

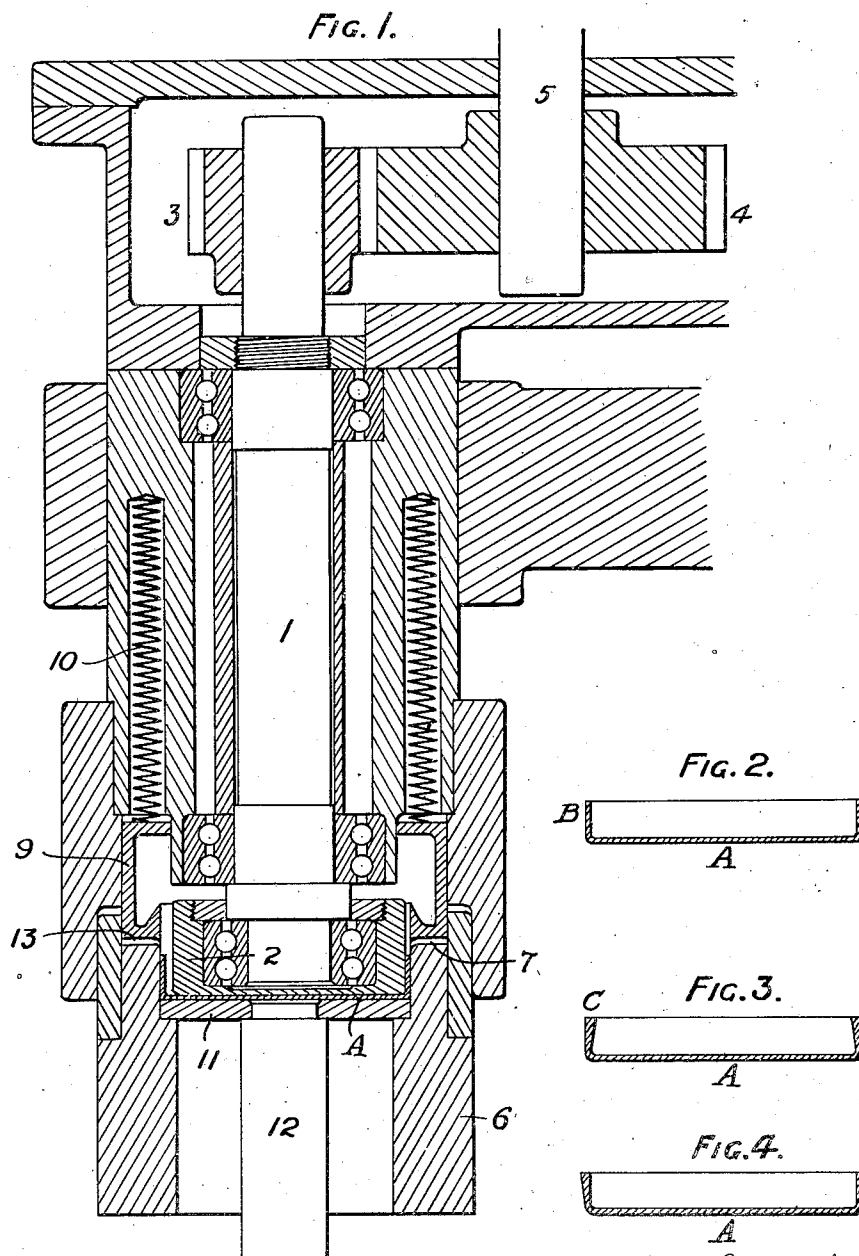
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METHOD OF MANUFACTURE OF FLANGED ARTICLES OF PAPER OR LIKE MATERIAL

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## UNITED STATES PATENT OFFICE

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METHOD OF MANUFACTURE OF FLANGED  
ARTICLES OF PAPER OR LIKE MATERIAL

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4 Claims. (Cl. 93—36)

This invention relates to an improved method of drawing flanged articles of paper or like material, such as boxes, caps or covers, and has for its object to avoid the many difficulties experienced in the present methods of drawing these articles, among which difficulties may be mentioned:—(1) that the pleats or folds in a flange produced by an uncontrolled drawing operation must be homogeneous with the portion of the flange which is not pleated, and this can only be accomplished by pressure, while if the punch and die employed vary sufficiently in size for this purpose the material cannot be drawn down between their operating surfaces without rupturing the flange; (2) that the natural grain of the paper when acted on by the usual arrangement of punch and die is not uniform around the finished article, so that the flange will have a tendency to open out more in one direction than another; (3) in the usual method of drawing these caps or covers the material must contain a certain amount of moisture, usually some form of lubricant to prevent the fracture of the drawn portion or flange during the operation, and the evaporation of this moisture causes variations in the diameter of the finished product, this variation not being uniform either in the article itself or in comparison with others; (4) absorption of moisture by the finished article has a tendency to cause the flange to open out and return to its original position; (5) the folds which are sometimes designedly made to space the material evenly do not unite with the other material of the flange, but on the contrary tend to produce weakened lines which defeat the object and affect the surface of the article, preventing it from making a tight fitting closure when employed for that purpose; and (6) it is often desirable that a container and its cover should both be of the same material, but while the stock used may be perfectly suitable for the manufacture of the container it may not be suitable for drawing to form a flanged cover. These and other disadvantages are all overcome by the method of drawing flanged articles forming the subject matter of the present invention, according to which instead of employing a die and a punch having only a reciprocating movement into and out of the die, and the respective sizes of which correspond approximately with the outer and inner diameters of the flange to be formed on the blank, I propose to use a die into which the material is forced by an eccentrically mounted punch which is smaller than the inner diameter of the flange

to be formed, and may or may not be rotatable in relation to the spindle by which it is carried.

Although I do not wish to confine myself to any special form of apparatus for use in carrying out my invention, a suitable arrangement thereof is shown in Fig. 1 of the accompanying drawing, Figs. 2, 3 and 4 showing caps or covers such as may be made by the improved method.

In Fig. 1 it will be seen that a spindle 1 carries the punch or forming head 2, the end of such spindle on which the punch is mounted being slightly eccentric in relation to the main part thereof. The spindle 1 is continuously rotated by suitable means, such as pinion 3 meshing with gear 4 receiving its motion from a motor shaft 5. A ring or retainer 9 may be arranged to come into contact with the surface of the blank A resting on the top of die 6 before the punch begins to enter the die, to keep the edges of such blank flat and prevent the material from bulging irregularly as it is being drawn into the die, the degree of pressure of the ring 9 on the blank depending on the tension of the springs 10 which act on the upper surface of the ring 9. Notches or teeth 13 in the lower surface of ring 9 co-operate with notches or teeth 7 in the upper surface of die 6 to cause the blank A to be crimped regularly in definite places around the edge to be flanged as it is being forced into the die. In the case of some materials however the ring or retainer 9 and the notches or teeth therein and in die 6 will not be necessary.

Suitable means such as a crank movement must be provided for bringing the die and punch or forming head together and separating them at suitable intervals, and also for placing a blank A in position when they are separated.

The operation of the punch or forming head 2 carried by the continuously rotating eccentric ended spindle 1 is, as it comes into contact with the blank A, to force it into the die 6, the eccentric arrangement causing the punch to make contact with one side of the inner surface of the flange as it is being formed, thus rotating the punch on its spindle, and so gradually as it enters the die to roll out the flange in such a manner that there is no tendency for it to be fractured during the operation. The diameter of the punch 2 being slightly smaller than the inner diameter of the flange to be formed, it will be seen that the possibility of the flange being fractured by being forced into the die (as so often happens when the punch and die are made to leave only the actual thickness of

the material between their operative surfaces) is obviated, as there is room for the material being crimped to enter quite freely into the die at the point opposite to that at which the pressure of the punch is being applied.

It will also be understood that although the greatest pressure is only being applied at one point at any time, yet for every complete revolution of the spindle 1 such pressure will be applied to the entire circumference of the flange of the blank being operated upon.

It has been found in practice that by this method the pressure applied is sufficient to knit the fibres of the paper together so completely that the weakening lines always hitherto present are entirely obviated. The natural grain of the different portions of the flange becomes homogeneous, the displaced fibres being welded together in a new lay so that there is no tendency for the flange to open out or become deformed even by the absorption of moisture or by the drying out of any moisture that may have been in or may be applied to the article.

When the sides of the punch or rolling head are parallel as shown in Fig. 1 a flanged cap or cover such as shown in Fig. 2 will be produced, with the side walls or flange B of equal thickness throughout, but if desired a cap or cover as shown in Fig. 3 may be obtained by the employment of a punch or rolling head of tapering form. In the latter case the extra material which is necessarily present at the outer end C of the flange would instead of being compressed to the same extent as would otherwise be necessary form a clinch to make the article when used as a cap or closure fit more closely onto the container for which it is intended, especially if the latter is made to conform to the shape of the closure. A cap such as is shown in Fig. 4 would be obtained by the use of a die with a tapering inner surface and a straight sided punch, thus disposing of the extra material in a similar way to that of the cap shown in Fig. 3.

An ejecting arrangement such as shown in Fig. 1 may be provided, consisting of a head 11 mounted on a spindle 12. When forming caps such as shown in Figs. 2 and 4 such head may be caused to operate at any time after the punch or rolling head has been retracted, but for caps such as shown in Fig. 3 it would be desirable that the ejector should follow the punch as it moves away until it has left the die, when the cap would be subsequently stripped off the punch by any suitable means.

When it is desired to produce flanged articles of other than circular shape, the die would of course be of the required form for the article, and the punch also of similar form but sufficiently smaller to permit it to enter freely into the die. The eccentric end of the spindle turns freely in the punch, and its eccentricity causes the latter to slide along the sides of the flange being formed on the blank and so impart the desired formation thereto. In this case instead of the rolling action obtained when a circular punch and die are employed to produce a circular article as hereinbefore described, an ironing effect is obtained which will however give substantially the same result.

What I claim is:—

1. The method of making a drawn flanged closure cap, consisting in pressing a blank into a die of less diameter than the blank and thereby forming a flange wall around the blank, maintaining the blank in contact with the bottom of the die and subjecting the said flange to pressure between the wall of the die and the inner side of a localized portion of said flange throughout the entire extent of said flange, so that each portion thereof is successively subjected to such pressure while the blank is held in contact with the bottom of the die.

2. The method of making a drawn flanged closure cap, consisting in forcing a blank of greater diameter than a die into said die, and thereby forming a flange around the blank, holding the blank against the bottom of the die, and while so holding the blank successively subjecting localized portions of the flange to outward radially directed pressure around the entire extent of the flange.

3. Apparatus of the class described, comprising a die, a punch of less diameter than the die, a shaft mounted for rotation and on which the punch is eccentrically mounted, the axis of rotation of said shaft being concentric with the die, and the punch and the die being arranged for relative movement toward and from each other to permit the punch to enter and leave the die, and means active to normally cause the punch to move out from the die.

4. Apparatus as claimed in claim 3, including a ring concentric with the die and normally in contact with the end surface of the wall of the die to grip the blank therebetween prior to the entry of the punch into the die to form a flange around the blank.

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