June 10, 1947. J. H. GOSNELL, JR 2,421,935

DIE

Filed April 17, 1944 3 Sheets-Sheet 1

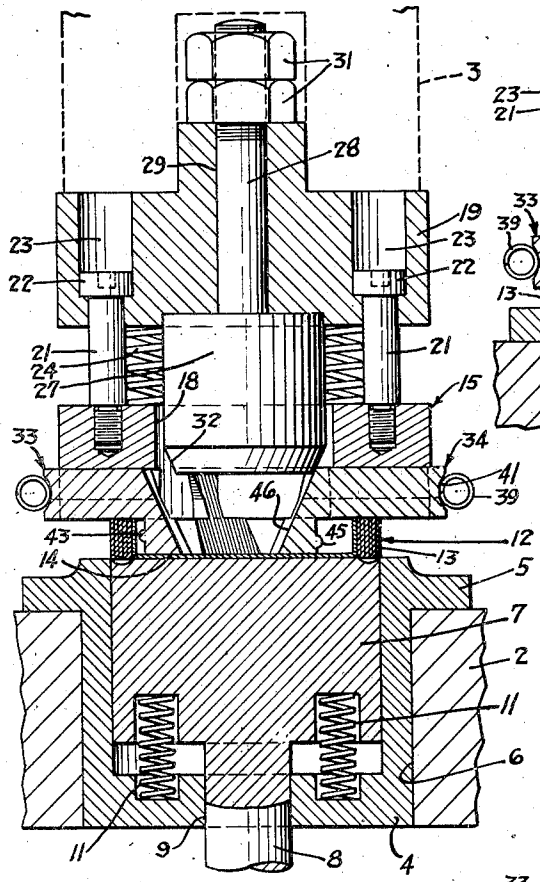


FIG. 1

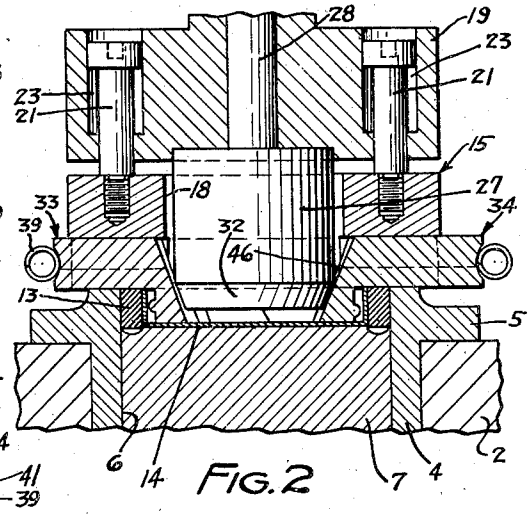


FIG. 2

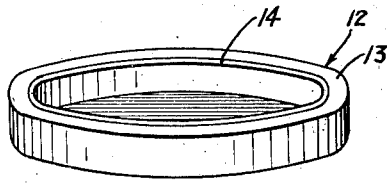


FIG. 10

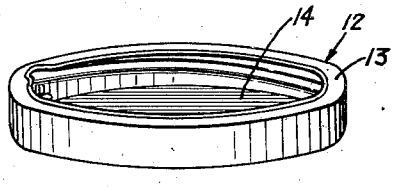


FIG. 11

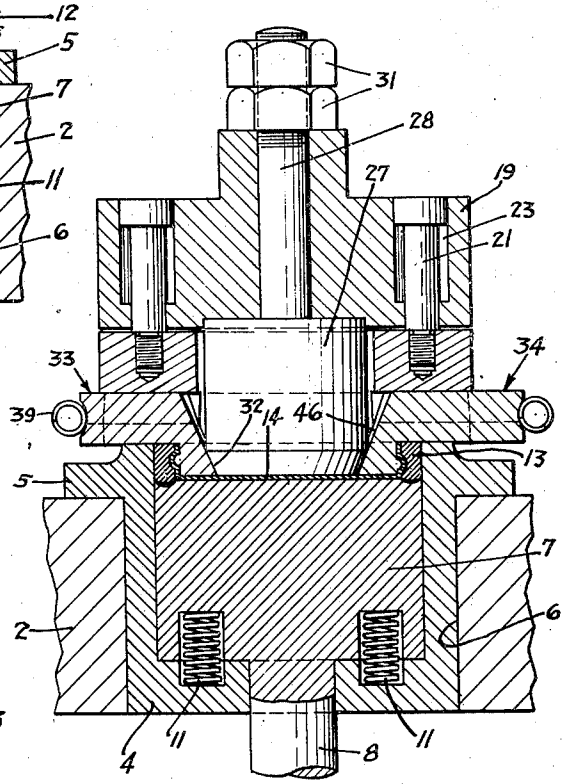


FIG. 3

INVENTOR
JOSEPH H. GOSNELL, JR.
By Paul, Paul & Moore
ATTORNEYS

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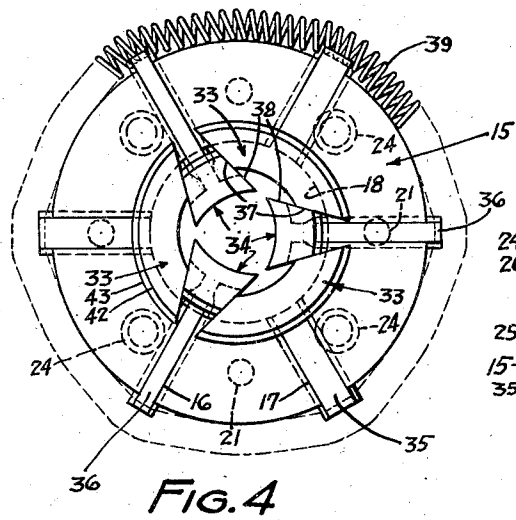


FIG. 4

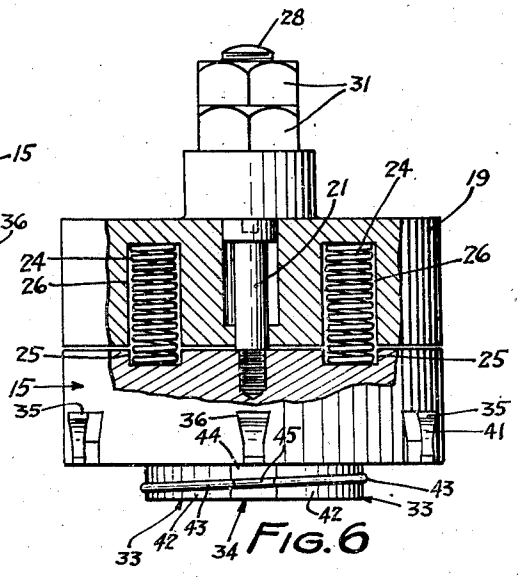


FIG. 6

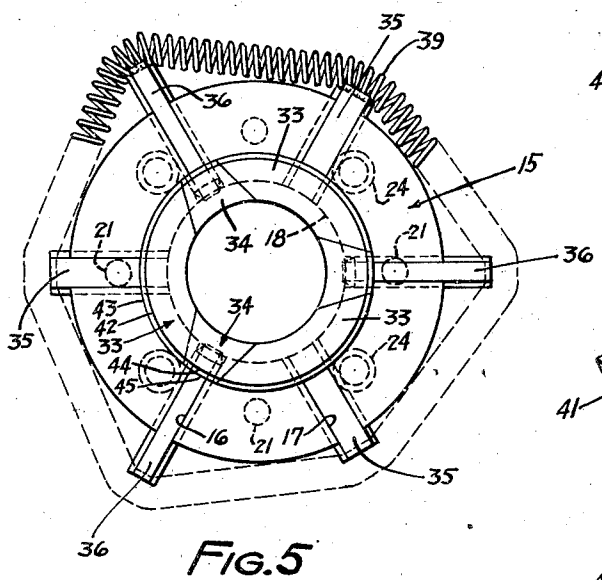


FIG. 5

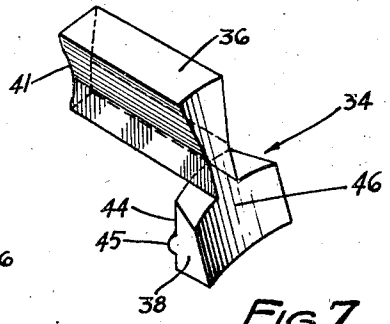


FIG. 7

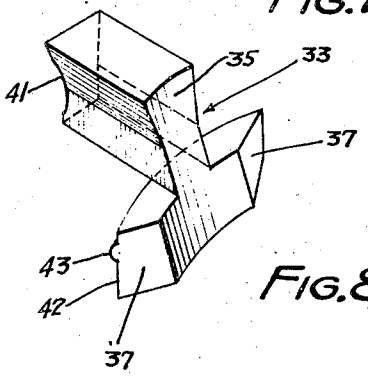


FIG. 8

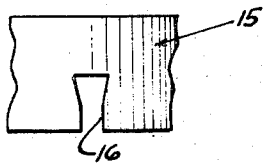


FIG. 9

INVENTOR
JOSEPH H. GOSNELL, JR
By Paul, Paul & Moon
ATTORNEYS

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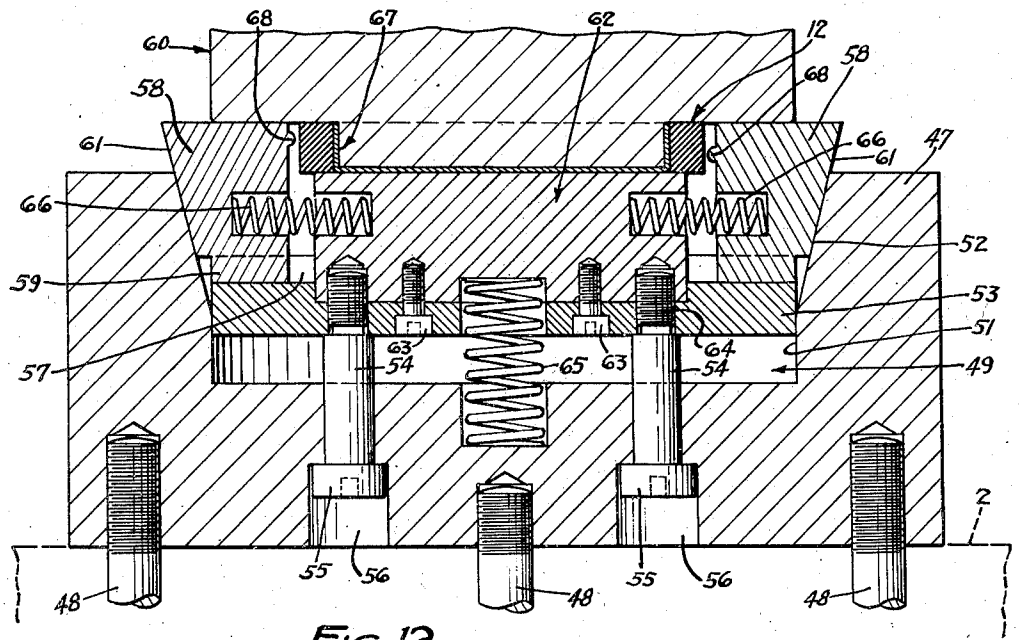


FIG. 12

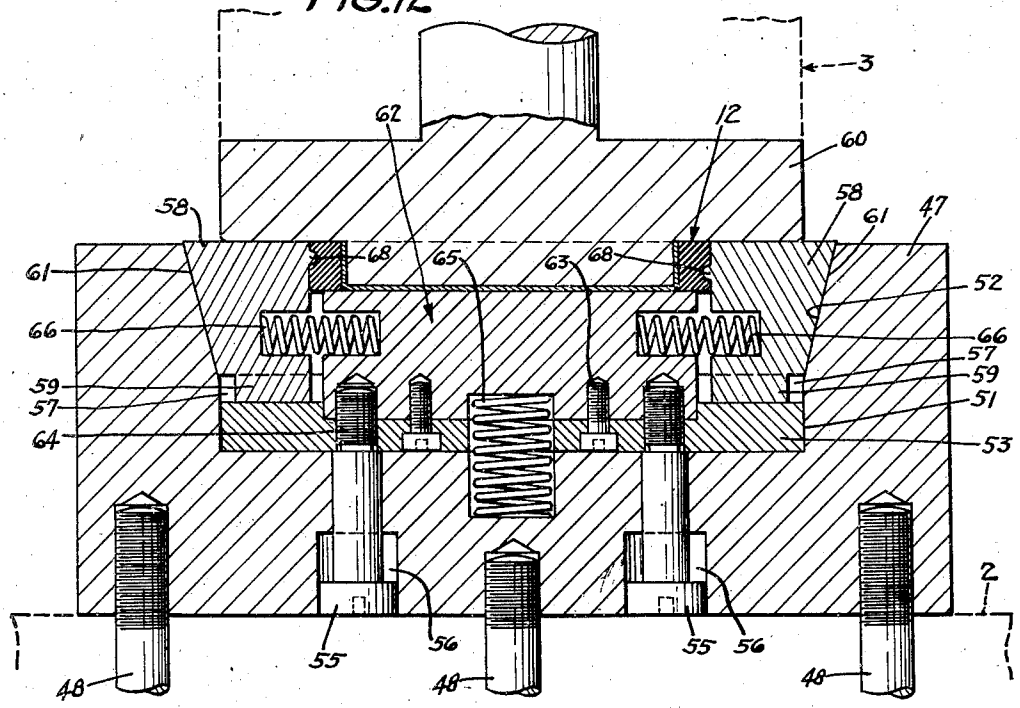


FIG. 13

INVENTOR
JOSEPH H. GOSNELL, JR.
By Paul, Paul & Moore
ATTORNEYS

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DIE

Joseph H. Gosnell, Jr., Minneapolis, Minn.

Application April 17, 1944, Serial No. 531,517

6 Claims. (Cl. 93—36)

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This invention relates to new and useful improvements in dies and more particularly to dies of the general character employed for threading caps or closures by pressure, such as may be used on glass jars, and many other types of containers.

An important feature of the present invention resides in the provision of a die for forming continuous threads in flanged caps or closures, comprising a plurality of coacting die segments having means for simultaneously expanding them into engagement with the interior surface of a cap flange around its entire circumference, whereby a continuous thread may be formed in the cap in one operation.

A further object is to provide a die for forming threads in the flanged wall of a cap or closure by the application of pressure against the cap flange in a direction at right angles to the movement of the press ram, and whereby little or no pressure is exerted on the cap and in an axial direction during the operation of forming the threads.

A further object is to provide an apparatus for forming continuous threads or part threads in a closure or similar device, comprising a die holder having a plurality of die segments and wedge elements supported therein, and the wedge elements being interposed between adjacent ends of the die segments and arranged to be engaged by a plunger whereby said wedge elements are forced outwardly to thereby expand the die segments into engagement with the flanged wall of a cap to form threads therein, and each wedge element having a die surface adapted to cooperate with the die segments to complete the formation of the threads, and whereby the resultant threads will be continuous and unbroken around the wall of the cap.

A further object is to provide a thread forming die comprising a plurality of die segments each having an inclined surface adapted to be engaged by a plunger as the plunger approaches the limit of its working stroke, whereby said segments are positively expanded into engagement with the work being operated upon, and whereby the downward thrust or vertical pressure of the plunger against the inclined surfaces of the die segments is converted into a horizontal pressure to force the die segments into engagement with a wall of the work in a horizontal plane, thereby to form threads or other depressions therein.

Other objects of the invention reside in the unique construction of the die as a whole, whereby the various segments thereof are movably and inseparably supported in a die holding member

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which in turn is movably mounted in a supporting head carried by the ram of the press, and said head carrying a plunger having a surface engageable with a plurality of wedge elements, having operative connections with the die segments whereby when the plunger is operated to outwardly translate said wedge elements, the die segments are expanded into engagement with the flanged wall of a cap or other work; in the simple manner of mounting the die segments in the die holder whereby they may readily and quickly be removed therefrom as when substituting one set of die segments for another; in the provision of a die for forming continuous or part threads exteriorally of a cap flange; and in the provision of a simple and inexpensive die of this general type which may be manufactured at low cost and which readily lends itself for use on conventional presses with little or no alterations of the press.

Other objects of the invention will appear from the following description and the accompanying drawings and will be pointed out in the annexed claims.

In the accompanying drawings there has been disclosed a structure designed to carry out the various objects of the invention, but it is to be understood that the invention is not confined to the exact features shown, as various changes may be made within the scope of the claims which follow.

In the drawings:

Figure 1 is a vertical sectional view showing the die in its normal contracted position;

Figure 2 is a view similar to Figure 1 with some of the parts omitted, showing the die segments partially expanded as a result of downward movement of the plunger;

Figure 3 is a similar view to Figure 1 showing the plunger at the bottom of its working stroke and the segments expanded to form threads in a cap wall;

Figure 4 is a bottom view of the die showing the die segments and wedge elements in contracted position;

Figure 5 is a view similar to Figure 4 but showing the die segments expanded;

Figure 6 is a side elevational view of the die partially broken away;

Figure 7 is a perspective view showing one of the wedge elements removed from the die holder;

Figure 8 is a perspective view showing one of the die segments removed from the die holder;

Figure 9 is a fragmentary view showing one of the slots which support the die segments and wedge elements;

Figure 10 is a perspective view of a form of closure cap prior to having threads formed therein;

Figure 11 is a similar view showing the cap after threads have been formed in the flange thereof;

Figure 12 is a view showing a modified construction wherein the die segments are normally expanded and are contracted into engagement with the closure wall to form exterior threads therein; and

Figure 13 is a view similar to Figure 12 showing the die segments contracted into engagement with the closure wall.

In the selected embodiment of the invention herein disclosed there is shown in Figure 1, for purpose of disclosure, a portion 2 of a bed plate of a conventional press and a ram 3, indicated in dotted lines. A cup shaped member 4 having an upper annular flange 5 is seated in a suitable aperture or bore 6 provided in the bed plate 2.

A member 7 is yieldably mounted in the cup shaped member 4 and has a stem 8 which is slidably supported in a bore 9 provided in the bottom wall of the member 4, as best shown in Figure 1. Suitable springs 11 are received in sockets provided respectively in the member 7 and bottom wall of the cup shaped member 4 and constantly exert an upward pressure against the member 7 to retain it in its normal elevated position shown in Figure 1. The member 7 is adapted to support the work to be operated upon, in the present instance, paper caps 12 such as may be used to provide closures for various types of containers.

In the present application I have shown each cap 12 as being composed of two parts, an annulus or collar 13 preferably made by winding sheet paper upon itself to form a cylinder and then severing the cylinder into sections whose lengths are substantially equal to the height of the flange of the closure when the latter is completed. Within the annulus or collar 13 there is snuggly fitted a cup shaped member 14 which may also be of paper. A cup shaped member 14 is inserted into and secured in each annulus or collar 13 and the assembly is then positioned on the yieldably mounted block or member 7, as shown in Figure 1. It is to be understood that when the die is in its normal inoperative position, the die assembly is positioned over the yieldable block 7 in spaced relation thereto to permit the insertion of the work between the block 7 and die and also to permit its removal of the work therefrom, when the thread forming operation has been completed. The particular manner of forming the cylindrical wall portion 13 of the cap and securing the cup shaped member 14 therein, as shown in Figures 10 and 11, is old and well known in the art and forms no part of the present invention.

The novel die herein disclosed is shown comprising a die holder, generally designated by the numeral 15, having a plurality of radially disposed open slots 16 and 17 in its lower face which extend outwardly to the periphery thereof from a circular bore 18 provided in the die holder. The die holder 15 is movably supported from a head 19 by a plurality of bolts or studs 21, shown having their lower reduced terminals received in threaded engagement with the die holder and having heads 22 vertically movable in sockets 23 provided in the head 19. Suitable springs 24 are received in sockets 25 and 26 provided in the die holder 15 and head 19, respectively, as best shown in Figure 6, and cooperate to constantly urge the die holder 15 and head 19 away from one another into the positions shown in Figure 1.

A plunger 27 is secured in abutting relation to the head 19 and has a stem 28 received in a bore 29 provided in the head 19. Suitable nuts 31 are received in threaded engagement with the upper end of the stem 28 of the plunger 27, thereby to firmly secure the plunger in position for operation as a unit with the head 19.

The lower end portion of the plunger 27 is received in the bore 18 provided in the die holder 15, and the lower end of the plunger has a beveled face 32 adapted to engage the thread forming segments and elements next to be described.

In the invention as shown in Figures 1, 2 and 3, the die holder 15 is adapted to support a plurality of thread forming die sections 33 and wedge elements 34. The die sections 33 are relatively larger than the wedge elements 34 as will be noted by reference to Figures 4, 5, 7 and 8. The die sections 33 have upstanding tongues 35 adapted to be received in the slots 17 provided in the bottom face of the die holder 15, and the wedge elements 34 have similar tongues 36 receivable in the relatively smaller slots 16 provided in the die holder. The tongues 35 and 36, as clearly illustrated in Figures 6, 7 and 8, taper outwardly at their upper ends, and the slots 16 and 17 are correspondingly shaped thereby to prevent the die segments 33 and wedge elements 34 from dropping out of the bottom of the die holder, when inserted therein, as shown in Figures 4 and 5.

By reference to Figures 4 and 5 it will be noted that the opposed ends of the die segments 33 are formed with inclined faces 37 which are engaged by inclined faces 38 provided on the wedge elements 34. Suitable means such as a spring 39 is provided for constantly urging the die segments 33 and wedge elements 34 inwardly into contracted position as shown in Figure 4. The spring 39 as shown in the drawings, encircles the die holder 15 and is seated in concave seats 41 provided in the outer ends of the die segments 33 and wedge elements 34, as shown.

The periphery 42 of each die segment 33 is provided with an elongated bead 43, and the periphery 44 of each wedge element 34 is provided with a similar bead 45. The beads 43 and 45 cooperate to form an internal thread in the cap, when the die segments and wedge elements are expanded by relative downward movement of the plunger 27 from the position shown in Figure 1 to that shown in Figure 3. This results because of the inclined face 32 of the plunger 27 engaging the interior inner faces 46 of the wedge elements 34, as will readily be understood by reference to Figures 1, 2 and 3.

An important feature of the invention resides in the formation of the die segments 33 and wedge elements 34 and their relative positions in the die holder 15. By reference to Figures 1 and 4 it will be noted that when the die segments and wedge elements are contracted, as when the plunger 27 is in its upper position, shown in Figure 1, the inner beveled faces 46 of the wedge elements will be positioned within the confines of the die segments 33, whereby they are readily engaged by the lower end of the plunger 27, when the latter is moved downwardly from the position shown in Figure 1 to that shown in Figure 3. The die segments 33 and wedge elements 34 are so shaped and related to one another that when the plunger 27 reaches the limit of its downward

movement, shown in Figure 3, the peripheries 42 and 44 of the die segments 33 and wedge elements 34, respectively, will cooperate to form a true circle or cylinder whereby the coacting beads 43 and 45 will cooperate to form a continuous thread in the flange 13 of the cap 12, as will be understood by reference to Figure 6 and as clearly illustrated in Figure 3.

It is to be understood, however, that if it is desired to form only part threads or grooves in the cap instead of a continuous thread, such part threads may readily be formed by simply fashioning the beads 43 and 45 accordingly. In some instances it may be found desirable to completely omit the thread forming beads 45 on the wedge elements 34.

In Figures 12 and 13 there is shown an apparatus for making exterior threads on the periphery of a cap, as distinguished from the interior threads formed by the apparatus shown in Figures 1 to 3.

In the form shown in Figure 12 a suitable block 47 is shown mounted on the bed plate 2 and may be secured thereto by suitable bolts 48. A shallow bore 49 is provided in the block 47 and has a lower cylindrical wall portion 51 and an upper inclined wall portion 52. A die supporting plate 53 is mounted for vertical movement in the cylindrical bore 49 and is retained therein by bolts 54 having heads 55 received in sockets 56 provided in the bottom face of the block 47.

The upper face of the plate 53 is provided with radial grooves 57 each adapted to receive a die segment 58 having tongues 59 slidably received in the grooves 57, as will readily be understood by reference to Figures 12 and 13. The peripheries 61 of the die segments 58 are beveled to correspond to the beveled bore 52 in the block 47, whereby when the die segments are moved downwardly relatively to the block 47, they will be forced inwardly to the positions shown in Figure 13, as will readily be understood.

A cap supporting member 62 is secured to the plate 53 by such means as bolts 63 and serves to provide a support for the cap 12 during the operation of forming the threads in the periphery thereof. The bolts 54 are shown provided with threaded terminals 64 received in apertures provided in the plate 53 and may also be screw threaded into suitable threaded sockets provided in the bottom face of the supporting member 62.

A suitable spring 65 has its ends received respectively in sockets provided in the block 47 and supporting member 62 and serves to constantly urge the plate 53 carrying the die segments and supporting member 62, upwardly to the position shown in Figure 12. A suitable spring 66 is also interposed between each die segment 58 and the supporting member 62 to constantly urge the die segments outwardly into the positions shown in Figure 12.

The usual ram 3 of the press may be provided at its lower end with male die 60 having a reduced cylindrical portion 67 adapted to enter the cap 12, as shown in Figures 12 and 13, thereby to support the flanged wall of the cap during the operation of forming threads in the periphery of the cap, as shown in Figure 13. In Figure 12 the male die is shown in the position when it has just engaged the die segments 58 and whereby the cap 12 is firmly supported upon the member 62. As the ram continues in its downward movement from the position shown in Figure 12 to that shown in Figure 13, the die segments 58 are forced inwardly against the tension of the springs

66, as the result of the coacting beveled faces 61 of the die segments and the beveled wall 52 of the block 47. Such inward movement of the die segments 58 will cause the thread forming beads 68 provided on the inner faces thereof to become embedded in the periphery of the cap 12, whereby exterior threads are formed in the cap as will readily be understood by reference to Figures 13.

When the ram 3 starts its upward movement, the cap supporting member 62 will follow the male die 60 until its upward movement is arrested as result of the heads 55 of the bolts 54 engaging the bottoms of the sockets 56, as shown in Figure 12. Simultaneously as the supporting member 62 moves upwardly to the position shown in Figure 12, the die segments 58 are expanded or moved outwardly by the action of the springs 66, whereby the thread forming beads 68 are moved out of engagement with the periphery of the cap, as shown. The ram then continues its upward movement until the bottom end of the cylindrical portion 67 of the male die 60 is spaced well above the top face of the die segments 58, after which the cap may readily be removed from the bottom of the ram and a new one fitted thereon to be threaded as hereinbefore described.

The novel thread forming apparatus herein described readily lends itself for use in forming threads in various materials to be used in the manufacture of caps or closures for various types of containers. The type of thread to be formed in the cap is readily controlled by changing the size and shape of the thread forming beads provided on the die segments, as will readily be understood. It is also to be understood that while I have herein described the apparatus as used for forming threads in paper caps, such as may be used as closures for Mason jars, and the like, the apparatus may be used for making various other types of articles where applicable without departing from the scope of the invention.

It will be apparent to those skilled in the art that I have accomplished at least the principal objects of my invention, and it will also be apparent to those skilled in the art that the embodiments herein described may be variously changed and modified without departing from the spirit of the invention, and that the invention is capable of uses and has advantages not herein specifically described; hence it will be appreciated that the herein disclosed embodiments are illustrative only, and that my invention is not limited thereto.

I claim as my invention:

1. In a die of the class described, a hollow die member, a cylindrical cap supporting member yieldably mounted in the die member, a holder, a plurality of die segments mounted for radial movement in the holder and each having a thread-forming portion on its periphery, and a plunger mounted for movement in a direction at right angles to the movement of the die segments, said plunger having operative connections with the die segments whereby when moved in one direction, said segments are expanded into engagement with a flange of a closure cap thereby to provide a continuous screw thread therein.

2. In a die of the class described, a fixed hollow die member, a cap supporting member yieldably mounted therein, a ram, a die holder supported on the ram over the cap supporting member, a plurality of die segments movably mounted in the die holder and each having a thread-forming portion on its periphery, wedge elements as-

sociated with said die segments and each having a thread-forming portion, and a plunger fixed to the ram and movable therewith when the ram is operated, whereby said plunger may engage the wedge elements and outwardly translate them to expand the die segments into thread-forming engagement with the flange of a cap positioned on the cap supporting member, the thread forming portions of said segments and wedge elements cooperating to provide a continuous thread in the cap, when moved into thread-forming engagement therewith.

3. In a die of the class described, a fixed hollow die member, a cap supporting member yieldably mounted therein, a ram, a head secured to said ram, a die holder yieldably supported on the ram over the cap supporting member, a plurality of die segments mounted for radial movement in the die holder and each having a thread-forming portion on its periphery, wedge elements interposed between said die segments and each having a thread-forming portion, and a plunger fixed in said head and movable therewith when the ram is operated, whereby said plunger may engage the wedge elements and outwardly translate them to expand said wedge elements and die segments into thread-forming engagement with the flange of a cap positioned on the cap supporting member, said segments and wedge elements cooperating to provide a continuous, uniterrupted thread in the cap.

4. In a die of the class described, a fixed hollow die member, a cap supporting member mounted therein, a ram, a head secured to said ram, a die holder yieldably supported from said head, a plurality of die segments mounted for radial movement in the die holder and each having a thread-forming portion on its periphery, wedge elements interposed between adjacent die segments and each having a thread-forming portion, the inner ends of said wedge elements being inclined to the axis of the die holder, and a plunger fixed in said head and movable therewith when the ram is operated, whereby said plunger may engage the inner inclined ends of the wedge elements and outwardly translate said elements, whereby they will expand the die segments into thread-forming engagement with the flange of a relatively large cap supported on the cap supporting member, the thread formed by said segments and wedge elements being continuous and unbroken.

5. In a die structure of the class described, a hollow die member adapted to be secured to the bedplate of a press, an article supporting member yieldably mounted in said die member, a head adapted to be secured to the press ram for movement therewith, a plunger secured in said head and depending therefrom, a die holder yieldably supported from said head and having an axial bore for receiving the plunger, a plurality of die segments mounted for radial movement in the die holder and having their inner ends

normally positioned in the path of the plunger, and means whereby when the plunger is operated to move said die segments into operative engagement with the article, the lower faces of the die segments will engage the article and firmly support it on the die supporting member, after which the plunger will continue its downward movement relative to the die holder and subsequently engage said wedge elements and die segments and expand them into operative engagements with the cap, to provide a continuous uninterrupted thread therein.

6. In a die structure of the character described, a cup-shaped die member adapted to be fixedly supported in the bedplate of a press, a plunger secured to and movable with the press ram, an article supporting member yieldably supported in said die member and adapted to recede into the die member under pressure of the plunger whereby the wall of the cup-shaped die member may support the flanged wall of a closure cap against outward pressure, during the working stroke of the plunger, a die holder, a plurality of die segments movably mounted in the die holder and each having a thread-forming portion adapted to engage the periphery of the cap flange, wedge elements interposed between said die segments, said plunger having its lower end positioned in a bore in the die holder in operative relation to the inner ends of the wedge elements and said die segments, means permitting relative axial movement of the die holder with respect to the plunger to permit the die segments to engage the cap flange before the plunger can engage the inner ends of the wedge elements and said die segments and simultaneously expand them into thread-forming engagement with the closure flange to form therein a continuous thread, and means for contracting the die segments and said wedge elements, after the thread-forming operation has been completed, thereby to permit convenient removal of the threaded closure from the die.

JOSEPH H. GOSNELL, JR.

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