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G. A. BUTTRESS

2,003,643

BOTTLE CAP FORMER

Filed Feb. 2, 1934

FIG. 1.

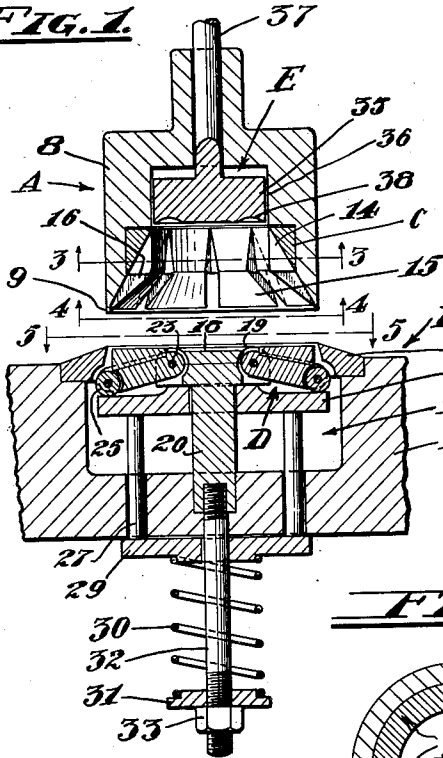


FIG. 2.

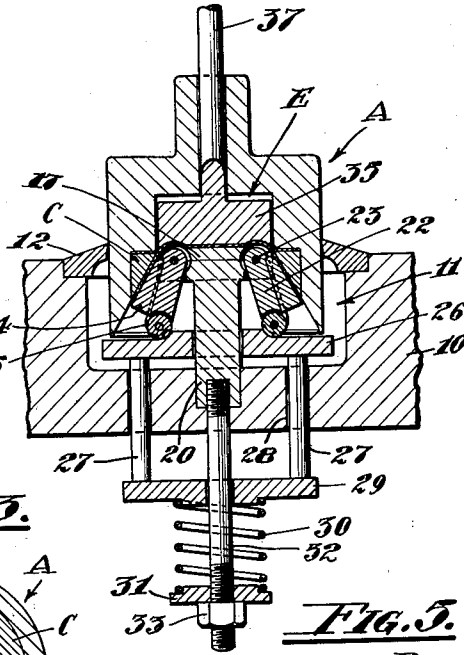


FIG. 3.

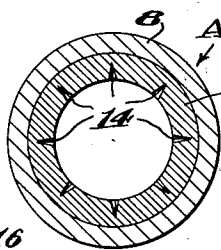


FIG. 5.

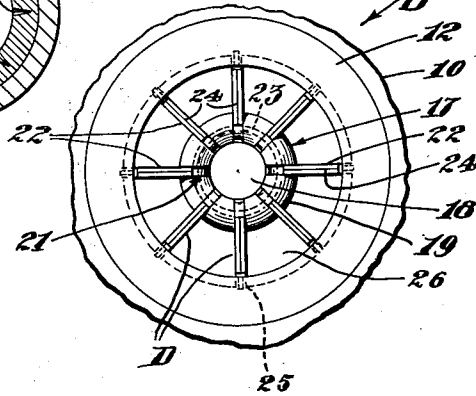


FIG. 4.

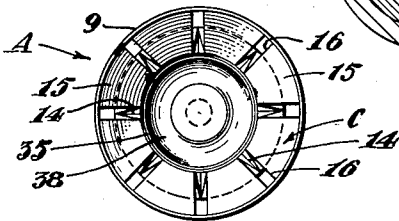
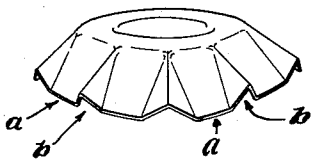


FIG. 6.



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# UNITED STATES PATENT OFFICE

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## BOTTLE CAP FORMER

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Application February 2, 1934, Serial No. 709,478

3 Claims. (Cl. 93—60)

This invention relates to a bottle cap forming mechanism and more particularly pertains to a mechanism for forming bottle caps out of fibrous sheet material of the character set forth in my  
5 co-pending application for United States Patent Serial Number 700,050, filed November 28, 1933.

An object of the invention is to provide a mechanism for forming circular blanks from sheet fibrous material, such as paper, and forming  
10 the blank with a series of marginal folds to form a dished cap adapted to be positioned over the mouth of a bottle and to subsequently have the marginal portion thereof folded inwardly against the sides of the bottle neck and at the same time  
15 provide a series of radially extending webs composed of overlying areas of the marginal portion of the sheet material.

Another object of the invention is to provide a mechanism of the above character which will  
20 function to cut the blank and form it with the requisite folds in a single operation, whereby the caps may be produced rapidly and at a minimum of cost.

Another object is to provide a mechanism of the above character which is simple in construction  
25 and efficient in operation.

With the foregoing objects in view, together with such other objects and advantages as may subsequently appear the invention resides in the  
30 parts and in the combination and arrangement of parts hereinafter described and claimed, and illustrated by way of example in the accompanying drawing in which:

Fig. 1 is a view of the mechanism as seen in  
35 vertical section partly in elevation, and showing the parts in their normal position;

Fig. 2 is a view similar to Fig. 1, but showing the parts in their cap forming position;

Fig. 3 is a detail in horizontal section as seen  
40 on the line 3—3 of Fig. 1 in the direction indicated by the arrows;

Fig. 4 is an inverted plan view as seen on the  
line 4—4 of Fig. 1;

Fig. 5 is a plan view taken on the line 5—5  
45 of Fig. 1; and Fig. 6 is a view in perspective of a cap as formed by the mechanism.

Referring to the drawing more specifically A and B indicates generally the punch and die  
50 members of a combined punching and forming mechanism and between which members a sheet of fibrous material, such as paper, is fed and on operation of the punch and die member a blank is struck from the sheet and formed into a bottle cap of inverted dish shape as shown in Fig. 6;  
55 the blank being formed of circular outline and

being bent to provide an outwardly flared or diverging marginal portion *a* which is crimped to provide a series of spaced pleats *b* consisting of united triangular shaped areas adapted to be  
5 disposed to overlie each other and connected together to form radially extending webs.

The punch member A embodies a cylindrical body portion 8 which is hollow and is formed at its lower margin with an annular punching edge 9 constituting the punching element. The die  
10 member B embodies a body member 10 formed with an upwardly opening recess 11 on the margin of which is mounted a countersunk ring 12 the inner upper margin of which constitutes an  
15 annular die adapted to cooperate with the annular punching edge of the punch A on downward movement of the latter to strike out a circular blank of the sheet material of paper being worked. The annular punch and die members are disposed in axial alignment with each  
20 other.

The interior of the punch is formed with a series of folding elements C and the die member B is provided with a series of crimping elements D formed and arranged to cooperate with the  
25 folding elements C to effect folding and crimping of the marginal portion of the paper blank struck out by the punch. The folding elements C are formed on a ring 14 fitted into the body 8 of the punch member and comprise a series of teeth  
30 arranged with adjacent teeth spaced apart by recesses 16. The center of the recesses 16 extend radially from the center of the annular punching edge 9.

The lower portion of the inner faces of the  
35 teeth 15 lead upwardly from the inner margin of the punch edge 9 from a plane spaced slightly above the lower edge of the punch; such faces projecting on the plane of a truncated cone. The upper portions of the inner faces of the teeth  
40 extend vertically on the plane of a cylinder. The lower portion of the inner walls of the recesses 16 extend on the plane of a truncated cone but at a greater pitch or angle than that of the lower portion of the teeth 15. The sides of the lower  
45 portions of adjacent teeth 15 forming the sides of the recesses 16 extending in parallel while the upper portions of the side margins of adjacent teeth converge toward each other with the side walls of the upper portions of the recesses 16  
50 converging inwardly toward each other and intersecting on the radial central plane of the recess. The upper portions of the recesses are thus formed with triangular shaped side walls.

The cooperating crimping element of the die 55

member B embodies a cylindrical annular head 17 arranged concentric with the circular die 12 and substantially on a plane therewith. The upper face of the head is formed with a central circular recess 18 bordered by a rolled rim 19.

The outer margin of the head 17 is of a diameter slightly less than that of the cylindrical plane of the upper portions of the teeth 15, which latter are thereby adapted to be positioned to collectively encircle the head 17 in spaced relation thereto on downward movement of the punch member.

The head 17 is stationary relative to the die 12, being carried on a stem 20 extending downwardly into the lower wall of the recesses 11 and fixed relative thereto.

The head 17 is provided with a series of radially extending slots 21 in each of which is mounted a vertically swinging arm 22 connected to the head by a pivot 23. Each of the arms 22 carries on its upper edge a crimping member 24 of a cross sectional shape substantially conforming to the cross section of the upper portion of the recesses 16, there being an arm 22 with its associated crimping member 24 for each recess 16. The arms 22 are normally positioned with the upper edges of the members 24 disposed on a plane slightly below the plane of the upper edge of the die 12; the outer ends of the arms being fitted with rollers 25 which seat on a plate 26 encircling the stem 20 beneath the head 17 and which plate is carried on stems 27 extending downwardly through openings 28 in the bottom of the recess 11 and connecting with a plate 29 arranged beneath the die body 10 and normally abutting against the latter under the urge of a spring 30 which bears beneath the under side of the plate 29 and an abutment 31 carried on a stem 32 projecting downwardly from the member 10. The abutment 31 is mounted for adjustment on the stem 32 for varying the tension of the spring 30, it being connected to the stem 32 by screw threads. A lock nut 33 is screwed on the lower end of the screw 32 for retaining the abutment 31 in its adjusted positions.

The punch member A is equipped with an ejector E which embodies a plunger head 35 normally positioned in the cavity 36 formed in the plunger head above the crimping members C and which plunger head is carried on a stem 37 and is mounted for reciprocal movement with the punch member and is adapted to be held stationary for an interval on initial upward movement of the punch member to effect ejection of the formed cap in a manner common in punch and die constructions. The lower face of the plunger 36 is formed with an annular channel 38 of arcuate cross section arranged to coact with the rounded rim 19 on the stationary head 17 to form a central embossment on the top surface of the cap.

In the operation of the invention the punch member A is reciprocated vertically with relation to the die member B in the manner common in punch and die operations. When the punch member is in its uppermost position as shown in Fig. 1, a sheet of paper is placed over the die member whereupon the punch member is moved downwardly so as to cause the punching edge 9 of the punch member to penetrate the paper and pass through the die ring 12. The circular piece of paper thus formed will then be positioned interiorly of the punch member so that on continued downward movement of the latter the marginal portion of the paper will be bent over the

upper edges of the crimping members 24 astride of which the teeth 15 advance as the punch member moves downwardly.

At the same time marginal portions of the paper blank extending between adjacent crimping members 24, together with the portion being crimped will be forced downwardly by the action of the inclined surfaces of the lower portions of the teeth 15; the arms 22 being caused to move downwardly by pressure of the die members through the blank thereon; the arms 22 swinging downwardly and forcing the plate 26 and also the plate 29 in a downward direction in opposition to the spring 30.

Continued downward movement of the punch member to its lowermost position shown in Fig. 2 will cause the portions of the blank bent downwardly by the inclined lower ends of the teeth 15 to assume a substantially vertical position by the action of the vertical upper end portions of the teeth, and at the same time the marginal portions of the blank extending astride the crimpers 24 on the arms 22 will be forced into the upper end portions of the recesses 16 and thereby crimped into pleats of substantially triangular form. At this point of operation the arms 22 will have been swung downwardly and the plunger 35 will be brought to bear upon the upper surface of the central portion of the blank extending over the head 17.

The punch member is then moved upwardly relative to the plunger 35 and restored to its uppermost position; the plunger being held stationary a short interval on initial upward movement of the punch member to effect ejection of the formed cap out of engagement with the teeth of the folding element C. The arms 22, on release of the pressure of the punch member will be caused to move upwardly under the urge of the spring 30 thereby effecting dislodgment of the formed cap from the die and permitting its removal. On ejection of the formed blank it will, by reason of the inherent spring of the paper, expand from the position it assumes when formed by the punch and die, that is, the marginal portion a of the formed blank will spring outwardly and likewise the side portions of the pleats b, crimped by action of the arms 22, will slightly spread apart.

The product thus formed is in readiness for application to the mouth of a bottle which is effected by suitable mechanism, constituting no part of the present invention. It will be understood that in applying the cap to a bottle the side portions of the pleats of the cap will be united together to secure the cap on the bottle against accidental removal.

I claim:

1. In a punching mechanism for forming paper caps for bottles, a circular die, a punch cooperable with said die to punch a circular blank, a head arranged centrally of said die, a series of vertically swinging arms pivotally supported on said head and projecting radially therefrom, yieldable means for normally maintaining said arms in an uppermost position, crimping elements carried on the upper edges of said arms, and means on said punch member for bending the marginal portion of the blank over said crimping elements to form radially extending pleats on the marginal portion of said blank and also to form said marginal portion at an angle relative to the central portion of the blank.

2. In a punching mechanism for forming paper caps for bottles, a circular die, a circular punch

cooperable with said die to form a circular blank, a series of teeth arranged interiorly of said die having inclined lower wall portions and vertically extending upper wall portions, the side walls of said teeth being arranged to provide upwardly and inwardly tapered spaces between the upper portions of said teeth, and vertically movable crimping elements associated with said die cooperable with said tapered spaces for forming radial pleats on the marginal portion of said blank.

3. In a mechanism for forming paper caps for bottles, an annular die, a circular punch associated with said die to form a circular blank, a series of spaced teeth arranged interiorly of said punch formed with upwardly and inwardly inclined lower end portions extending on the

plane of a truncated cone, the inner faces of the upper ends of said teeth extending on a cylindrical plane, the side faces of the upper portions of said teeth inclining inwardly and converging upwardly, a series of radially extending vertically swinging arms associated with said die arranged interiorly thereof and adapted to register with the spaces between said teeth, crimping members carried on the upper face of said arms of angular cross section for cooperation with the spaces between the upper end portions of said teeth to form pleats on the marginal portion of the blank, and yieldable means for normally maintaining said swinging arms in an uppermost position.

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