

June 5, 1945.

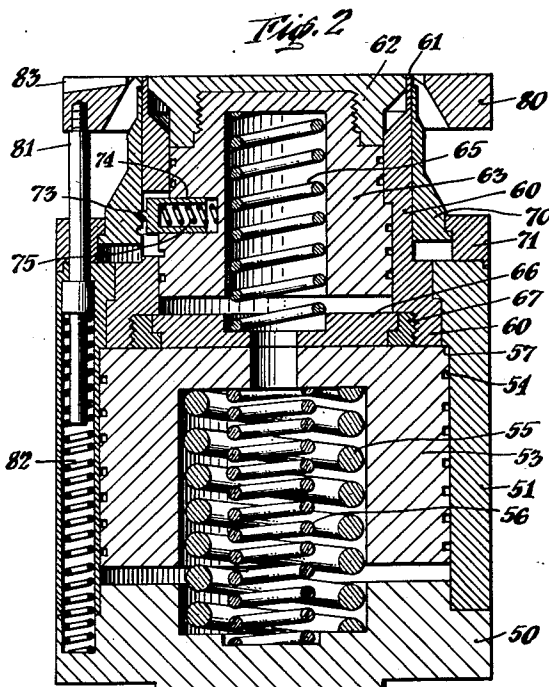
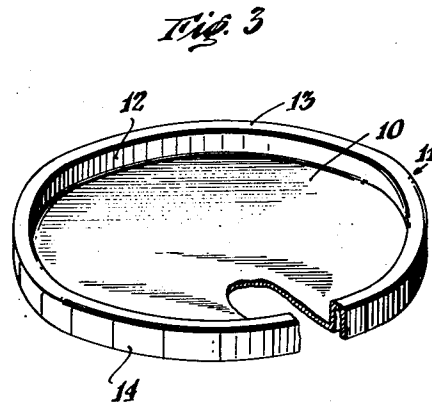
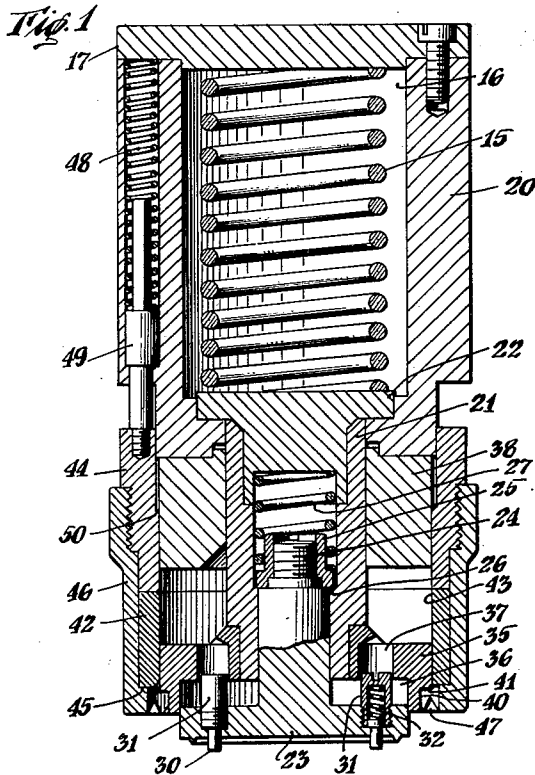
H. W. MARTIN

2,377,351

DIE

Filed May 29, 1943

2 Sheets-Sheet 1



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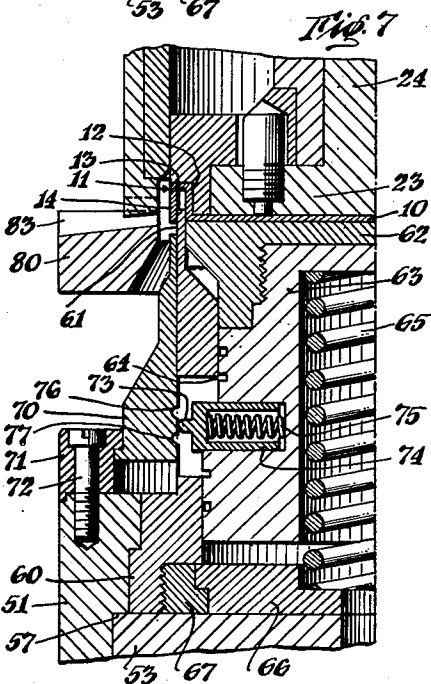
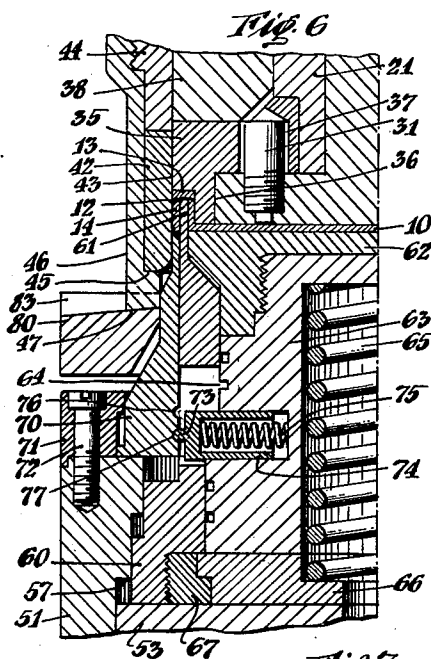
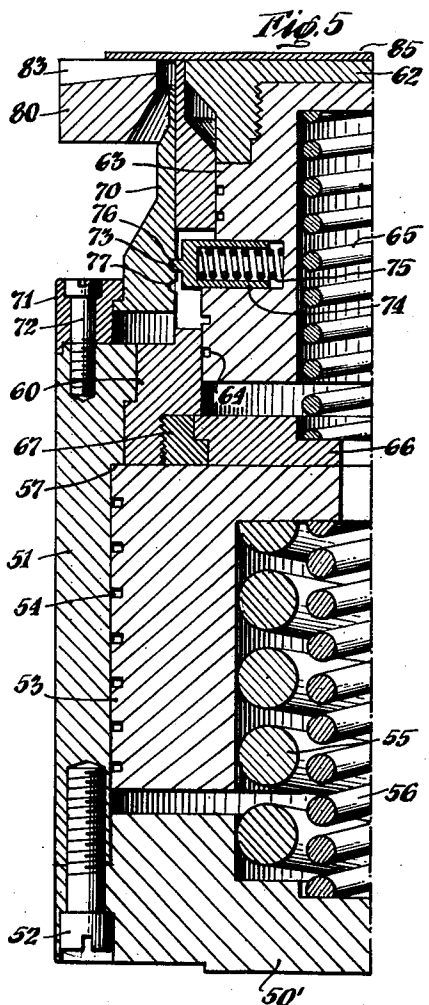
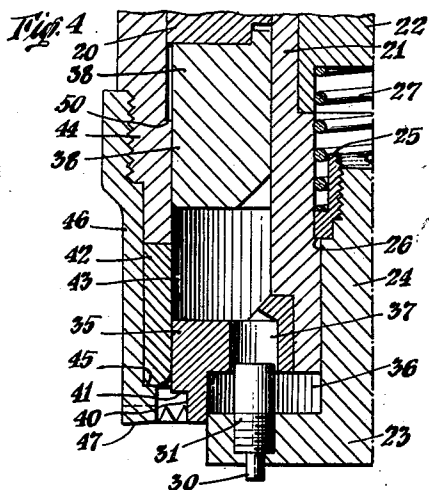
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,377,351

DIE

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Application May 29, 1943, Serial No. 488,991

6 Claims. (Cl. 18—35)

This invention relates to dies for making paper caps and more particularly to dies of the general type disclosed in the patent to Martin, 2,221,197, dated November 12, 1940, which includes members for drawing the blank to form a central cup or diaphragm, a draw ring to form a peripheral up-standing U-shaped rim housing to extend over the rim of the container to which the cap is applied, an outer skiving ring to skive or compress the outer wall of the rim housing, and a sizing ring to engage the lower edge of said outer wall for sizing and shaping the same and for applying die forming pressure thereto.

The present invention provides an improved die of the above type which is particularly suited for forming a cap having a narrow rim housing to fit over the thin edge of a tubular paper or metal container.

In making caps of this type, difficulty has been experienced in stripping the formed cap from the die, inasmuch as the rim housing tends to grip the draw ring with a force which tends to deform or injure the outer wall of the cap when it is stripped therefrom. It is accordingly an object of the present invention to provide a die in which this difficulty is eliminated and in which means is provided for stripping the formed cap from the die without injury to the cap.

Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

Although the novel features which are believed to be characteristic of this invention are pointed out more particularly in the claims appended hereto, the invention itself may be better understood by referring to the following description, taken in connection with the accompanying drawings in which a specific embodiment thereof has been set forth for purposes of illustration.

In the drawings,

Fig. 1 is a vertical longitudinal section through an upper die member embodying the present invention;

Fig. 2 is a similar section through the cooperating lower die member;

Fig. 3 is a perspective view, partly broken away to show the construction, of a cap of the type formed on the die members of Figs. 1 and 2.

Fig. 4 is a partial enlarged section of the upper forming die prior to the forming operation;

Fig. 5 is a similar partial section of the lower forming die;

Fig. 6 is a section through a portion of the upper and lower dies in forming position; and

Fig. 7 is a section similar to Fig. 6 showing the cap being stripped from the draw ring.

In the following description, certain specific terms are used for convenience in referring to various details of the invention. It is to be understood, however, that these terms are to be given as broad an interpretation as the state of the art will permit.

Referring first to Fig. 3, the completed cap is shown as comprising a central diaphragm 10 and an up-standing U-shaped rim housing 11 having a vertical inner wall 12, a top 13, and an outer wall 14. In the embodiment shown, the inner wall 12 and the outer wall 14 are spaced to grip the top edge of a paper or metal container. The cap may be made from a paper blank which has been suitably pretreated as set forth in the Baum Patent 1,668,349, dated May 1, 1928, or from other thin, flexible material, such as aluminum foil or the like.

The upper die for forming the above cap is shown more in detail in Fig. 1 as comprising a shell or support 20 which carries an upper diaphragm support 21 and an upper diaphragm support cap 22, which are slidably mounted in the shell 20 for movement against the pressure of a spring 15 or compressed air in a cylinder 16. The cylinder 16 is closed by a cap 17.

An upper diaphragm draw plate 23 is provided with a cylindrical section 24 which is slidably mounted within the upper diaphragm support 21 and is provided with a cap 25 which is threaded onto the cylindrical part 24 and engages a shoulder 26 on the upper diaphragm support 21 to limit the movement of the upper diaphragm draw plate 23. A spring 27 is seated between the cap 25 and the cap 22 for holding the diaphragm draw plate 23 in its lower position. A plurality of ejector pins 30 are mounted in housings 31 carried by the diaphragm draw plate 23 and are held in their lower positions by springs 32. These pins 30 serve to strip the cap from the upper diaphragm draw plate.

The diaphragm support 21 also carries a diaphragm head ring 35 having a central recess 36 in which the diaphragm draw plate 23 slides and having apertures 37 to receive the pinholders 31 when the draw plate is pressed upwardly within the recess 36 to the position shown in Figs. 6 and 7. A head stop 38 is carried by the shell 20 to limit the upward movement of the draw plate 23 and the head ring 35. During the cap forming operation the diaphragm support 21, together with the head ring 35 and the draw plate 23, is moved upwardly with respect to the

shell 20 against spring or air pressure in the cylinder 16.

The diaphragm head ring 35 is provided with an outer surface 40 which forms the outer surface of the inner wall 12 of the cap and with a top surface 41, which forms the top 13 of the cap.

A skiving ring 42 is slidably mounted with respect to the head ring 35 and is provided with an inner surface 43 which presses and skives the outer surface of the outer wall 14 of the cap. The skiving ring 42 is held by the skiving ring retainer 44 and by a shoulder 45 on an upper creasing ring 46 which is secured to the skiving ring retainer 44 and is provided with a lower surface 47 having a contour to crease the blank as it is drawn inwardly so as to facilitate folding the same downwardly to form the outer wall 14. The skiving ring retainer 44 is resiliently held by springs 48 and pins 49 carried in the shell 20 and is provided with a shoulder 50 which engages the shell 20 to limit the movement of the retainer and to cause the skiving ring to become rigid with the shell after a predetermined movement has taken place.

The lower die shown in Fig. 2 is provided with a base 50' to which a shell 51 is attached by suitable means shown as screws 52. A cup 53 is slidably mounted within the shell 51 and may be provided with a plurality of oil or grease grooves 54 at the sliding surfaces. The cup 53 and the base 50 are provided with aligned recesses in which springs 55 and 56 are seated. The springs urge the cup 53 upwardly against a shoulder 57 on the shell 51.

A rim housing draw ring 60 is seated on the cup 53. This ring 60 is provided with an upwardly extending flange 61 which extends into the space between the walls 12 and 14 of the cap for forming the same.

A diaphragm draw block 62, carried on a draw block body 63, is slidably mounted within the draw ring 60 and the block body 63 may be provided with oil or grease grooves 64 to lubricate the sliding surfaces. The block body 63 is provided with a recess in which a spring 65 is seated. The spring 65 is supported by a spring plate 66 which is mounted on the cup 53 and is held by a spring plate retainer 67 which is threaded to the draw ring 60. Sufficient clearance is provided between the spring plate 66 and the block body 63 to permit the desired relative movement of the block body and draw block with respect to the draw ring 60.

A sizing ring 70 is slidably mounted around the draw ring 60 and is supported for limited sliding movement by a sizing ring retainer 71 which is secured by a suitable means shown as screws 72.

A spring pressed pin 73, mounted on a cup 74 and held outwardly by a spring 75, is adapted to engage upper and lower recesses 76 and 77 respectively in the sizing ring 70 for causing limited movement of the sizing ring as will be described.

A lower creasing ring 80 is resiliently supported on the shell 51 by pins 81 and springs 82, and is provided with a top surface 83 which cooperates with the surface of the upper creasing ring 47 for creasing the outer portion of the blank as the latter is drawn thereover.

In the operation of this die for forming a cap, a pretreated blank 85 is placed between the upper and lower dies as indicated in Figs. 4 and 5. The upper die is then brought downwardly

against the lower die. As pressure is applied the upper diaphragm draw plate 23 is first forced upwardly into the head ring 35 against the pressure of the spring 27. When these parts have seated, the diaphragm draw plate 23 and the head ring 35 depress the lower draw block 62, thereby cupping the blank around the top and inner surface of the draw ring 60 until the draw block body 63 has seated against the spring plate 66. During this cupping operation the blank is drawn inwardly over the draw ring 60 between the creasing rings 47 and 80 which serve to crease or flute the outer portion thereof.

Continued downward movement of the upper die then causes the skiving ring 42 to slide downwardly around the diaphragm head ring 35 for compressing and skiving the outer surface of the wall 14 of the cap. After the skiving ring has moved downwardly to a position where head ring 35 is seated against the head ring stop 38 and the shoulder 50 of the skiving ring retainer 44 is seated against the shell 20, the entire upper die moves downwardly as a unit a slight further distance with the draw ring 60 and draw block 62 against the force of the springs 55 and 56. During this portion of the movement, the sizing ring 70 remains stationary and is thus brought upwardly against the lower edge of the outer wall 14 of the cap housing for die-compressing the wall 14 between the sizing ring 70, the skiving ring 42 and the draw ring 60. The die is then in the position shown in Fig. 6. In this position the pin 73 has snapped into engagement with the lower recess 77 of the sizing ring.

When the pressure on the upper die member is released the members separate in the reverse order. However, as the block body 63 moves upwardly the pin 73, which is carried thereby and is now engaged in the lower recess 77 of the sizing ring, carries the sizing ring upwardly with the block body 63, the draw ring 60 remaining stationary. The draw block 62 and the sizing ring 70 accordingly press upwardly against the diaphragm 10 and the lower edge of the wall 14 respectively of the cap, thereby stripping the cap from the draw ring 60 and forcing the entire cap upwardly.

When the sizing ring 70 reaches the limit of its upward movement as determined by the retainer 71, the pin 73 is forced out of the lower recess 77 and, moving upwardly with the block body 63, slides along the inner surface of the sizing ring 70 as shown in Fig. 7 until in the upper position of the draw block body 63 the pin 73 engages the upper recess 76 of the sizing ring 70 as shown in Fig. 5. The cap is then free from the draw ring 60 and may be removed therefrom.

When the operations are repeated for the formation of the succeeding caps, the pin 73, which is now in engagement with the upper recess 76 of the sizing ring 70, causes the sizing ring to move downwardly with the draw block body 63 until the sizing ring engages the top of the die shell 51 where it remains fixed. Further downward movement of the draw block body during the forming process then causes the pin 73 to be disengaged from the upper recess 76 and to slide downwardly over the inner surface of the sizing ring 70 until it reengages the lower recess 77 as above mentioned.

It is to be noted that in the above operation the sizing ring 70 is caused to move upwardly a limited distance with the lower draw block of the die so as to push the wall 14 of the cap upwardly

and strip the wall from the draw ring 60. The sizing ring, however, is automatically retracted by the pin 73 during the beginning of the next cap forming operation so that it returns to its sizing position. In this way stripping pressure is automatically applied simultaneously to both the inner wall 12 and the outer wall 14 of the cap so as to lift the entire ring housing 11 from the draw ring 60 and to prevent distortion thereof due to strains which might otherwise be set up in removing the formed cap from the die.

It is to be understood, of course, that the sizing ring may be operated by other mechanism and that a particular embodiment has been shown for purposes of illustration only. Such means may be designed to cause the skiving ring to move upwardly with the draw block for at least a portion of the upward movement of the draw block and then to return to its lower position before the wall 14 of the succeeding cap has been brought into contact therewith.

The invention is capable of various uses and is not to be restricted to the specific embodiment disclosed. The invention is to be restricted only in accordance with the scope of the following claims.

What is claimed is:

1. A die for forming paper caps or the like having a central depressed diaphragm portion and a peripheral inverted U-shaped container rim housing having spaced inner and outer walls and a top wall, said die comprising upper and lower die members mounted for relative forming and return movements and including a diaphragm draw plate and a diaphragm draw block respectively conforming to said depressed diaphragm, a draw ring forming a part of the lower die member and conforming to the inside of said rim housing between said inner and outer walls, a skiving ring forming a part of said upper die member and conforming to the outer peripheral surface of said outer wall for skiving and forming the same, a sizing ring forming a part of said lower die member and adapted to extend between said skiving ring and said draw ring to form the bottom edge of said outer wall, said sizing ring being adapted to cooperate with said skiving ring and said draw ring to exert die-forming pressure on said outer wall, and means for moving said sizing ring upwardly with said diaphragm draw block during at least a portion of said return movement of said die members after a forming operation, for stripping said rim housing from said draw ring.

2. A die for forming paper caps or the like having a central depressed diaphragm portion and a peripheral inverted U-shaped container rim housing having spaced inner and outer walls and a top wall, said die comprising upper and lower die members mounted for relative forming and return movements and including a diaphragm draw plate and a diaphragm draw block respectively conforming to said depressed diaphragm, a draw ring forming a part of the lower die member and conforming to the inside of said rim housing between said inner and outer walls, a skiving ring forming a part of said upper die member and conforming to the outer peripheral surface of said outer wall for skiving and forming the same, a sizing ring forming a part of said lower die member and adapted to extend between said skiving ring and said draw ring to form the bottom edge of said outer wall, said sizing ring being adapted to cooperate with said skiving ring and said draw ring to exert die-forming pressure

on said outer wall, means carried by said diaphragm draw block for engaging said sizing ring to move said sizing ring upwardly with said draw block during at least a portion of said return movement of the die members after a forming operation, for stripping said rim housing from said draw ring.

3. A die for forming paper caps or the like having a central depressed diaphragm portion and a peripheral inverted U-shaped container rim housing having spaced inner and outer walls and a top wall, said die comprising upper and lower die members mounted for relative forming and return movements and including a diaphragm draw plate and a diaphragm draw block respectively conforming to said depressed diaphragm, a draw ring forming a part of the lower die member and conforming to the inside of said rim housing between said inner and outer walls, a skiving ring forming a part of said upper die member and conforming to the outer peripheral surface of said outer wall for skiving and forming the same, a sizing ring forming a part of said lower die member and adapted to extend between said skiving ring and said draw ring to form the bottom edge of said outer wall, said sizing ring being adapted to cooperate with said skiving ring and said draw ring to exert die forming pressure on said outer wall, means mounting said sizing ring for relative sliding movement with respect to said draw ring and means for moving said sizing ring upwardly with said diaphragm draw block during at least a portion of said return movement of said die members after a forming operation, for stripping said rim housing from said draw ring.

4. A die for forming paper caps or the like having a central depressed diaphragm portion and a peripheral inverted U-shaped container rim housing having spaced inner and outer walls and a top wall, said die comprising upper and lower die members mounted for relative forming and return movements and including a diaphragm draw plate and a diaphragm draw block respectively conforming to said depressed diaphragm, a draw ring forming a part of the lower die member and conforming to the inside of said rim housing between said inner and outer walls, a skiving ring forming a part of said upper die member and conforming to the outer peripheral surface of said outer wall for skiving and forming the same, a sizing ring forming a part of said lower die member, mounted for movement between upper and lower positions and adapted to extend between said skiving ring and said draw ring to form the bottom edge of said outer wall, said sizing ring when in its lower position cooperating with said skiving ring and said draw ring to exert die forming pressure on said outer wall, means operable during said return movement of said members after a forming operation, to move said sizing ring upwardly with said diaphragm draw block to its upper position for stripping said rim housing from said draw ring, and means for restoring said sizing ring to its lower position during the subsequent forming operation.

5. A die for forming paper caps or the like having a central depressed diaphragm portion and a peripheral inverted U-shaped container rim housing having spaced inner and outer walls and a top wall, said die comprising upper and lower die members mounted for relative forming and return movements and including a diaphragm draw plate and a diaphragm draw block respectively conforming to said depressed diaphragm,

a draw ring forming a part of the lower die member and conforming to the inside of said rim housing between said inner and outer walls, a skiving ring forming a part of said upper die member and conforming to the outer peripheral surface of said outer wall for skiving and forming the same, a sizing ring forming a part of said lower die member, mounted for movement between upper and lower positions and adapted to extend between said skiving ring and said draw ring to form the bottom edge of said outer wall, said sizing ring being adapted to cooperate with said skiving ring and said draw ring to exert die forming pressure on said outer wall, means carried by said diaphragm draw block for engaging said sizing ring and operable during at least a portion of said return movement of said die members after a forming operation to move said sizing ring upwardly with said draw block to its upper position for stripping said rim housing from said draw ring, means for limiting the upward movement of said sizing ring, and means for restoring said sizing ring to its initial lower position during the initial phase of the forming movement of said draw block during the succeeding forming operation.

6. A die for forming paper caps or the like having a central depressed diaphragm portion and a peripheral inverted U-shaped container rim housing having spaced inner and outer walls and a top wall, said die comprising upper and lower die members mounted for relative forming and return movements and including a diaphragm draw plate and a diaphragm draw block respec-

tively conforming to said depressed diaphragm, a draw ring forming a part of the lower die member and conforming to the inside of said rim housing between said inner and outer walls, a skiving ring forming a part of said upper die member and conforming to the outer wall for skiving and forming the same, a sizing ring forming a part of said lower die member and adapted to extend between said skiving ring and said draw ring to form the bottom edge of said outer wall, said sizing ring being adapted to cooperate with said skiving ring and said draw ring to exert die forming pressure on said outer wall, a pair of spaced recesses in said sizing ring, a spring-pressed pin carried by said draw block and adapted to selectively engage said recesses, one of said recesses being positioned to receive said pin when said sizing ring and said draw block are in their lower forming positions to cause said sizing ring to move upwardly with said draw block during a part of the return movement of said draw block, stop means for limiting the upward movement of said sizing ring to cause said pin, moving upwardly with said draw block, to disengage said first recess and to engage said second recess, said second recess being positioned to cooperate with said pin to cause said sizing ring to move downwardly with said draw block during the initial phase of the succeeding forming movement, and stop means for limiting the downward movement of said sizing ring to cause said pin, moving downwardly with said draw block, to disengage said last recess and to reengage said first recess.

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