Sept. 10, 1946. L. G. ZESBAUGH 2,407,465

METHOD AND APPARATUS FOR MAKING CAPS OR COVERS

Filed July 8, 1942 3 Sheets-Sheet 1

Fig.-1.

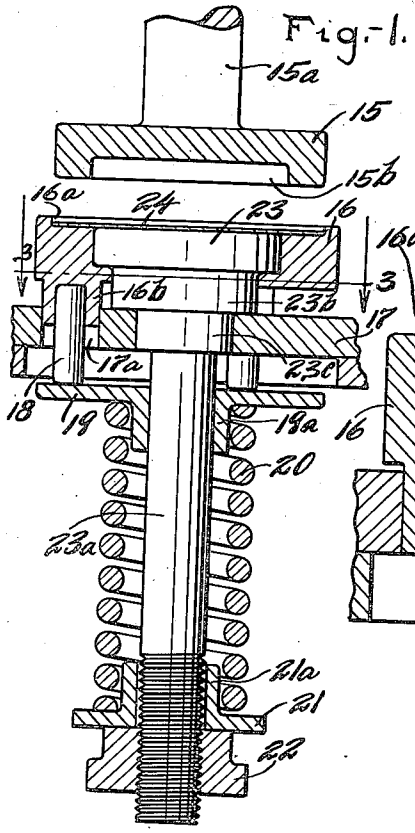


Fig.-2.

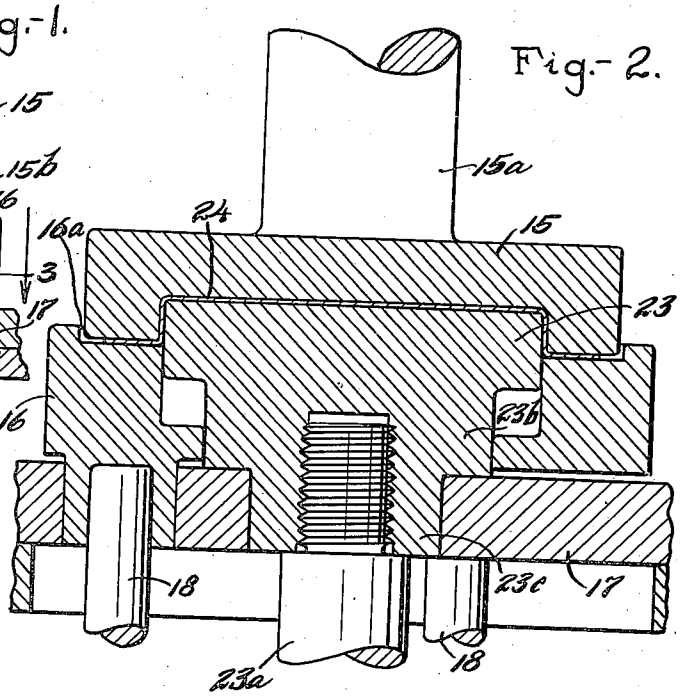
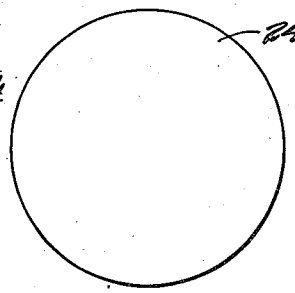


Fig.-4



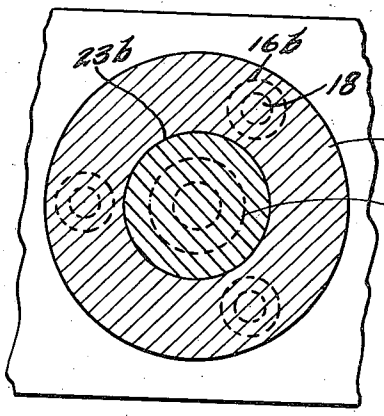


Fig.-3.

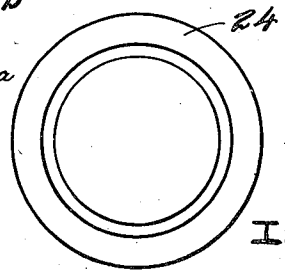


Fig.-5.

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Sept. 10, 1946. L. G. ZESBAUGH 2,407,465

METHOD AND APPARATUS FOR MAKING CAPS OR COVERS

Filed July 8, 1942 3 Sheets-Sheet 2

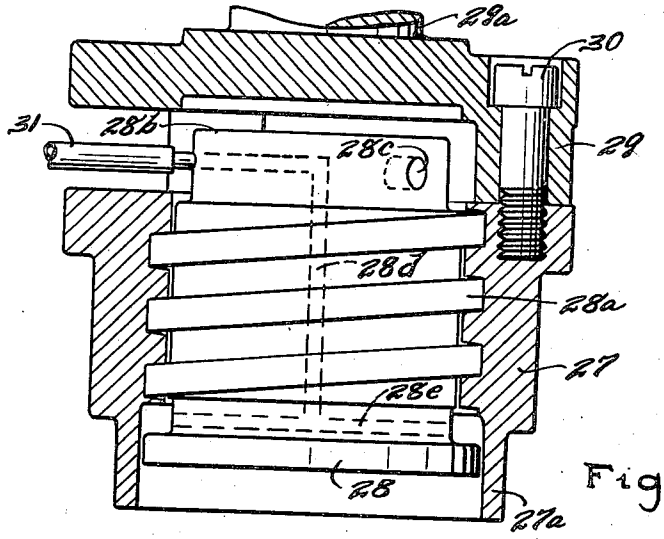
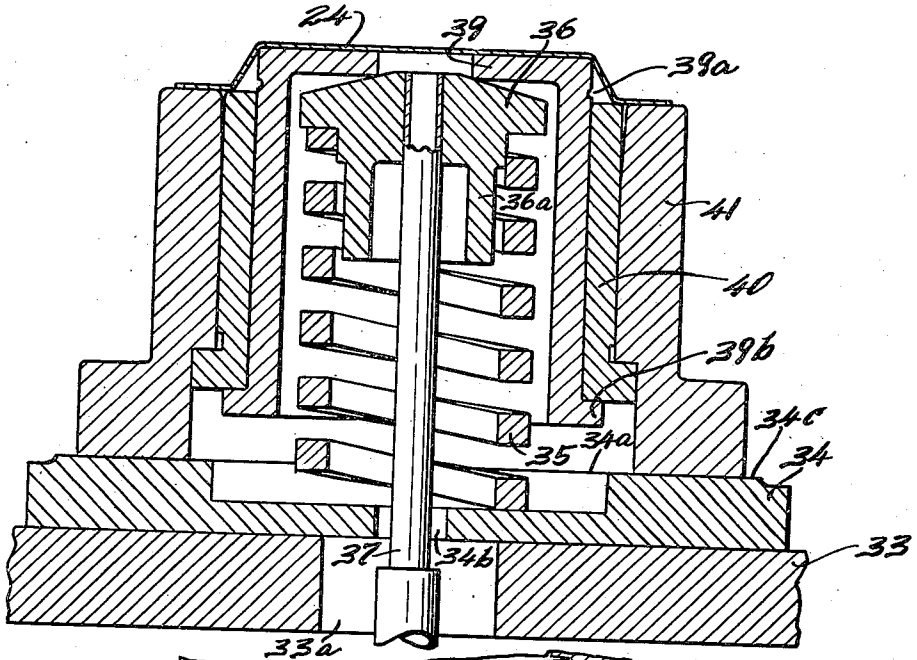


Fig.-6.



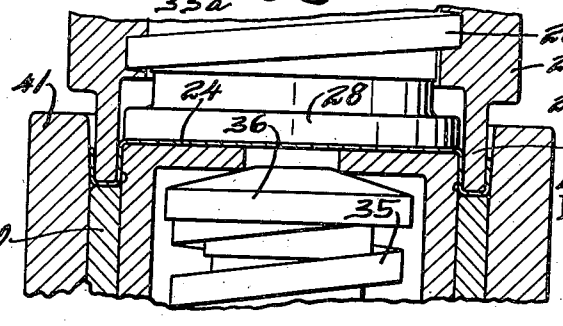


Fig.-7.

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METHOD AND APPARATUS FOR MAKING CAPS OR COVERS

Filed July 8, 1942 3 Sheets-Sheet 3

Fig. 8.

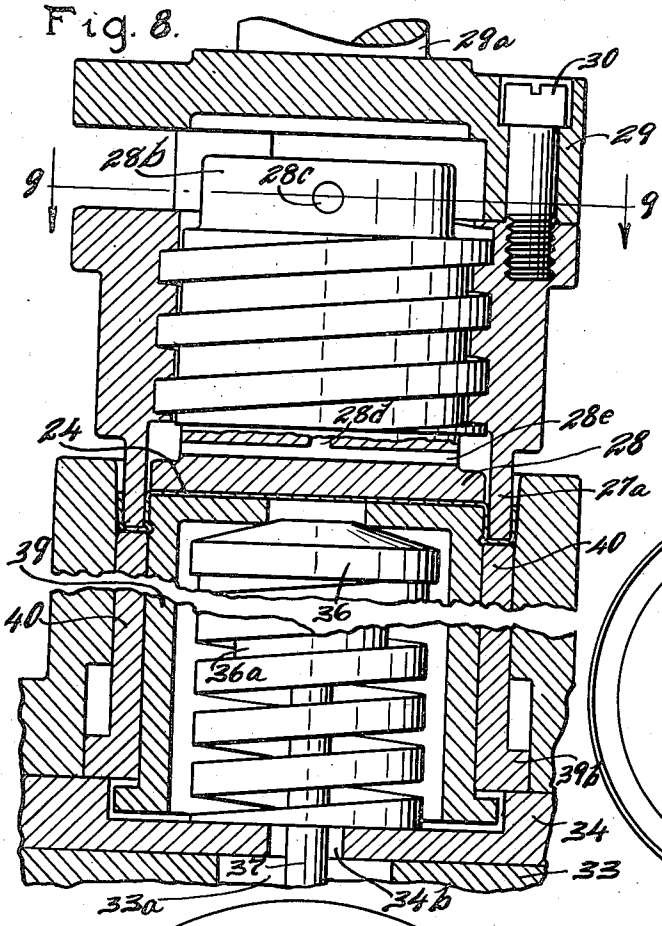


Fig.-9.

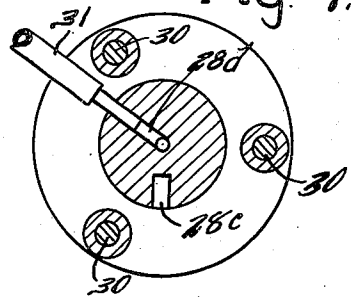
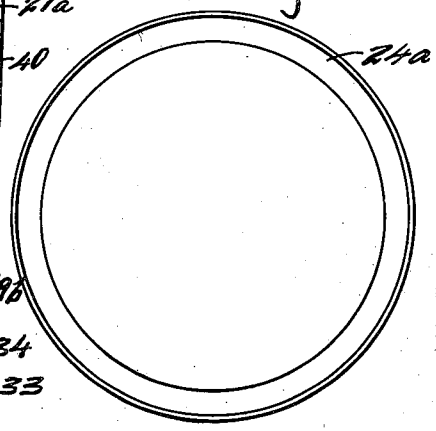


Fig.-10.



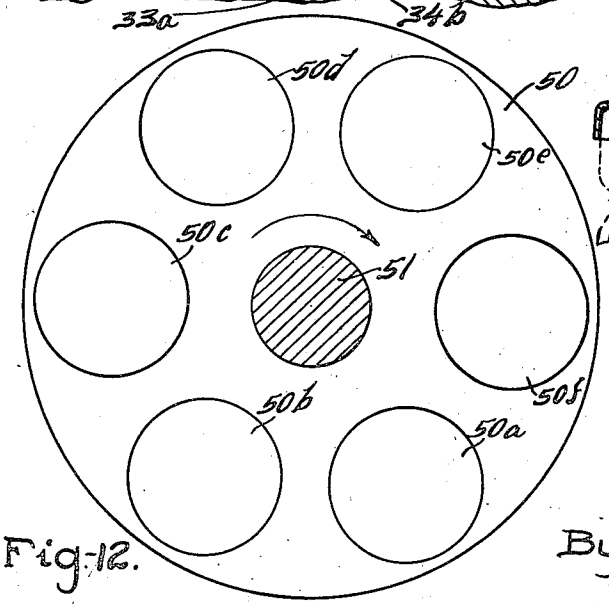


Fig.-12.

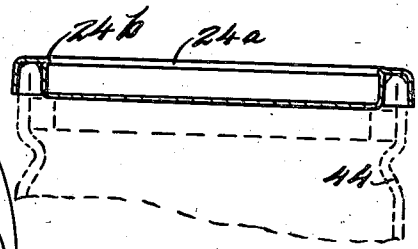


Fig.-11.

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Patented Sept. 10, 1946

2,407,465

UNITED STATES PATENT OFFICE

2,407,465

METHOD AND APPARATUS FOR MAKING CAPS OR COVERS

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Application July 8, 1942, Serial No. 450,140

7 Claims. (Cl. 93—1.3)

1

This invention relates to a method and apparatus for making a cap or cover for a container, and particularly for making a cap or cover for a cylindrical container such as a milk bottle.

It is desirable in a cap for such a container to have one that is sufficiently rigid so that it can be handled and placed on the container without being distorted and one that will fit the container tightly and form a tight closure therefor.

It is also desirable to have a cap or cover which fits along both the inner and outer side of the container.

It is an object of this invention therefore, to provide a method and apparatus for making a cap which is strong and which makes a tight fit on the container.

It is a further object of the invention to provide a method and apparatus for making a cap or cover from a sheet of paper-like material in which the sheet is bent and formed as desired without undue strain or tearing of the material.

It is another object of the invention to provide a method and apparatus for making a cap or cover of paper-like sheet material, which cap or cover will fit closely on the inner and outer sides of the container.

It is more specifically an object of the invention to provide a method and apparatus for making a cap or cover from a sheet of paper-like material adapted to fit a substantially cylindrical container, which cap or cover fits closely on the inner and outer sides of the container top and which is strengthened by a bead or ridge formed about the top thereof.

These and other objects and advantages of the invention will be fully set forth in the following description made in connection with the accompanying drawings in which like reference characters refer to similar parts throughout the several views and in which:

Fig. 1 is a vertical central section through certain dies which are first used;

Fig. 2 is a partial view similar to Fig. 1 shown on an enlarged scale and showing the dies in a different position;

Fig. 3 is a horizontal section taken on line 3—3 of Fig. 1 as indicated by the arrows;

Fig. 4 is a plan view of the blank used;

Fig. 5 is a plan view of the blank after having the first operation performed thereon;

Fig. 6 is a vertical section through certain dies used; the same being shown in open position with the object to be operated on therein;

Fig. 7 is a partial view similar to Fig. 6 showing the dies in closed position;

2

Fig. 8 is a central vertical section through the dies shown in Fig. 6 in a different arrangement and in closed position;

Fig. 9 is a horizontal section taken on line 9—9 of Fig. 8;

Fig. 10 is a bottom plan view of the finished cap;

Fig. 11 is a central vertical section through the cap showing the same on a container which is shown in dotted lines; and

Fig. 12 is a horizontal section illustrating a die and blank carrying turret.

Referring to the drawings an apparatus is shown for carrying out the method of the invention comprising a female die 15 carried on a plunger 15*a* and having a cylindrical recess 15*b* at its underside. Die 15 cooperates with another die 16 having a shallow cylindrical recess 16*a* in its top surface. Die 16 has a depending cylindrical portion 16*b* fitting in openings 17*a* of a stationary frame member 17. Rim 16*b* carries and is supported by a plurality of pins 18 illustrated as three in number, which extend downward through the openings 17*a* and are supported upon a plate 19. Plate 19 has a central hub 19*a* receivable in and substantially fitting within the inner side of a compression coiled spring 20 supported at its lower end upon a plate or collar 21. Collar 21 has a central hub 21*a* fitting within spring 20. A nut 22 engages the lower side of plate 21 and can be adjusted to vary the tension of spring 20. Nut 22 is threaded upon the lower threaded end of a plunger 23*a* secured to a male die 23 having an upper cylindrical portion of a diameter to be received in recess 15*b* and of slightly smaller diameter than said recess. Die 23 fits within a cylindrical recess in member 16 and has a reduced portion 23*b* extending through and below member 16 and resting on frame member 17. A further reduced portion 23*c* fits in and may be secured in frame member 17. Plunger 23*a* depends from portion 23*c*, having a reduced portion threaded thereinto. It will thus be seen that male die 23 is stationary. The recess 16*a* is adapted to have placed therein a flat circular blank 24 from which the cap or cover is made. The first step of the method is carried out in the dies shown in Figs. 1 to 3.

In Fig. 6 an upper die assembly is shown comprising an annular member 27 having a lower annular portion 27a of reduced thickness. Member 27 is internally threaded and a plunger member 28 has a threaded shank 28*a* fitting in member 27. As illustrated, the lower end of plunger 28 is of a diameter slightly less than the inner

liameter of portion 27a and member 28 has a reduced portion between its lower end and the threaded shank 28a. Member 27 is secured to a vertically movable member 29 by a plurality of circumferentially spaced screws 30 shown as having their heads countersunk in member 29. Member 29 is carried on a plunger 29a. Member 29 has a recess in its lower portion adjacent member 27 and member 28 has a cylindrical shank 28b extending into said recess. Shank 28b has a radial hole 28c adapted to receive the end of an operating tool for turning member 28. Member 28 is shown as having a passage 28d of comparatively small diameter extending centrally thereof and the same extends laterally in portion 28b and has connected thereto a pipe or conduit 31. Passage 28d at its lower end communicates with radially extending passages 28e which extend to the outer side of the reduced portion above the lower end of plunger 28. Said upper assembly is adapted to be vertically reciprocated by suitable means attached to plunger 29a. A lower die assembly is also shown in Fig. 6 comprising a stationary frame member 33 through which extends a cylindrical passage 33a. A plate 34 is supported on frame member 33, the same having a central recess 34a in its top side and a central passage 34b of comparatively small diameter extending therethrough. A compression coiled spring 35 has its lower end resting on the bottom of recess 34a and supports at its upper end a member 36 having a frusto conical top surface. Member 36 also has a reduced lower portion 36a received in the upper end of spring 35. A pipe or conduit 37 extends through passages 33a and 34b and is secured in the upper end of member 36, the same having an upper end disposed at the top of member 36. Member 36 supports on its top surface a die 39 having a flat top surface and a cylindrical periphery. Member 39 is hollow or internally bored and members 35 and 36 are disposed within the inner side thereof. Member 39 has in its cylindrical periphery adjacent its top, an annular groove 39a. Member 39 has an annular projection 39b at its lower end forming an annular shoulder or ledge on which is supported an annular member 40. In its normal non-operative position as shown in Fig. 6, the top of member 40 is substantially flush with the top of an outer stationary member 41 within which member 40 fits and within which it is movable with member 36. Member 41 is supported upon a boss 34c on the top of plate 34. The second step of the method of the invention is performed in the die assembly shown in Figs. 6 and 7.

In Fig. 8 another die assembly is shown. While this could be separately made and be an entirely separate unit from the structure shown in Figs. 6 and 7, it may also be formed by the change in the position of the upper die assembly shown in Fig. 6. A tool can be inserted in hole 28c and member 28 rotated through a partial revolution to bring member 28 to a lower position in die 27a. In the embodiment illustrated the structure is the same therefore in Fig. 8 as in Fig. 6, except that member 28 is in a position about $\frac{1}{16}$ of an inch lower than the position it occupies in Figs. 6 and 7.

In carrying out the first step of the method the flat circular blank 24 which is made of rather stiff paper-like material is placed in the recess 16a. Die 15 is then moved downward and the blank 24 is engaged first by the lower annular portion of die 15. As die 15 moves downward

member 16 is depressed and moved downward against the tension of spring 20. The male die 23 remains stationary and the female die 15 therefore, moves downward around the same to the position shown in Fig. 2. The blank 24 is thus molded or formed in the dies as shown in Fig. 2. When die 15 is again elevated the blank due to the resiliency of the material assumes the shape shown in Fig. 6 so that the cup or cup-like portion formed at its central part is of frusto conical form. The blank 24 is now placed in position over the member 39 as shown in Fig. 6. The blank now has a flat annular rim at its outer portion and this rests upon the upper end of member 41. The upper die assembly is now moved downward and annular die 27a descends in line with and centrally of annular member 40. The lower end of plunger 28 engages the top of the blank 24 and holds the same flat against the top of member 39. Members 28 and 27a move downward together and annular member 40 is depressed with members 36 and 39 against the tension of spring 35 so that annular portion 27a moves downwardly within member 41 as shown in Fig. 7. There is sufficient room about annular member 27a when it is within member 41 so that the material can draw downwardly around the lower end thereof without undue strain or tearing to bring the blank to the form shown in Fig. 7. The flat annular rim on the blank has now been turned downwardly to form an annular flange and an annular groove is thus formed about the underside of the blank. Air is supplied through the pipe 31 and passes out through passages 28e and downwardly around the lower die assembly and prevents the blank from being lifted by the upper assembly when the latter is raised.

The third step in the method is performed with the dies in the position shown in Fig. 8. Plunger 28 has been lowered some distance below the position it occupied when the second step of the method was performed on the blank. The blank is now in position with the central cup-like portion fitting over the upper end of member 39. The upper assembly which has been raised is again lowered and the top of the blank is held in flat condition between plunger 28 and the upper surface of member 39. As the upper assembly moves downward members 39 and 40 move downwardly against the tension of spring 35. Member 40 comes to rest seated against the top of the boss 34c as shown in Fig. 8 and this is the same position it occupies when depressed for the second step on the blank. Member 39 however is not stopped but moves downward into the recess 34a as shown in Fig. 8 and it now occupies a position lower than the position it occupies when depressed for the second step. It moves through an additional distance equal to the distance that plunger 28 was lowered by turning thereof. The distance between the top of member 40 and the bottom of member 28 has therefore been reduced and the depth of the blank or cover will thus be reduced. The groove 39a in member 39 is now disposed substantially in line with the top of member 40. When the blank is thus reduced in depth it is compressed and the material is squeezed into groove 39a and this forms a tight or sharp bead or ridge about the lower inside corner of the blank as seen in Fig. 8. This has the effect of stiffening the cover and the outer flange of the blank or cover is again pressed into the dies and ironed so to speak, so that it is pressed firmly into place. The dies shown in Figs. 6 and 7 and in Fig. 8 are

heated so that a good ironing effect is produced. The dies shown in Figs. 1 and 2 have been used in a non-heated condition. When the upper die assembly as shown in Fig. 8, is raised, the blank will be held down on the lower assembly as above described. When the upper assembly has moved upward a blast of air can be turned by a suitable valve through pipe **37** and this lifts and discharges the blank from the lower die assembly. The blank has now been brought to final form and the cap or cover is in finished condition. The outer flange is substantially cylindrical in form although it may have a very slight flare. This would assist in placing and fitting it on top of the container **44** as shown in Fig. 11. The central cup-like portion of the cover fits down tightly within the container **44** so that a seal is obtained at the inner side of the container across the top thereof and at the outer side. The completed cover designated **24***a*, has the bead or rib **24***b* formed at the top of the cup-like depression therein or at the inner corner of the annular channel of the cap. This as stated, stiffens the cap and assists in holding the same in the desired form. A simple and yet very efficient cap or cover has been produced.

In making a machine to produce the covers in large quantities a turret **50** such as shown in Fig. 12, could be used, and this would be revoluble about a central shaft **51** as indicated by the arrow The. circles shown on the figure would represent die assemblies, particularly the lower portion of the die assembly shown in Fig. 1. The turret would be rotated intermittently ⅙ of a revolution. The said turret would be used to perform the second and third operations on the cap. The lower die assembly shown in Figs. 6, 7 and 8 would be located at the circles shown on the turret. At position **50***a* the upper die assembly as shown in Fig. 8, would be located. There would be no upper die at positions **50***c* and **50***f*. At position **50***d* the upper die assembly shown in Figs. 6 and 7 would be located while at position **50***e* the upper die assembly shown in Fig. 8 would be located. The turret **50** would thus movably carry the lower die assemblies and the paper blanks placed thereon while the upper die assemblies would be stationarily located about the turret and co-act with the lower dies as the same come into alignment therewith. The covers in the form shown in Fig. 6 would be placed on the die assembly at the position **50***f*. The turret would then move to bring this into position **50***a*. Here the upper die assembly shown in Figs. 6 and 7 would descend and perform the second operation on the cover. The turret would then move and the cover be brought to the position shown at **50***b*. Here the upper die assembly as shown in Fig. 8 would descend and perform the final operation on the cover. The cover would then be moved by the turret to position **50***c* and here the same would be removed from the dies. Another cover as shown in Fig. 6, would be placed on the lower die and the second and third operations would successively be performed thereon at positions **50***d* and **50***e*. The cover would then be moved to position **50***f* where it would be removed from the dies and another cover as shown in Fig. 6, placed in position. Operators would be located at positions **50***f* and **50***c* and the caps as shown in Fig. 6, would be continuously and successively placed on the lower die assemblies as they stopped at said positions. The upper die located at positions **50***a*, **50***b*, **50***d* and **50***e* would descend simultaneously and all operate on the covers. Several operations would thus be performed at once. The operators removing and placing on new covers at positions **50***c* and **50***f* could work in perfect safety as no upper dies are located at those positions. A very rapid production of the covers would thus be possible.

From the above description it will be seen that I have produced a simple method and apparatus for making a very efficient cap or cover for a container. The successive steps are necessary on the blank in order that it be properly molded and drawn without damage or tearing. It would not be possible to bring the cover to final form with just one operation. The dies are so arranged that the edge of the blank can be drawn in to give the desired bends and shape. The heated dies act to press and iron the cover so that the finished cover is of proper and desired shape and will retain such shape. The covers can be very rapidly produced and constitute a very efficient closure for the container. The cover fits tightly on the container and will not be removed by liquid in the container engaging the same.

The method and apparatus have been amply demonstrated in actual practice and found to be very successful and efficient.

It will of course, be understood that various changes may be made in the form, details, arrangement and proportions of the apparatus and in the steps and sequence of steps of the method without departing from the scope of applicant's invention, which generally stated, consists in a method and apparatus capable of carrying out the objects above set forth, such as disclosed and defined in the appended claims.

What is claimed is:

1. A method of making a cap or cover for a container for food or other material which consists in pressing a circular flat blank of sheet material such as cardboard or comparatively thick paper at its central portion to form a cup therein with a flat circular rim thereabout, then pressing the outer part of said rim into frusto conical shape to form a down turned flange extending for some distance from the top of said cup, thus forming an annular groove around the underside of said cover which groove has substantially parallel sides and which is adapted to receive the top of said container, then compressing said cup vertically and forming a bead or ridge about the top of said cup to stiffen said cover and forming the whole of said outer flange into substantially cylindrical form.

2. A method of making a cap or cover for a container which consists in providing a flat circular blank of paper-like sheet material, pressing a cup-like depression in the central portion thereof, then pressing the entire outer edge portion of said blank to form an outer downturned flaring flange thus forming an annular groove having substantially parallel sides adapted to receive the top of said container, and then pressing said cover to form a sharp bead or ridge about the top of said cup and decreasing the depth of said cup.

3. A method of making a cap or cover for a container which consists in pressing a flat circular blank of sheet material such as cardboard or stiff paper between dies to form a cup-like depression in the central portion thereof, pressing the same between dies to form the entire outer part of said blank into a downturned annular flange thus forming an annular groove having substantially parallel sides, which groove is adapted to receive the top of said container, then pressing the same

between dies to reduce the depth of said cup-like depression and form a sharp bead or ridge about the top edge of said cup and bring said flange into substantially cylindrical form.

4. An apparatus for forming a cap or cover having in combination, means for forming a cup-like depression in the central portion of a flat circular one-piece blank of sheet material, means for turning down a portion of said blank extending from its outer edge inwardly a substantial distance to form an annular flange and thus form an annular groove having substantially parallel sides at the underside of said blank and means for forming a bead or ridge about the top of said cup-like depression or at the inner corner of said groove.

5. The method of making a cap or cover for a container which consists in pressing a one-piece substantially circular blank of paper-like material having considerable resiliency to form a cup-like projection at its central portion with a flat rim thereabout, then pressing said rim including the entire outer portion of said blank into cylindrical form to extend along but spaced from said projection to form an annular groove adapted to receive the top of said container and then pressing said blank to form an inwardly extending pinched bead about the upper inner corner of said annular groove to strengthen said cover.

6. The method of making a cap or cover for a container which consists in pressing a flat substantially circular blank of paper-like sheet material between dies to form a cup-like depression in the central portion thereof, holding the central portion of said blank in flat condition and then pressing the same to form the entire edge portion of said blank into cylindrical form spaced from and extending about said depression to form an annular groove adapted to receive the top of said container and then again pressing said blank to form an inwardly extending sharp bead or ridge about the top inner corner of said groove to strengthen said cover.

7. An apparatus for forming a cap or cover for a container having in combination, means for forming a cup-like depression in the central portion of a flat circular one-piece blank of paper-like sheet material, means for forming the edge portion of said blank into annular form about and spaced from the wall of said depression, thus forming an annular groove adapted to receive the top of said container and means for compressing said blank having therein a small annular depression into which the upper inner corner of said groove is pressed to form a sharp bead or ridge about said corner to strengthen said cover.

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