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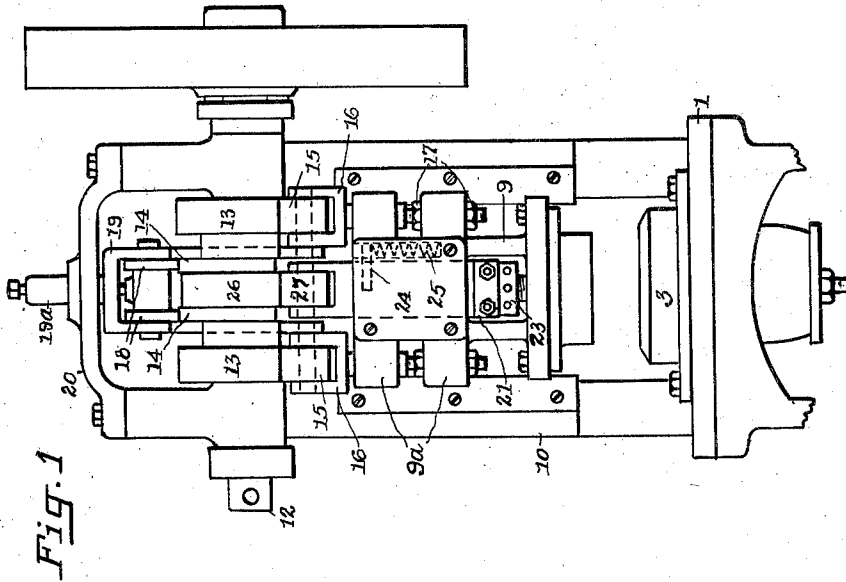
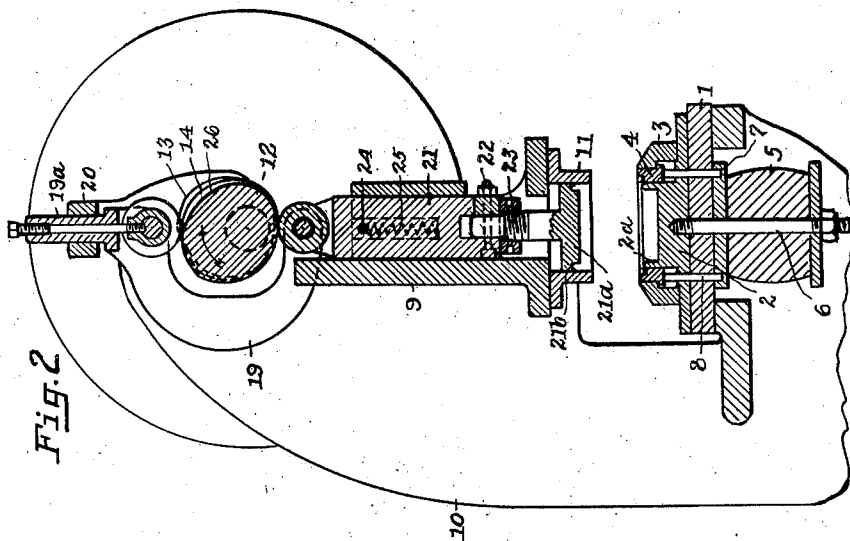
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MANUFACTURE OF SHEET METAL CAPS

Filed July 25, 1935

2 Sheets-Sheet 1



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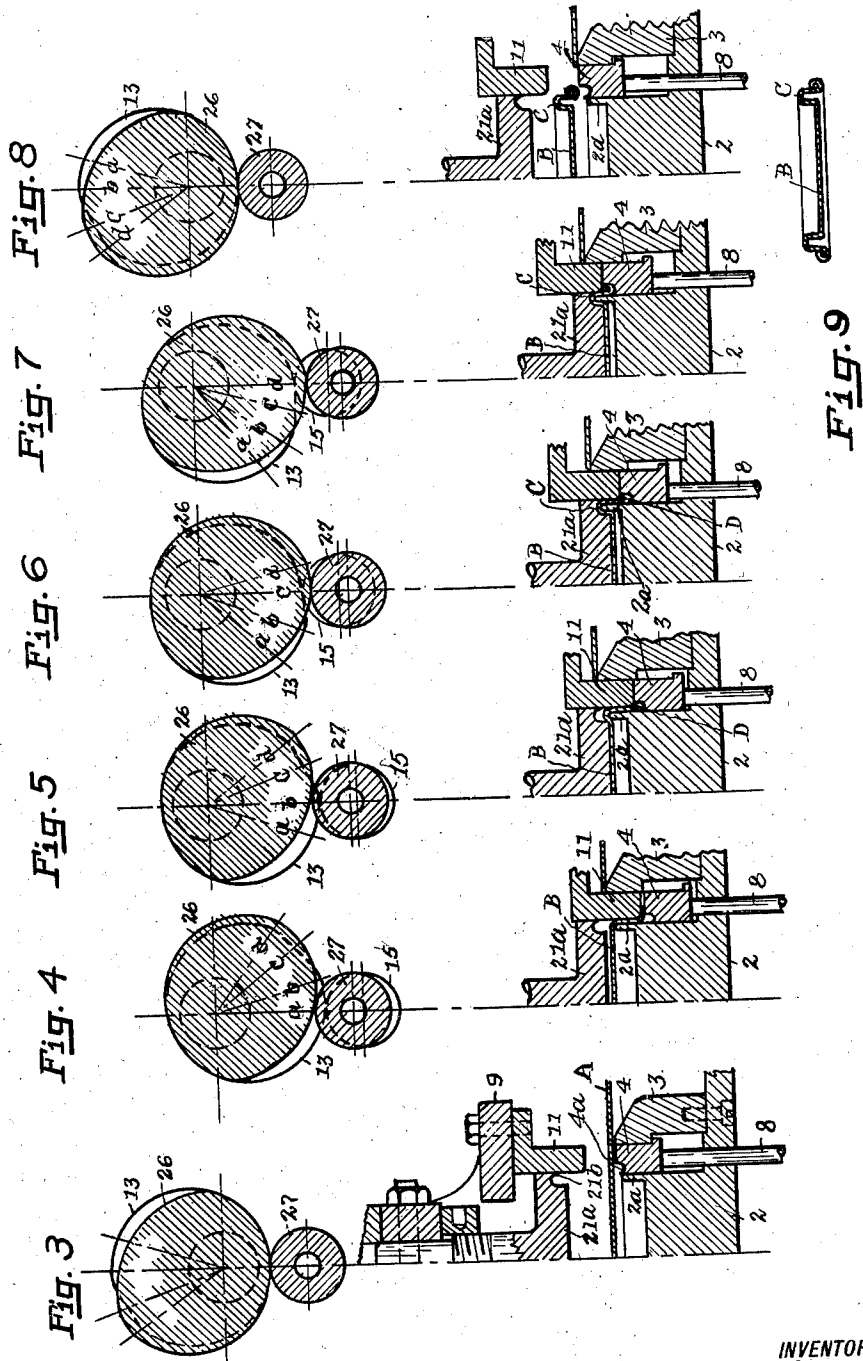
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MANUFACTURE OF SHEET METAL CAPS

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Application July 25, 1935, Serial No. 33,043

3 Claims. (Cl. 113-42)

This invention relates to the forming of articles of sheet metal which will have the form of a cap presenting an upstanding peripheral bead to assume telescoped relation to a top flange on a can (such caps being commonly used as paint-can and the like tops) and preferably also have the edge of the cap-skirt altered in diameter, as expanded and curled.

In the example herein set forth all the operations performed may occur in one stroke of the forming press. However, the following are the essential features of the invention:

Given an anvil adapted to be capped by and formed to fit within a cap in some way already made to exist and such anvil having a concentric upstanding top-flange at its periphery defining a top recess in the anvil, a plunger above and adapted to be received in and formed approximately to fit said recess, a die-instrumentality embracing the anvil and formed with a die-surface which in cross-section is beveled upwardly, there is means to move the plunger downwardly into telescoped relation to said recess and thereupon hold the plunger at dwell and, while the plunger is so held, move said instrumentality upwardly relatively to the plunger, whereby a cap (made to cap the anvil) will be first formed by said plunger and anvil-flange with an upstanding peripheral bead and then have the lower edge of its skirt altered in diameter, i. e., reduced or enlarged in diameter according to the direction of bevel of the die-surface.

Next, given the anvil and plunger formed and arranged as stated and also said die instrumentality but with its die-surface beveled upwardly to the side of the die, there is means to move the plunger to a prescribed limit down into the recess and, while it is so moving, move said instrumentality up and thereupon continue the upward movement of said instrumentality, whereby a cap made to cap the anvil and having its skirt above said die-surface will be first formed by said plunger and anvil-flange with the mentioned bead and then have the lower edge of its skirt enlarged in diameter by the die-surface. The purpose in moving said instrumentality up as the plunger moves down takes into account the creeping of the metal over the anvil flange as the center of the cap is depressed and is to preserve the initial relation between the die-surface and edge of the skirt, especially if said die-surface is a portion of a curling groove.

Next, given the anvil as before, members co-active to maintain a circumferential slip-grip on and so prevent wrinkling of the margin of a sheet

metal piece in some way already made to exist and placed on the anvil with its margin projecting laterally from and all around the anvil, and given the plunger formed and related as before, there is means to effect relative movement as between the anvil and said members whereby to draw said margin into depending-skirt relation to the center portion of the piece and then move the plunger into telescoping relation to said recess. I find in practice that when the operation of forming the skirt and that of forming the bead are simultaneously performed the metal of the piece is quite likely to break or be unduly strained and weakened.

Mechanism useful in carrying out the invention is shown in the accompanying drawings by way of example,

Fig. 1 being a front elevation thereof;

Fig. 2 a substantially central vertical section thereof;

Figs. 3 to 8 showing fragments of the mentioned parts and their actuating means in vertical section and in the several steps beginning with placement of the sheet from which is cut the piece to form the cap and ending with discharge of the finished cap; and

Fig. 9 shows the finished cap in transverse section.

Let 1 be the bed of a press having seated thereon the anvil 2 whose extending flange supports the cutting die 3; these parts are suitably affixed to the bed. The anvil has an upstanding flange 2a at its periphery. The space shown intervening between the anvil and die 3 is occupied by the lower annular gripping member 4 which, by having a circumferential inside groove formed with a die-surface 4a converging upwardly toward the anvil, itself forms a die instrumentality to alter the diameter of the edge of the skirt of the cap formed, in fact actually serving to form the edge portion into a curl. The member 4 is yieldingly supported to the limit shown (where its top is flush with that of the cutting die, member 4 abutting the latter) by an elastic, as rubber, cushion 5 supported by a stud 6 depending from the bed and topped by a disk 7 between which and said member are the pins 8 penetrating the bed.

A slide 9, vertically reciprocatory in and guided by the uprights 10 of the press, is equipped with the upper annular member 11 of said gripping instrumentality which is formed to fit cutting die 3 and so closely embrace the anvil as just to permit the thickness of the metal being treated to be received between them. Above it, journaled in the uprights, is a suitably driven horizontal shaft

12 equipped with a pair of cams 13 for depressing the slide and a pair 14 for elevating it. The cams 13 engage rollers 15 journaled in forks 16 vertically adjustable, by nuts 17 screwed on the forks, in ears 9a of the slide. The cams 14 engage rollers 18 which are journaled in a forked yoke 19 bent around the shaft and extending upwardly from the slide, the yoke having a top stud 19a guided in a brace 20 connecting uprights 10.

A plunger 21 is movable vertically in the slide; its lower end or acting portion is a pad 21a whose stem is clamped in the body of the plunger by a screw 22, such stem being threaded and equipped with a nut 23 which, by engaging the bottom of such body, determines the elevation to which such pad descends when the plunger moves downwardly. The plunger has a stud 24 resting on a spring 23 housed in the slide and it is thus normally held elevated in the latter. Its descent in the slide is effected by a cam 26 on shaft 12 acting on a roller 27 on the plunger. The lower face of the pad part of the plunger, which snugly fits the member 11, is formed with a groove 21b whose cross-sectional contour conforms with that of and is adapted to receive the flange 2a of the anvil.

A sheet A is positioned as in Fig. 3. When in the rotation of the cams they assume position a (Fig. 4) there will have been a gripping of the sheet by members 4-11, a cutting out of a piece from the sheet by the coaction of member 11 with the cutting die 3 and finally the drawing of such piece into the form of a cap B by the coaction of the members 4-11 with the anvil. In this operation the margin of the original piece, which is prevented from wrinkling by the compression of members 4-11, slips between said members so as to be nearly if not quite withdrawn therefrom as shown in Fig. 4. The plunger is now depressed by its cam 26 to start its coaction with the flange of the anvil (position b, Fig. 5) to form the bead C on the cap, the metal of the cap-skirt undergoing such creeping over the flange that its edge D is entirely withdrawn, if not already so, from between the members 4-11 but stands flared over the die-surface 4a of the groove of member 4. Note that the depression of the plunger is non-simultaneous with that of the members 4-11, which avoids straining and likely breakage of the metal. When this stage in the descent of the plunger, is reached members 4-11 are caused by the cushion 5 (cams 13 permitting) to rise at such a compensating rate with respect to the rate of continuing descent of the plunger to its limit (position c, Fig. 6) as to preserve edge D of the cap within the groove. Members 4-11, still upwardly urged by the cushion, now continue their rise while the plunger remains held down so that the groove first expands (by die-surface 4a) and finally curls said edge-position d, Fig. 7. When the curl is completed the plunger and slide begin to rise, the slide at a sufficiently slower rate than the plunger to avoid mutilating the cap. Finally, the slide continuing its rise and now carrying with it the plunger, the completed cap is ejected from the anvil by member 4.

Thus, referring to Figs. 5 to 7, a cap present on the anvil is first subject to the downward pressure of the plunger to form the bead on the cap and then has the lower edge of its skirt altered in diameter by the die instrumentality 4 while the cap is held down by the plunger.

Again, Figs. 5 and 6, while the plunger is mov-

ing down the said instrumentality is moving up, with creeping of the metal over the anvil-flange, whereby the die-surface 4a maintains its initial relation to the edge of the cap skirt as is necessary where said die-surface is, as here, a portion of a curling groove.

Finally, Figs. 3 to 7, instead of both the drawing of the piece into the form of a cap and the forming of the bead on the cap taking place simultaneously, the drawing is first effected and then the bead formed, thus as stated to avoid weakening and likely breakage of the metal.

Having thus fully described my invention what I claim is:

1. Mechanism to reform a sheet metal cap including an anvil adapted to be capped by and formed snugly to fit within the cap and having a concentric upstanding top flange substantially at its periphery defining a top recess in the anvil, a plunger above and adapted to be received in and formed approximately to fit said recess, a die instrumentality embracing the anvil and formed with a die-surface which in cross-section is beveled upwardly approximately to the side of the die, and means to move the plunger to a prescribed limit down into the recess and, while it is so moving, move said instrumentality up and thereupon continue the upward movement of said instrumentality, whereby a cap made to cap the anvil and having its skirt above the die-surface will be first formed by said plunger and anvil-flange with an upstanding peripheral bead and then have the lower edge of its skirt enlarged in diameter by said die-surface.

2. Mechanism to convert a disk of stiff sheet material into a cap having an upstanding peripheral bead comprising fixed structure including an anvil having an upstanding top flange substantially at its periphery and on which to support the disk with its margin projecting all around outwardly of the flange, downwardly movable means to grip and draw downwardly said margin of the thus-supported disk, a plunger movable downwardly into the anvil recess and being thereby coactive with said flange to form a bead on the cap to be produced, and means to move downwardly independently of each other first the gripping means and then the plunger to respectively draw the disk to cap form and form the bead on such cap.

3. Mechanism to convert a disk of stiff sheet material into a cap having an upstanding peripheral bead comprising fixed structure including an anvil having an upstanding top flange substantially at its periphery and on which to support the disk with its margin projecting all around outwardly of the flange, downwardly movable means to grip and draw downwardly said margin of the thus-supported disk including upper and lower gripping elements, the lower element forming a curling die, a plunger movable downwardly into the anvil recess and being thereby coactive with said flange to form a bead on the cap to be produced, and means to move downwardly independently of each other first the gripping means and then the plunger to respectively draw the disk to cap form and form the bead on such cap and thereupon hold the plunger substantially at dwell and while the plunger is so held move the lower gripping element upwardly to curl the depending edge of the cap.

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