in the bed. A knockout pad or spindle **50** is positioned within the drawing die **46** and is adapted for vertical reciprocation in synchronization with a draw punch **52** and a cutting punch **54** as is well understood in the metal drawing art. The cutting punch **54**, having a cutting edge **56**, cooperates with the cutting die edge **44** to first cut out of a sheet S of material a circular blank or disk as shown in FIGURE 7. The cutting punch **54** is made from two concentric elements **58** and **60** fixed with respect to each other. The outer element **58** has its lower end projecting down beyond the lower end of the inner element **60**. As will be noted in FIGURE 7, the lower end of the member **58** provides an annular flat face for clamping the marginal portion of the circular blank or disk to the draw die just prior to the drawing operation. In other words, when the cutting punch descends to the full limit of its travel the outer peripheral area of the severed blank is clamped between the lower annular face of the member **58** and the outer upper annular face of the draw die **46**. Mounted centrally of the cutting punch **54** is the draw punch **52** which is adapted for vertical movement into engagement with the clamped circular blank or disk to thereby form the cap therefrom.

As shown in FIGURE 7, the draw punch **52** has just descended into engagement with the blank or disk cut from the sheet material S and is ready to begin the cap drawing operation. Referring now to FIGURE 8, it will be noted that the draw punch **52** has decended vertically downwardly from its position in FIGURE 7 and has formed the cap by drawing the marginal edges of the cap inwardly from between the cutting punch and draw die **46** as indicated at **64** in FIGURES 11 and 12.

The draw die **46** is provided with a tapered surface **68** which defines the taper skirt **18** of cap **10** as well as an annular cutout portion **70** necessary for the forming of the lugs **30** and corrugations on the skirt **18**. On the surface of the draw die **46** which opposes the cutting punch **54** there is provided a plurality of radially extending lugs or ribs **72** which are used to form the corrugations in the cap **10**. The ribs **72** extend from the inner edge of the draw die **46** radially outwardly and terminate short of the outer edge. The surface between the ribs or lugs **72** and surrounding the outer ends of the lugs **72** is flat and not relieved and, therefore, when the cutting punch **54** cuts a blank and clamps the blank in place on the draw die, the outer edge of the blank is depressed so that when the blank is drawn and contracted by actuation of the draw

punch 52, the sheet material of the blank is forced to flow over and around the ribs 72, thus making a positive formation of each corrugation on the cap. Since there is an annular cutout portion 70 on the draw die as indicated in FIGURES 11 and 12, when the cap skirt 18 contracts during the drawing operation, the corrugations formed by the ribs 72 will remain on the portion of the blank which eventually forms the skirt 18. As shown in FIGURES 14 and 16, each of the ribs or lugs 72 is rounded as indicated at 74 adjacent its inner end whereas its sides are bevelled as shown at 76.

The details of construction of the draw punch 52 are important in that their simplicity of design makes the draw punch capable of extended usage with nominal wear whereas the one piece draw punches used in the past were extremely difficult to make and expensive to replace. The draw punch 52 includes a body portion 78 which is adapted to be threaded onto a vertically reciprocating head. The body portion 78 is provided with an annular recess 80 having its lower end merged to a tapered surface 82 complementary to the tapered surface 68 of the draw die. A center circular depression or well 84 is provided in the lower end of the body 78. A plurality of radially extending and circumferentially spaced slots 86 and provided in the lower end of the body member 78, the slots 86 being capable of receiving outwardly extending fingers 90 of an insert ring 88. The ring 88 is held in position by a cap member 92 which has its center portion complementary to the depression 84 in the end of the body 78. A suitable stud 94 passing through the cap member 92 and threaded into the threaded hole 96 retains the cap member and insert ring in place on the body portion 78. The cap member 92 is provided with a tapered surface 98 which is an extension of the tapered surface 82 on the body member and is adapted to assist in the formation of the skirt 18 of the cap 10.

As will now be evident, the insert ring 88 which has its fingers 90 extending outwardly of the surfaces 82 and 98 as best shown in FIGURE 12 is adapted to form the lugs 30 in skirt 18 of the cap 10. FIGURE 11 shows a radial sectional view through the draw punch 52 in-between a pair of spaced fingers 90, clearly discloses the formation of the skirt 18 of cap 10. By providing a removable insert ring 88, the life of the draw punch 52 is materially increased as heretofore mentioned. The main wear of the draw punch 52 takes place on the edge of the finger 90 forming the lugs 30 of the cap. When this edge is worn, the insert ring 88 may be removed and reversed to utilize the other edge of the fingers 90 for forming the lugs on the caps.

As will now be understood, the cap is formed from sheet material, the configuration of the cap being such that the method of and the apparatus for making the cap are more simple and less expensive than previous methods and apparatus used. Further, the cap by the provision of a tapered skirt 18 provides for a space between flanges of adjacent caps when the caps are nested so that the caps may be easily picked off by a pick-off finger of a cap applying machine. Additionally, the provision of lugs 30 on the skirt 18 of the cap 10 controls the nesting of the caps in such a manner that the caps are positively prevented from tilting or cocking with respect to one another, thus, insuring proper feeding of the caps to bottles in the cap applying machine. The type of corrugations provided on the cap flange as well as on the skirt of the cap insure a positive seal with the sealing bead of a bottle when the cap is applied thereto as well as when the cap is resealed on the bottle.

Having set forth the nature, objects and advantages of the invention, it will also be obvious from the description of the invention that the same is susceptible to some changes and modifications without departing from the principle and spirit thereof. For this reason, the terminology used in the specification is merely for the purpose

of description and not limitation, the scope of the invention being defined in the claims.

What is claimed and desired to be secured by United States Letters Patent is:

1. Apparatus for forming a container closure of the type having a top, a depending annual skirt and a radial flange at the bottom of the skirt, comprising a support, a cutting die on said support having a fixed cutting edge, a draw die fixedly mounted within said cutting die and having an upper surface, a cutting punch mounted above said cutting die for movement toward and away from said cutting die and having an outer peripheral cutting edge adapted to coact with said cutting edge of the cutting die to sever a closure blank from sheet material overlying said cutting die, a draw punch mounted above said draw die for movement toward and away from said draw die, means providing a substantially radially ribbed draw surface around the inner periphery of said draw die, means also providing an upwardly open circumferential depression around the upper part of said draw surface, means for clamping the outer periphery of the severed blank prior to drawing of said blank, means for moving said draw punch toward said draw die for forming said closure, and means providing a series of circumferentially spaced radial projections on said draw punch correspondingly located relative to said depression, so that when said draw punch descends after the blank has been cut the draw punch engages the blank to force it in forming relation over said draw surface with said ribbed surface forming corrugations in the closure flange and said projections cooperating with said depression for forming circumferentially spaced lugs in the closure skirt.

2. In the apparatus defined in claim 1, said draw die surface depression means being located to intersect the inner peripheral edge of the draw die upper surface.

3. In the apparatus defined in claim 1, said draw die surface being tapered inwardly and downwardly from the said depression.

4. In the apparatus defined in claim 3, said draw punch having a tapered surface corresponding to said draw die surface and extending above and below said projections.

5. Apparatus for forming a container closure of the type having a top, a depending annular skirt and a radial flange at the bottom of the skirt comprising a support, a cutting die on said support having a fixed cutting edge, a draw die fixedly mounted within said cutting die and having an upper surface comprising an annular outer region disposed at a lower level than the cutting die edge and an annular inner region disposed at a higher level than said outer region, a cutting punch mounted above said cutting die for movement toward any away from said cutting die and having an outer peripheral cutting edge adapted to coact with said cutting edge of the cutting die to sever a closure blank from sheet material overlying said cutting die, said cutting punch having annular outer flat end region corresponding to and aligned with said outer cutting die region and an inner annular flat region aligned with and corresponding to said cutting die inner region disposed at a higher level than said outer cutting die region, a draw punch mounted above said draw die for movement toward and from said draw die, means providing a substantially radially ribbed draw surface around said inner annular surface region of said draw die, said outer annular regions of said cutting punch and cutting die cooperating to clamp the outer periphery of said severed blank prior to drawing, means for moving said draw punch toward said draw die for forming said closure, means also providing an upwardly open circumferential depression around the upper part of said draw surface, and means providing a series of circumferentially spaced radial projections on said draw punch correspondingly located relative to said depression, so that when said draw punch descends after the blank has been cut the draw punch engages the blank to force it in forming relation over said draw surface with said ribbed surface

forming corrugations in the closure flange and said projections cooperating with said depression for forming circumferentially spaced lugs in the closure skirt.

6. In the apparatus defined in claim 5, the difference in level between the inner and outer regions of both the draw die and the cutting die being substantially equal to the thickness of the sheet material being formed.

7. A draw punch for forming container closures comprising a body member and a cap member removably axially secured together, means forming an annular tapered end surface extending over adjacent portions of both of said members, and means separable from each of said members clamped axially between said members providing a circumferentially spaced series of substantially radial projections from said surface.

8. A draw punch comprising a body member, a cap member axially secured thereto, and a removable insert ring axially clamped between said members, said members providing a tapered annular surface adjacent said ring, and a circumferential series of projections on said ring extending substantially radially from said surface.

9. In the draw punch defined in claim 8, one of said members being formed with an end recess for receiving said ring and a series of radially extending circumferentially spaced slots through which extend said ring projections.

10. The draw punch defined in claim 8, wherein said ring is flat sided and symmetrical so as to be reversible.

11. Apparatus for forming a container closure of the type having a top, a depending annular skirt and a radial flange at the bottom of the skirt comprising a fixed cutting die having a continuous cutting edge, a draw die fixedly mounted within said cutting die and having an upper surface, a cutting punch mounted above said cutting die for movement toward and away from said cutting die and having an outer peripheral cutting edge adapted to coact with said cutting edge of the cutting die to sever a closure blank from sheet material overlying said cutting die, a draw punch mounted above said draw die for movement toward and from said draw die, means providing a substantially radially ribbed draw surface around the inner periphery of said draw die, means also providing an upwardly open circumferential depression around the upper part of said draw surface, cooperating means on the cutting punch and draw die for clamping the outer periphery of said severed blank prior to drawing of said blank, means for moving said draw punch toward said draw die for forming said closure, and means providing a series of circumferentially spaced radial projections on said draw punch correspondingly located relative to said depression, so that when said draw punch descends after the blank has been cut the draw punch engages the blank to force it in forming relation over said draw surface with said ribbed surface forming corrugations in the closure flange and said projections cooperating with said depression for forming circumferentially spaced lugs in the closure skirt.

12. Apparatus for forming a container closure of the type having a top, a depending annular skirt and a radial flange at the bottom of the skirt, comprising a support, a cutting die on said support having a fixed cutting edge, a draw die fixedly mounted within said cutting die and having an upper surface, a cutting punch mounted above said cutting die for movement toward and away from said cutting die and having an outer peripheral cutting die to sever a closure blank from sheet material overlying said cutting die, a draw punch mounted above said draw die for movement toward and from said draw die, means providing a substantially radially ribbed draw surface around the inner periphery of said draw die, means also providing an upwardly open circumferential depression around the upper part of said draw surface, and means providing a series of circumferentially spaced radial projections on said draw punch correspondingly located relative to said depression, so that when said draw punch descends after the blank has been cut the draw punch engages the blank to force it in forming relation over said draw surface with said ribbed surface forming corrugations in the closure flange and said projections cooperating with said depression for forming circumferentially spaced lugs in the closure skirt, said draw punch comprising upper and lower members removably secured together and a ring clamped therebetween and said projections being formed on said ring.

13. In the apparatus defined in claim 12, said ring being reversible.

14. Apparatus for forming a container closure of the type having a top, a depending annular skirt and a radial flange at the bottom of the skirt comprising a fixed cutting die having a continuous cutting edge, a draw die fixedly mounted within said cutting die and having an upper surface comprising an annular flat outer region and a radially ribbed annular inner region, with the tops of the ribs lying in a plane disposed at a higher level than said outer region, a cutting punch mounted above said cutting die for movement toward and away from said cutting die and having an outer peripheral cutting edge adapted to coact with said cutting edge of the cutting die to severe a closure blank from sheet material overlying said cutting die, a draw punch mounted above said draw die for movement toward and from said draw die, means providing a substantially radially ribbed draw surface region around the inner periphery of said draw die, said cutting punch having at its lower end an annular flat outer region aligned with the outer region of said draw die and an annular flat inner region aligned with said ribbed annular inner surface region of the draw die and disposed at a higher level than the outer region of said cutting punch, and the blank being clamped at its outer periphery between said outer punch and draw die regions after being severed, means also providing an upwardly open circumferential depression around the upper part of said draw surface, and means providing a series of circumferentially spaced radial projections on said draw punch correspondingly located relative to said depression, so that when said draw punch descends after the blank has been cut the draw punch engages the blank to force it in forming relation over said draw surface with said ribbed surface forming corrugations in the closure flange and said projections cooperating with said depression for forming circumferentially spaced lugs in the closure skirt.

15. Apparatus for forming a container closure of the type having a top, a depending annular skirt and a radial flange at the bottom of the skirt comprising a support having a fixed continuous cutting edge, a cutting punch mounted above said cutting edge for movement toward and away from said fixed cutting edge and having a cutting edge adapted to coact with said fixed cutting edge to severe a closure blank from sheet material overlying said fixed cutting edge, an annular draw die mounted within said fixed cutting edge and having an upper substantially horizontal surface formed with a row of circumferentially spaced upstanding draw ribs adjacent its inner periphery, means forming an annular downwardly and inwardly tapered surface within said draw die, means forming an annular recess in said tapered surface in intersecting relation to said upper surface, and a draw punch mounted for movement from above said draw die toward said draw die to displace said severed blank into said draw die during drawing, said draw punch being formed with an annular tapered surface corresponding to the tapered surface of said draw die and having axially intermediate the upper and lower ends of its said tapered surface a row of circumferentially spaced projections adapted to extend into said recess during said drawing operation, said draw punch tapered surface being substantially continuous except for said projections.

16. In the apparatus defined in claim 15, said draw punch comprising a body member having a bottom member removably secured thereupon and said projections

being formed on a separable ring secured between said members.

17. In the apparatus defined in claim **16**, the interface between said members being formed with a axial recess to receive said ring and slots to receive said projections.

18. In the apparatus defined in claim **16**, the opposite ends of said ring lying in parallel planes so that the outer edges of said projections are sharp corners, said ring being reversible for continued use when the corners wear on one side.

19. A draw punch for forming sheet material comprising a body member, a lower end member removably secured on said body, an annular tapered surface formed on the lower end of said body and extending substantially continuously over adjacent portions of both of said members, and a ring separably secured between said members having a circumferentially spaced row of radial projections projecting through said surface.

20. In a container closure forming apparatus, a fixed draw die surrounded by a stationary continuous cutting edge and having below said edge a horizontal flat annular outer top surface region and an inner row of circumferentially spaced ribs, and a vertically movable punch die mounted above said draw die with its lower outer peripheral edge formed with a cutting edge to coact with

said fixed cutting edge to sever a closure blank from a sheet overlying said draw die, the lower end of said punch die being formed with inner and outer flat annular regions arranged at different elevations with the outer region disposed at the lower level, and said inner and outer regions of the punch die being axially aligned respectively with the inner and outer regions of said draw die.

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