

Aug. 28, 1962

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3,050,849

METHOD OF COLD FORMING METAL

Filed May 29, 1959

FIG. 1.

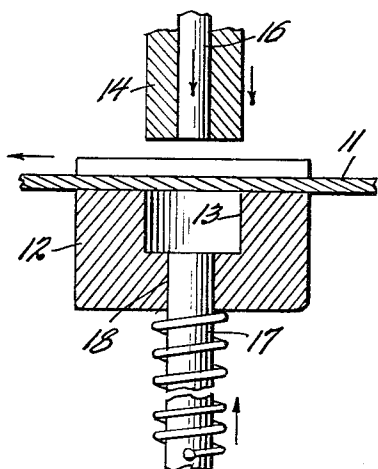


FIG. 2.

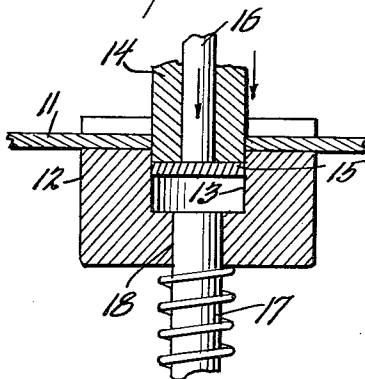


FIG. 3.

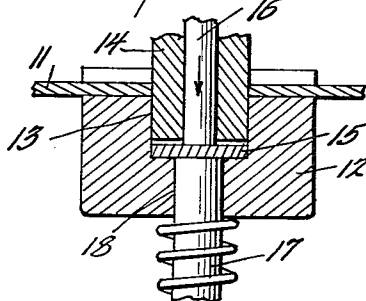


FIG. 4.

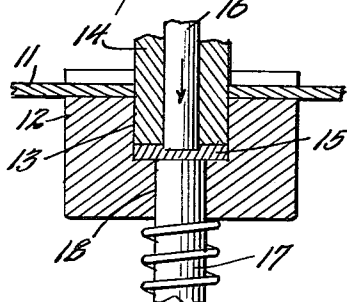


FIG. 5.

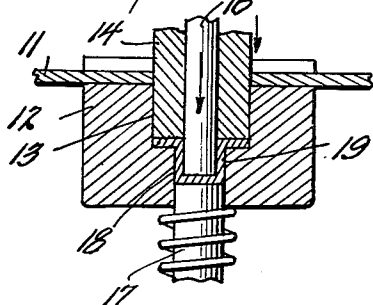
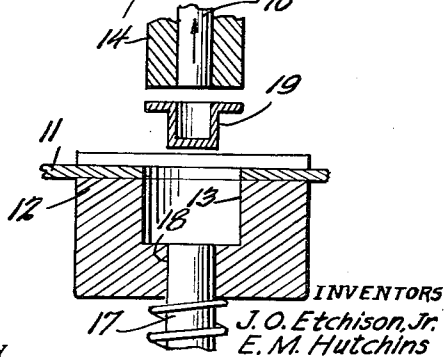


FIG. 6.



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METHOD OF COLD FORMING METAL

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Filed May 29, 1959, Ser. No. 816,976

4 Claims. (Cl. 29—534)

This invention relates to a method of cold forming metal and more particularly to a method of cold forming metal cups.

It is an object of this invention to provide a method of cold forming metal into cups in a continuous operation.

A further object of this invention is to provide a method of cold forming metal into cups during a single forward stroke of a blanking and forming die.

A method of forming cups embodying certain features of this invention may include the steps of inserting a metal disk into a die, depressing the central portion of the disk while simultaneously thickening the marginal portions of the disk, advancing the central depressed portion of the disk to form a cup while simultaneously forcing the metal in the thickened marginal portion of the disk into the side wall of the cup being formed.

Other objects and advantages of the present invention will become apparent from the following detailed description when taken in conjunction with the following drawings, wherein:

FIG. 1 is a cross-sectional view of a press supporting a metal plate in a blanking position;

FIG. 2 is a cross-sectional view of the press showing a metal disk being blanked out of the metal plate and inserted into a forming die by a blanking punch;

FIG. 3 is a cross-sectional view of the press showing the disk as it is bottomed on the forming die by a forming punch mounted within the blanking punch;

FIG. 4 is a cross-sectional view of the press showing the central portion of the disk being depressed and the marginal portion being thickened by the forming punch;

FIG. 5 is a cross-sectional view of the press showing the central portion of the disk as it is advanced by the forming punch; and

FIG. 6 is a cross-sectional view of the press showing the forming punch in a withdrawn position and the metal cup as it is stripped therefrom.

Referring to the drawings, a strip of sheet metal 11, or other like material from which it is desired to form a cup-like receptacle, is shown supported on a rigidly fixed forming die 12 and over a cylindrical die cavity 13 formed in the die 12. A vertically supported cylindrical blanking punch 14 of a diameter slightly less than that of the die cavity 13 is reciprocated by any suitable means, not shown, to blank out a cylindrical disk 15 of any desired diameter, as determined by the diameter of the blanking punch, and force it into the die cavity 13. The diameter of the disk determines the volume of the completed cup.

The blanking punch 14 is stopped before the disk 15 bottoms in the die cavity 13. A forming punch 16, mounted axially with the blanking punch 14 and reciprocated in a continuous stroke at a constant speed corresponding to that of the blanking punch by suitable means, not shown, continues its descent after punch 14 is stopped and bottoms the disk 15 within the die cavity 13 and against a spring-biased backing punch 17 which extends to the bottom of die cavity 13 through an opening 18 in the forming die 12.

As the forming punch 16 continues to descend against the resistance of the backing punch 17, the center portion of the disk is depressed until it is the same thickness as that of the base of a cup desired to be formed. The ma-

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terial displaced from the center of the disk 15 is forced outwardly around the end of the forming punch 16 which extends beyond the blanking punch 14, filling the space between the blanking punch 14 and the bottom of the die cavity 13.

After the marginal portion of the disk 15 becomes thickened, the combined pressure of the blanking punch 14 and the forming punch 16 on the disk 15 overcomes the resistance of the backing punch 17, permitting the forming punch 16 to continue its descent and advance the central portion of the disk 15 into the opening 18 and against the backing punch 17 which now moves at the same rate as the forming punch. The blanking punch descends simultaneously with the forming punch 16, compressing the metal within the die cavity 13 and uniformly forcing it toward the center of the disk where it is evenly formed into the side walls of a cup 19. The rate of movement between the blanking punch 14 and forming punch 16 is relative and may be varied as desired to produce the required flow of metal into predetermined areas.

Blanking punch 14 forces the metal within the thickened marginal portion of the disk 15 into the opening 18 and stops upon reaching the bottom of its stroke, at which time the forming punch 16 also reaches the bottom of its stroke, thus completing the forming operation. Upon withdrawal of the blanking punch 14 and the forming punch 16, the backing punch 17 will return to its initial position within the opening 18 as shown in FIGS. 1-4. When the blanking punch 14 clears the die cavity 13 a suitable distance, it is stopped and continued movement of the forming punch 16 within the blanking punch 14 strips the cup 19 from the forming punch 16. The metal strip 11 then is advanced to a position for a repeat operation.

It is to be understood that the above-described method of cold forming metal is simply illustrative of one application of the broad principles of the invention. For example, the relative speed of the blanking punch 14 with respect to the forming punch 16 and the lengths of their respective strokes may be varied to regulate the length of the cup as is required. Further, the sizes and shapes of the cups and the wall thicknesses thereof formed may be varied by a proper choice of diameters and configurations of the blanking punch and the forming punch.

What is claimed is:

1. A method of cold forming metal cups which comprises moving two coaxially mounted punches at the same speed into engagement with a metal strip, blanking out a disk from said strip, inserting the disk into a die cavity, stopping one of said punches, forcing the second punch to engage the central portion of the disk whereby the central metal is displaced from the center to the periphery of the disk, and simultaneously advancing the two punches at different relative speeds whereby the material in the periphery is forced toward the displaced central portion to form a cup.

2. A method of forming a flanged cup by operating a pair of coaxially mounted punches with a die which comprises, moving said punches in unison into engagement with a sheet material to blank out a disk from the material and advance the disk into the die, momentarily stopping the outer punch at a predetermined distance from the bottom of the die, advancing the center punch relative to the outer punch to displace a portion of the central material of the disk toward the periphery thereof, advancing the center punch to further displace the central material of the disk, and simultaneously moving the outer punch at a slower rate than the center punch to extrude the previously displaced material into the space between the center punch and the die wall.

3. A method of forming a flanged cup with an annular blanking punch and a coaxial forming punch positioned

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with respect to each other so that the faces thereof are in the same plane which comprises placing a sheet of material over a die having a cylindrical cavity communicating with a coaxially extending opening, advancing said punches in unison to sever a disk from the material, stopping the annular punch while advancing the forming punch to seat the disk on a step formed between the cavity and opening so that said annular punch is spaced from the top of the disk, applying a counter force through said opening to oppose displacement of the disk into said opening, applying a force to said forming punch to displace the material of the center of the disk into the space formed between the disk and said annular punch, applying a force to said forming punch to overcome the counter force to draw the disk into said opening, and then applying a force to said annular punch to force the displaced material into said opening.

4. A method of forming a flanged cup with an annular blanking punch and a coaxial forming punch positioned with respect to each other so that the faces thereof are in the same plane which comprises positioning a sheet of material over a die having a cavity communicating with a coaxially extending opening, simultaneously advancing said punches to sever a disk from the material, stopping

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the annular punch, moving the disk out of engagement with the annular punch, and seating the disk on a step formed between the cavity and opening so that said annular punch is spaced from the disk, applying a counter force through said opening to oppose displacement of the disk into said opening, applying a force to said forming punch to displace the material of the center of the disk into the space formed between the disk and said annular punch, applying a force to said forming punch to overcome the counter force to draw the disk into said opening, and then simultaneously applying a force to said annular punch to force the displaced material into said opening.

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