

May 24, 1938.

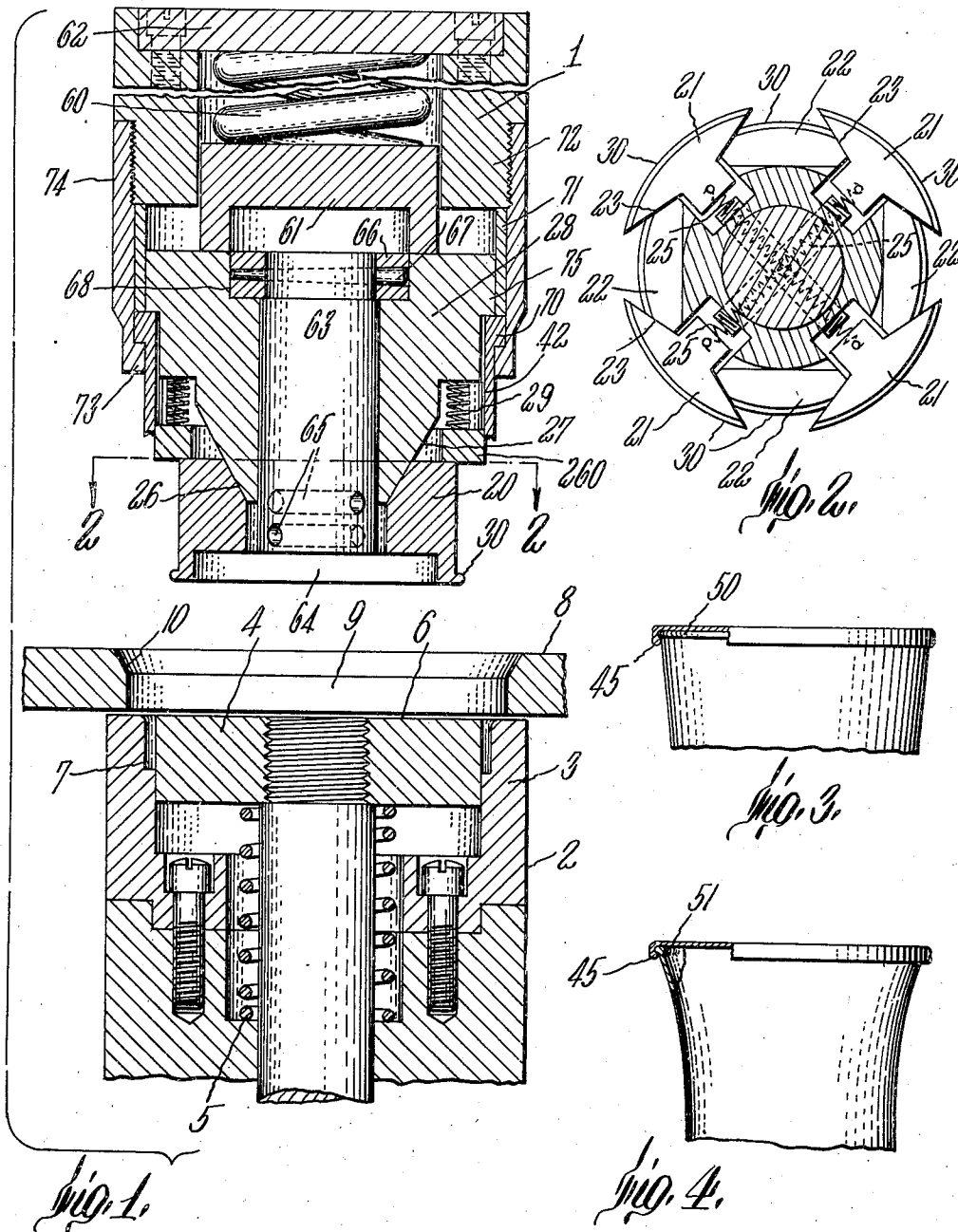
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2,118,080

MOLDING MECHANISM

Original Filed June 24, 1933

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

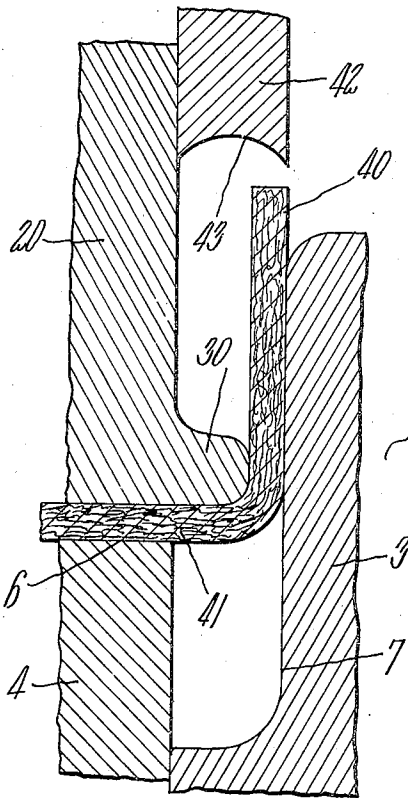


Fig. 5.

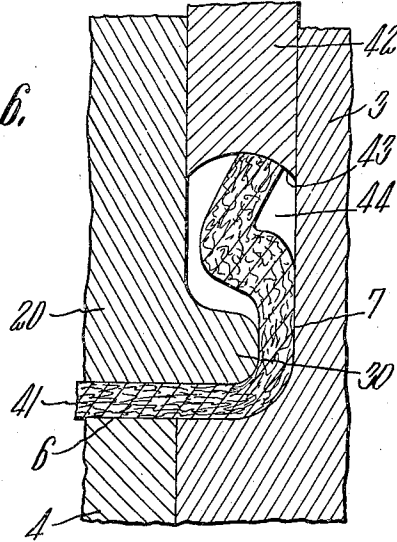


Fig. 6.

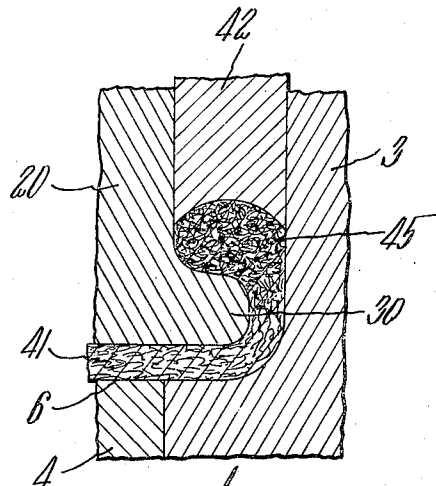


Fig. 8.

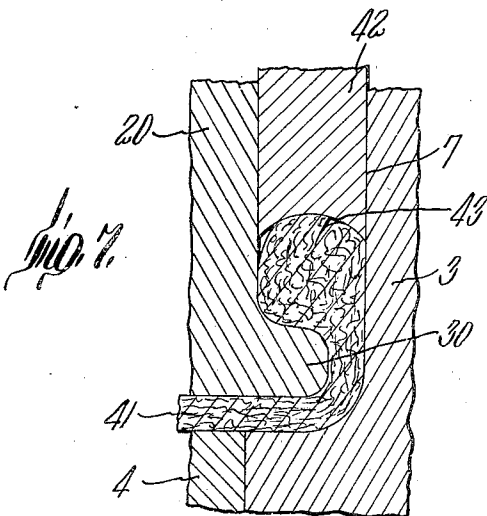


Fig. 7.

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UNITED STATES PATENT OFFICE

2,118,080

MOLDING MECHANISM

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Original application June 24, 1933, Serial No.
677,483. Divided and this application Decem-
ber 11, 1935, Serial No. 53,897

4 Claims. (Cl. 18—42)

This invention relates to mechanism for forming up articles from sheet material and more particularly from paper which has been so pre-treated that it can be successfully subjected to molding and pressing operations. A purpose of this invention is to form up or mold such sheet material into such form that the article produced may be used as a cover for a lipped receptacle so that the cover may be snapped on or off, and when on will hold the contents of the receptacle securely even when the receptacle is inverted. To this end, the cover is formed up with a marginal flange provided with an inwardly extending marginal bead of such a uniform, dense structure, and without apparent folds, that it will not be permanently deformed during use. This application is a division of my application Serial No. 677,483, for "Paper article and method of forming it", filed June 24, 1933.

For a more complete understanding of this invention reference may be had to the accompanying drawings, in which,—

Figure 1 is a central vertical section through the cap-forming portions of the forming dies.

Figure 2 is a horizontal section on line 2—2 of Figure 1.

Figure 3 is a fragmentary view partly broken away showing the cap applied to the top of a paper cup.

Figure 4 is a view similar to Figure 3, but showing the cap applied to a tumbler or glass.

Figures 5 to 8 inclusive are detail sections showing successive stages of the cap-forming operation.

Referring first to Figures 1, 2 and 3, at 1 and 2 are indicated cooperating dies. The lower die 2 comprises a socket member 3 in which is positioned a yielding base member 4 which may be depressed against the pressure of a spring 5 to the base of the socket with its upper face 6 substantially flush with the lower edge of a counter-bored portion 7 at the upper end of the socket 3. At 8 is shown a plate member having an opening 9 therein flared at 10, this plate member being movable to present in succession disks of paper to be formed between the dies 1 and 2. The disk of paper when presented lies within the flaring portion 10 of this plate 8 and is forced downwardly therethrough by the plunger 20 of the die 1 and onto the base 6. This plunger 20 is provided with segmental portions 21 and 22, which, as shown best in Figure 2, are arranged in two sets having mating inclined faces 23. These faces 23 are inclined to the directions of motion of the pieces in collapsing and expanding, the

outwardly tapering members 22 acting as wedges between the inwardly tapering members 21. Retraction of the members 22 releases the members 21 so that they are free to be retracted. The segmental pieces 21 are shown as joined in pairs diametrically across the die 1 by means of springs 25 which together with springs 29 bearing on a ring 260 resting on the segmental pieces tend to hold these members in collapsed position in which condition also the portions 22 are still further retracted into the positions shown in Figure 2. The portions 22, however, have inclined inner upper faces 26 with which cooperate a frusto-conical portion 27 of an expanding block 28, so that as the block 28 is pushed downwardly relative to the members 21 and 22, both these sets of members are forced outwardly, the members 22 being moved out relative to the members 21 until their outer faces form with the outer faces of the portion 21 a continuous circumference. Both the members 21 and 22 are provided with segmental portions of an annular rib 30, which, when these segments are expanded, form together a continuous rib about the lower end of the plunger 20.

The first portion of the motion of the plunger 20 into the socket 3, carrying the central portion of the paper disk therewith, causes the marginal portion of the paper disk to be bent upwardly as shown at 40 in Figure 5, the central portion 41 of the disk being seated upon the base 6, the segmental portions 21 and 22 being then in expanded condition so that the flange 40 is engaged between the socket wall and the rib 30 adjacent to the face of the disk. When the plunger has entered the socket sufficiently far to seat the base member 4 against the base of the socket 3 into the position shown in Figure 6, the outer portion of the disk 40 just inwardly of the flange is seated on the base of the counterbored portion 7, and an annular forming member 42 provided with a concave lower face 43 has engaged the upper edge of the flange 40 and has upset and pressed it down endwise somewhat into the space 44 above the rib 30 and between the segments 21 and 22 and the wall of the socket 3, this space being substantially wider than the thickness of the paper stock, as is shown in Figures 5 and 6.

Engagement of the member 42 on the upper edge flange produces an upsetting action on the material of this flange, which is shown in successive stages in Figures 6 and 7. This upsetting action causes a re-arrangement of the fibers of the paper resulting in a thickening of the sheet material without substantial folding or rolling of

the sheet material on itself so that when the member 42 is in its extreme downward position, as shown in Figure 8, this fibrous stock has been upset and compacted on itself to form a homogeneous, highly compacted felted fibrous mass without seam or fold and molded into a bead configuration projecting inwardly from the outer wall of the flange. On raising the die member 1 from the die member 2, the die parts are returned to their original position and the formed cap is removed from the socket 3, while the springs 25 act to retract the segmental portions, thus freeing the formed cap from the die member 1.

In order to condition the paper stock so that it is capable of being upset and molded around its marginal flange and likewise to render it water-resistant or waterproof, it is desirable to pre-treat it with moisture and a water-resisting compound such as wax. The treatment acts to temper the fibers and facilitates the molding operation and the compacting of the fibers together. Preferably along with the paraffin is included a small percentage of a hardening wax such as carnauba or Montan wax.

Such a cap when formed may be snapped onto the top of a paper cup, such as shown in Figure 3, provided with a marginal bead 50 at its upper edge, the molded bead portion 45 of the cap being snapped under this bead on the cup. Likewise such a cap may be snapped over the upper edge portion of a glass or tumbler, as shown in Figure 4, which may likewise be formed with a thickened bead portion 51 about its upper edge, or the cap may be engaged with the upper edge of a cup which flares slightly at its upper end rather than having any pronounced bead thereat, both flaring and a slight bead being shown in Figure 4. If desired the cap may be sealed to the receptacle as by any suitable means such as a strip of cellulose compound shrunk thereover in accordance with well known practice.

By forming the marginal bead on the cap flange of highly compacted paper stock without fold or seam, it is capable of withstanding very severe service without being damaged and thus a very secure sealing of the contents of the cup or tumbler may be readily effected.

The block 28 of the upper die member is backed up by a spring 60 reacting between a plug 61 and the head 62. The plug 61 is recessed in its lower face to permit the entry therinto of the upper end of a post 63 on which the block 28 may slide. This post is provided with a head 64 at its lower end seated in recesses in the segmental portions 21 and 22, which are supported by this head. This head and the ring 260 act as supporting members between which the segmental portions are movable. The post 63 is also provided with transverse perforations 65 through which the springs 25 pass and it has a collar 66 fixed to its upper end as by the pin 67 to retain it in assembled relation to the block 28. In the position shown in Figure 1, the collar 66 rests in a counterbored portion 68 in the upper face of this block. The annular forming member 42 is provided with a portion 70 of enlarged outer diameter at its outer end which is clamped between a sleeve 71, butting the lower end of the casing 72 of the upper die member, and the internal shoulder 73 of a sleeve 74 having threaded engagement at its upper end with the casing 72. The block 28 has a shoulder 75 which may engage on the upper end of the mem-

ber 42, so that this block is held in assembled relation with the other parts of the upper die member with capability of a limited endwise motion, the lower end of the casing 72 defining its upper limit. The parts of the upper die member which are movable relative to the casing are thus held assembled by the sleeve 74, the spring 60 holding the forming member 42 normally elevated in the position of Figure 1 when the upper die member is elevated.

From the foregoing description of the cap and its method of formation and mechanism for so forming it, it should be evident that various modifications and changes can be made without departing from the spirit or scope of this invention as defined by the appended claims.

I claim:

1. In combination, a pair of cooperating dies, one of said dies having a socket and a yielding base for said socket, the other of said dies having a plunger adapted to enter said socket and provided with segmental portions relatively movable to expand and contract and when expanded to form an unbroken circumference, said portions having an outwardly extending rib at their outer ends cooperating with the inner wall of said socket when said plunger is in said socket to hold between them a marginal flange of a disk formed up by the insertion of said plunger into said socket with said disk therebetween and to form an annular channel above said rib portion wider than the thickness of said flange, means for expanding said segmental portions when said plunger has depressed said base, means on said other die entering said channel and engaging the free edge of said flange for molding said free edge portion between said segmental portions and socket wall into a seamless bead thicker than the remainder of said flange, and means for retracting said segmental portions on release of pressure between said dies to free said portions from beneath said flange bead.

2. A die including a casing, an expansible and collapsible section including a plurality of relatively movable parts, a member mounted for motion transverse to the expanding and collapsing movements of said parts and cooperating to expand said section on motion of said member in one direction, means yieldingly tending to collapse said section, means supporting said parts in operative relation to said member, means holding said member assembled with relation to said casing with capability of limited axial movement, means yieldingly tending to hold said member at one limit of its motion, and an annular forming member rigidly fixed to said casing in position to extend outwardly of said parts when said member is at the other limit of its motion.

3. A die including an expansible and collapsible section, said section comprising a plurality of relatively movable parts which when in expanded condition present together a continuous surface, said parts having mating faces inclined to the collapsing direction such that the collapsing motion of certain of said parts frees others for collapsing movement, means biasing said section to collapsed condition, means operative to expand said section, and a member forming an outer wall about said section when said section is expanded, said die including means operatively connecting said member and operative means to retract said member axially relative to said section when said operative means is actuated to permit said section to collapse.

4. A die including a casing, an expansible and collapsible section including a plurality of relatively movable parts each having an annular rib portion, said rib portions together forming an unbroken annular rib at said section when said parts are expanded, a member mounted for motion transverse to the expanding and collapsing movements of said parts and cooperating to expand said section on motion of said member in one direction, means yieldingly tending to collapse said section, means supporting said parts

in operative relation to said member, means holding said member assembled with relation to said casing with capability of limited axial movement, means yieldingly tending to hold said member at one limit of its motion, and an annular forming member rigidly fixed to said casing in position to extend outwardly of said parts when said member is at the other limit of its motion, and having a forming face cooperating with said rib.

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