Sept. 18, 1956 P. J. LAWSON 2,763,228

LID-MAKING APPARATUS

Filed Oct. 8, 1952 3 Sheets-Sheet 1

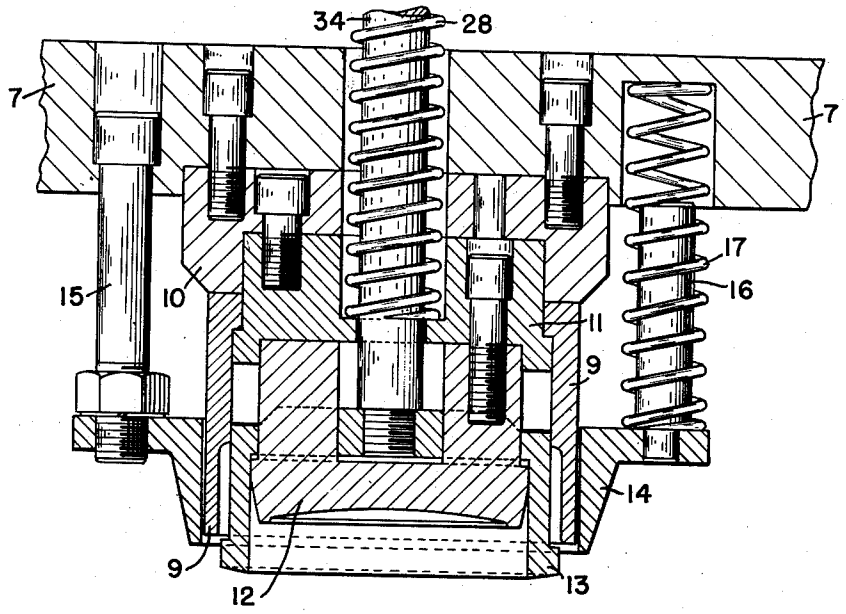
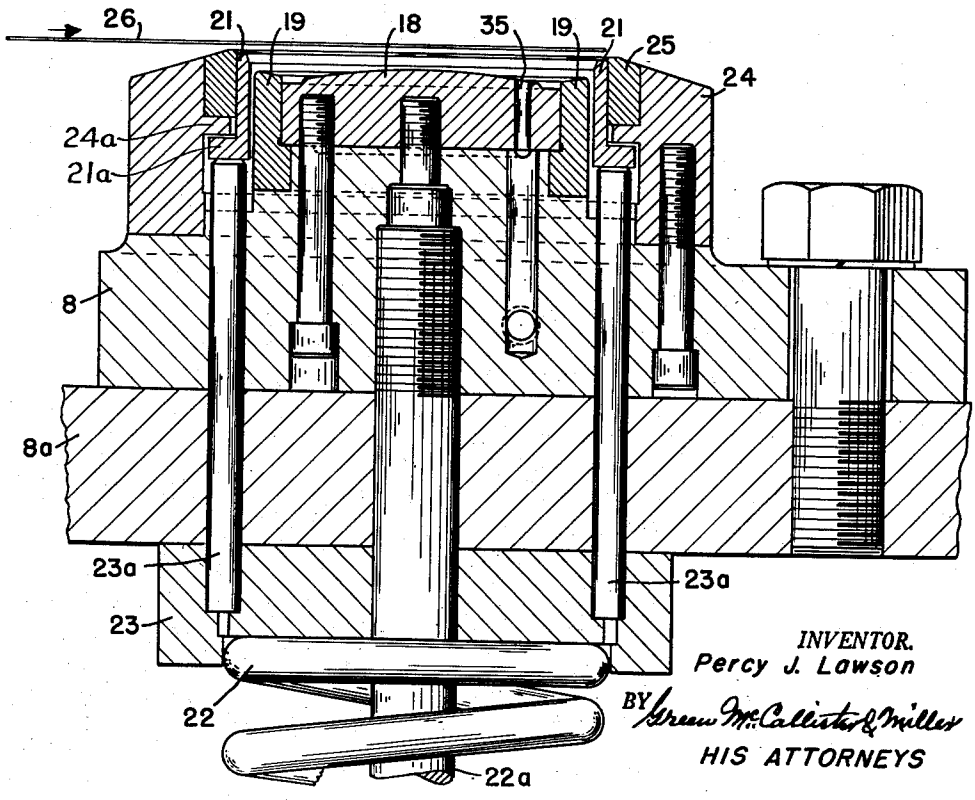


Fig. 1



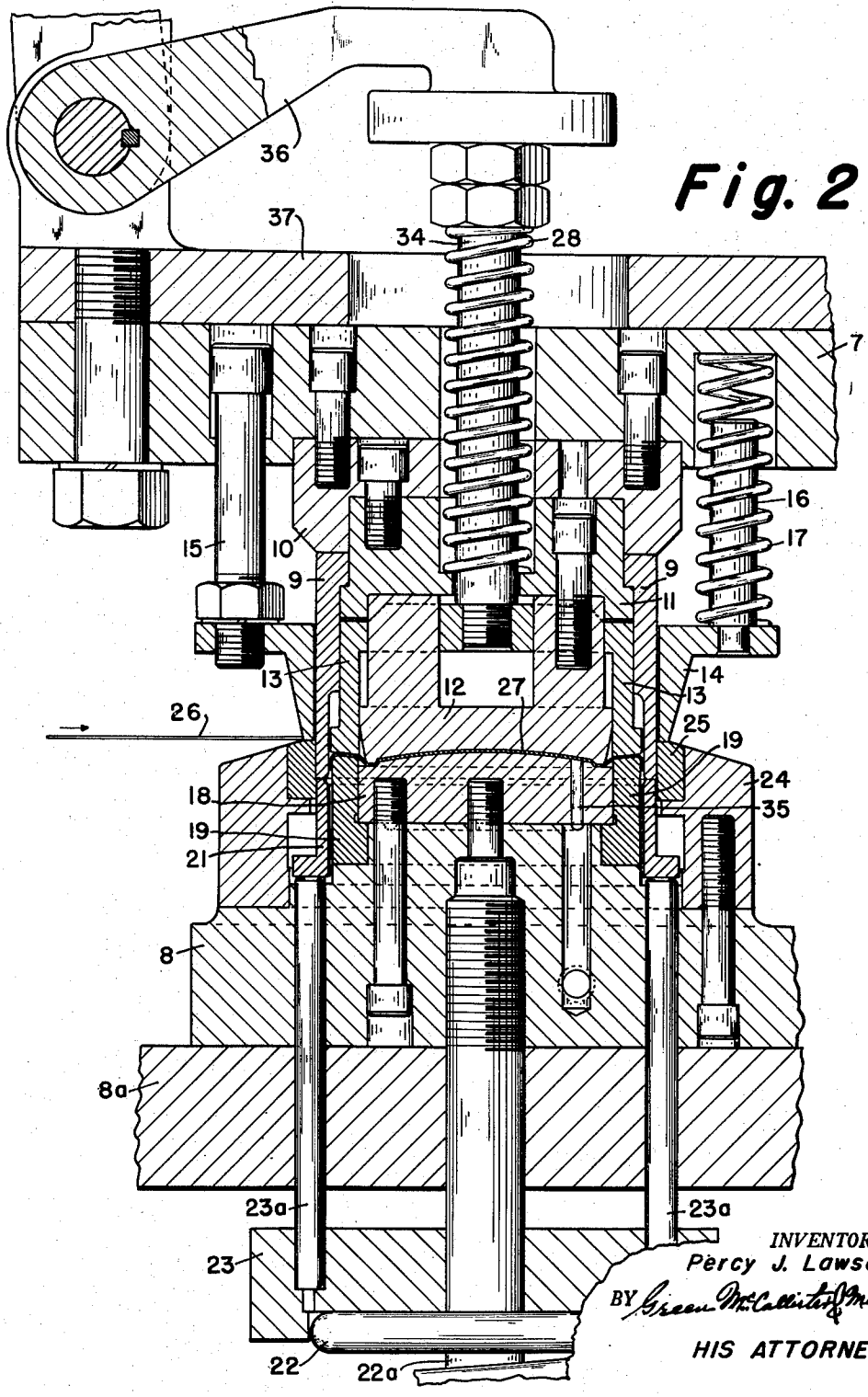
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Fig. 2



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LID-MAKING APPARATUS

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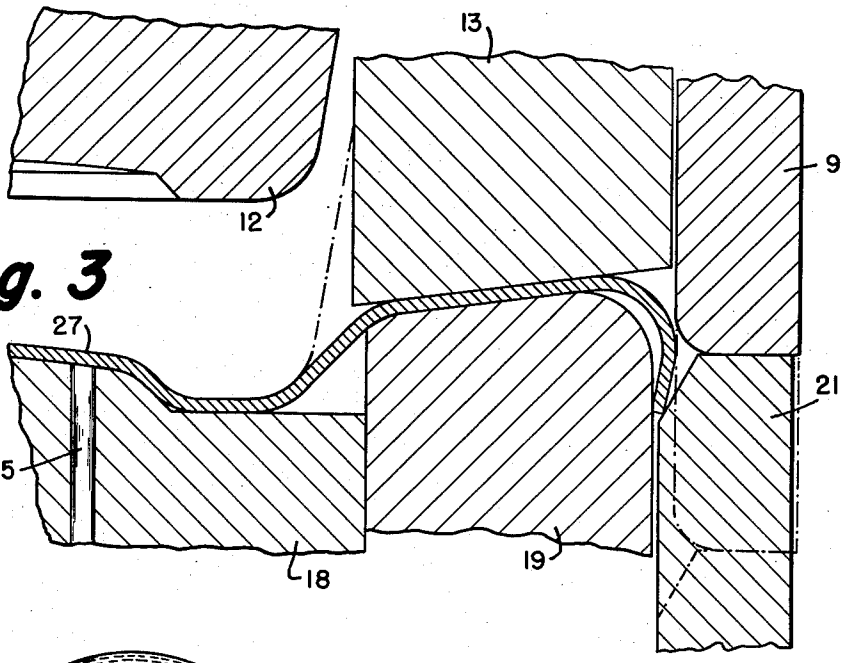


Fig. 3

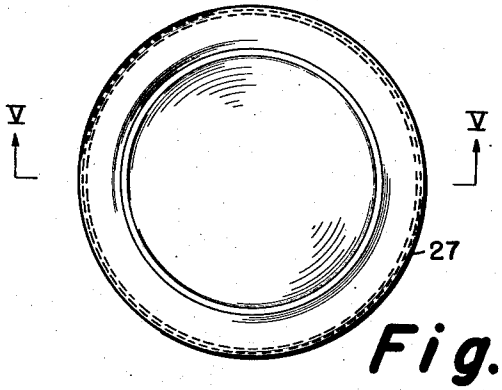


Fig. 4

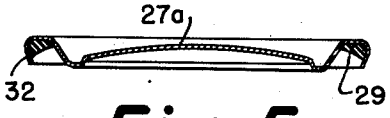


Fig. 5

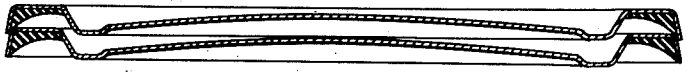


Fig. 6

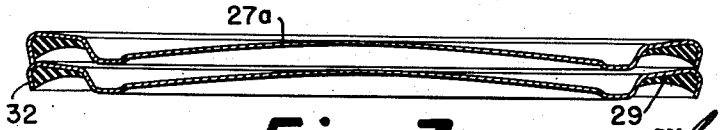


Fig. 7

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2,763,228

LID-MAKING APPARATUS

Percy James Lawson, Muncie, Ind., assignor to Ball Brothers Company, Incorporated, Muncie, Ind., a corporation of Indiana

Application October 8, 1952, Serial No. 313,775

2 Claims. (Cl. 113—42)

This invention relates broadly to the production of closures for containers and specifically to apparatus for commercially producing a new form of closure, under conditions such as to minimize the cost of production of the closures, the cost of the closures and the cost of assembling and packing the same for shipment and sale.

An object of the invention is to produce a lid to be used as a closure element and which is of such form that a number of such lids may be assembled and packed by mechanical means without danger of marring or damaging the lids or any portion thereof.

A further object is to produce a lid which includes a sealing gasket as a part thereof and which is of such form that a number of such lids may be stacked and packed face to back without injuring or detrimentally effecting such gasket.

A further object is to produce new procedure for manufacturing a new form of lid which may be employed as a closure element for containers such as glass jars used in the canning and preserving of food and other perishable material.

A further object is to produce apparatus for carrying forward the new procedure constituting one aspect of the invention here disclosed.

Lids somewhat similar to those produced by the procedure and the apparatus here disclosed and defined, are now in use and consist generally of a circular disc-like member surrounded by an annular flange and having an annular gasket-receiving groove or recess formed in the flange-projecting side thereof, and which is adjacent to and concentric with the flange. An annular gasket is located within the confines of the groove or recess and is adapted to seal the joint between the mouth of the container and the lid when the lid is employed as a closure part for a container. The gasket forming a part of the lids such as are here considered, is formed of a rubber-like composition such as a latex composition. The composition is usually flowed into the recess of the lid during the operation of completing the lid and, in effect, forms an integral part of the lid. The gasket so formed must be of uniform texture and thickness and must have a smooth and unmarred free surface for engaging the mouth or rim of the container to be sealed. For this reason it is necessary to protect the gaskets formed on or secured to the lids during packing for shipment and during shipment of the lids.

The assembling and packing of such lids as they are now formed, is tedious and must be performed by hand if the gaskets are to be protected against injury by reason of contact with and/or adherence to surfaces of adjacent lids. In order to prevent such injury, it has heretofore been the practice to pack a number of such lids in boxes or cartons and to so arrange the packed lids that they are located back to back and face to face, thus preventing contact, during packing and shipment likely to mutilate or in any manner mar the gasket or any other part of a lid included in the package. Such packing procedure has required the use of carefully dimensioned

cartons or similar containers and has also required that the depth dimension of each such carton is necessarily greater than would be the case if each of the lids packed therein was located face to back with relation to other lids.

A specific object of the present invention is to produce procedure for the manufacture of lids in commercial quantities and under commercial conditions, in which the lids so produced are similar to those now in use but are of such form that they may be packed face to back in cartons or containers of minimum dimensions, but without the danger of damaging any gasket, included in the make-up of the lids, by contact with or adherence to an adjacent lid.

The new form of lid, involved by the present invention, is substantially similar to lids now in use except that the flange constituting a part of each such lid is of such shape as to prevent the lids from nesting one within another, when stacked or located in face to back relationship with the free edge of the flange of one lid engaging the back of the adjacent lid at points around the flange thereof but remote from the edge of the flange so engaged.

With reference to the production of lids, such as herein described, it is noted that the lids are formed from suitable metal in sheet form which, for the purpose of minimizing cost of production, is enameled on the side thereof which forms the face of the finished lid, i. e., that face of the lid which is surrounded by the flange of the lid and is exposed to the interior of the container sealed by the lid. It will be understood that the enameled surface thus formed on the sheet material must be of uniform consistency and free from pin holes, cracks and crevices. This surface characteristic of the enamel must be maintained throughout the lid-producing operation or else the lids cannot be employed as closures for receptacles in which food or other moisture containing material is to be preserved. It might also be noted that the latex or similar composition which constitutes the sealing gasket for each lid, is placed on the enameled surface of the recess or groove formed in the face of the lid and, in fact, lies against the inner face of the flange of the lid. As previously indicated, this recess is located immediately adjacent the flange of the lid and the flange must, therefore, be of such form as to prevent a nesting of adjacent lids (when they are assembled in face to back relationship for shipping purposes), such as will permit or contribute to contact between the gasket of one lid with the back of an adjacent lid.

A further and more specific object is, therefore, to produce an improved arrangement of apparatus for the commercial production of a form of lid, wherein the procedure is such that the commercial production of the lid is accomplished under conditions such as to minimize cost of production and to make it possible to produce the new and improved form of lid at a cost such as will be competitive with the old form of lid.

The objects herein enumerated, are attained by means of the procedure defined and the apparatus illustrated for carrying forward that procedure.

In the drawings, Figure 1 is a diagrammatic sectional view illustrating in fragmental section parts of a usual form of press in which the timing of the operation of certain of the parts thereof is modified so as to carry forward the procedure constituting one aspect of the present invention; the punch block and the die block of the press are shown in Figure 1 in the relationship of those parts when the punch block is farthest removed from the die block and is about to begin its closing or die-forming movement.

Figure 2 is a fragmental sectional view of the parts of a press shown in Figure 1, but disclosing the relative posi-

tions of the punch block and the die block when the die block is located at the end of its die-forming stroke.

Figure 3 is a fragmental sectional view (on an enlarged scale) of portions of the press shown in Figures 1 and 2 and discloses the relative positions of parts, constituting portions of both the punch block and the die block, as the punch block moves away from the die block.

Figure 4 is a top plan view of the new form of lid produced by the procedure herein described and the apparatus herein illustrated. Figure 5 is a sectional view along the line V—V of Figure 4.

Figure 6 is a sectional view showing the nested relationship of two old forms of lids when located aligned in face to back relationship; and Figure 7 is a view corresponding to Figure 6 but disclosing the non-nesting relationship of the new form of lids when aligned and located in face to back relationship.

The improved lid-forming procedure disclosed, may be carried forward by a press of the high speed type which is generally of usual form except for the timing or the cooperative relationship between the functioning of some of the parts during the lid-forming operation. To be more specific as to apparatus, the parts of the press here under consideration are generally of usual form except that the time of operation of some such parts is so modified as to change the normal functioning thereof in such a way as to produce the form of lid herein illustrated and described.

It will be understood by those familiar with such apparatus, that the press consists primarily of a punch block **7** and a die block **8**. The punch block is adapted to reciprocate toward and away from the die block and the die block is firmly mounted on a frame or bolster **8***a* forming a part of the press. Any suitable and usual means may be employed for reciprocating the block **7**. For convenience of illustration and also because the press here under consideration is of a well known type, I have omitted many of the structural parts of the press. By so doing I, to some extent, accentuate those parts of the press which cooperate in the production of the new form of lid, illustrated in Figures 4, 5 and 7 of the drawings.

As illustrated, the punch block **7** of the press carries an annular shear member or punch **9**, which is backed up by a punch adapter **10** rigidly secured to the block **7**. The rear end of the punch is so formed as to provide a reentrant, annular shoulder which cooperates with a complementary shoulder formed on a punch retainer **11**. The retainer functions to position the annular punch **9** as it moves back and forth with the block **7**. The punch surrounds an upper plunger **12**, shown as rigidly secured to the punch retainer **11** and, consequently, to the block **7**. The plunger **12** contributes to the formation of the central portions of the lids formed by the press. It is provided with a concave face which, in the lid-forming operation, cooperates with a complementary face of a member **18** to be described, which forms a part of a matrix assembly carried by the die block **8** of the press. This cooperation of the parts in the formation of the lids, is occasioned by the closing or die-forming movement of the plunger **12**. An annular or ring-shaped knockout member **13** surrounds the plunger **12** and is in turn surrounded by the ring-shaped punch **9**, i. e., the knockout **13** is located between the plunger **12** and the punch **9**, and, as shown, is engaged by each such member.

A stripper **14** of annular form surrounds the punch **9** and is carried by the punch block **7**. The stripper is spring supported on the punch block and is movable relatively thereto and longitudinally of the punch **9**. As shown, the stripper **14** is carried by guiding parts **15** movably secured to the punch block **7**, and it is also provided with a series of spring retaining pins **16**. Each such pin is rigidly secured to the stripper **14** and projects into a recess formed in the block **7**, the inner end of which also constitutes a seat for coiled springs **17**. Each spring **17** surrounds one of the pins **16**. For simplicity of illustration

but one pin **16** and spring **17** is shown. The springs **17** function to yieldingly hold the stripper **14** in its forward, or what may be termed its stripper position, with relation to the block **7** and the plunger **12**.

The die block **8** constitutes a support for a number of parts, each of which cooperates with at least one of the parts described as carried by the punch block **7**. Thus the die part or central matrix member **18** cooperates with the plunger **12** in forming the central or intermediate portion of each lid and is rigidly mounted on and secured to the die block **8**. It is surrounded by what may be termed a matrix or die ring **19** which is rigidly mounted on the block **8**, surrounds the matrix member **18** and cooperates with both the plunger **12** and the knockout **13** in the die-forming operation of the press. This matrix or die ring **19** is surrounded by a draw ring **21** which is movably mounted on the block **8** and is normally spring pressed to its uppermost or advanced position by means of a coiled spring **22**. The coil spring **22** acts on the draw ring **21** through the agency of a spring plate **23** and pins **23***a* carried by the plate. In its uppermost position, the plate engages the lower side of the bolster **8***a* and in this way limits the uppermost spring pressed movement of the draw ring **21**.

The draw ring **21** is provided with a base flange **21***a* which, as shown in Figures 1 and 2, is overhung by a reentrant flange **24***a* formed on the die blank **24**. It will also be noted that the flange **24***a* forms a seat for the knife ring **25** and supports that ring. As clearly shown in Figure 3, the cooperative action between the annular knockout member **13** and the die ring **19** imparts holding or clamping pressure to the blank **27** but, as shown in Figure 3, a substantial portion of the outer edge of the blank is not subjected to this clamping pressure.

As clearly shown in Figure 3 this is due to the fact that the operative end of the ring **19** is rounded at its outer peripheral edge and in this respect does not conform to the contour of the cooperating face of the knockout **13**.

It is noted that for convenience and simplicity of description, I hereinafter sometimes refer to the opening movement of the plunger block as the upward movement of that block and I sometimes refer to the exposed and active faces of the matrix members as the upper faces of those members. Likewise the closing movement of the punch block is sometimes referred to as the downward movement and the exposed and active faces of the members assembled on the punch block as the lower faces of such members.

A die blank **24** surrounds the draw ring, is rigidly mounted on the block **8** and is recessed to receive a knife ring **25** which also surrounds the draw ring **21** and cooperates with the punch **9** in the operation of severing a circular lid blank from sheet metal or metallic strip material fed to the press. The draw ring **21** also cooperates with the punch **9** in holding the sheet material from which the lid blanks are cut, and also in forming a portion of each lid after each blank-cutting operation has been completed. The draw ring **21** cooperates with the knockout **13** during a portion of the die-forming operation and, as will be described later, also contributes to the functioning of the punch **9** and die ring **19**, in carrying forward one step of the procedure here under consideration.

From the foregoing it will be apparent that the plunger or reciprocating die member carried by the punch block **7**, is made up of a number of separately formed, and in some cases, separately operating elements. This is also true of the matrix portion of the press, which as previously noted, is carried by the die block **8**. It might also be noted that the press which forms the basis of the disclosures of Figures 1 and 2, is of the double type, i. e., is so formed that during each operating cycle two lids are formed, each by die members such as illustrated in the last mentioned figures of the drawings. This

statement will explain structural details which otherwise might be interpreted as parts of an incomplete apparatus.

During the operation of the press, metallic strip material **26** diagrammatically illustrated in Figure 1, is mechanically fed in a step by step movement to the matrix portion of the press. The feed mechanism is not illustrated, but it is apparent that each forward step of the strip **26** is accomplished while the punch block is up or is moving up and that the forward end of the strip is so positioned that it is acted upon by the die-forming elements of the press during the closing or downward movement of the punch block **7**. It is also noted that one face of the strip material has been enameled and the enameling operation has been fully completed prior to the delivery of the strip material to the press.

While the forward end of the strip material is in position over the matrix portion of the press, the plunger member **12** of the press moves downwardly toward it. This movement is occasioned by the forward or downward movement of the punch block **7**. During this movement the stripper **14** is in the advanced or rest position and is yieldingly held in that position by the coiled springs **17**. The lower end of the stripper, therefore, engages the strip material **26** prior to the time that the punch block has completed its forward movement and prior to the time that other die members are effective as forming elements. Under such conditions the then stationary strip material **26** is gripped between the nose or lower end of the stripper **14** and the upper annular surface of the knife ring **25**. The portion of the strip material **26** thus engaged by the stripper **14**, is held in tension across the elements of the die block which are surrounded by the knife ring **25**.

During this portion of the downward movement of the punch block **7** the knockout **13**, carried by it, is retracted by spring **28** which surrounds a bar **34** secured to the member **13**. As the press continues its downward or die-forming movement, the punch **9** contacts the portion of the strip held in tension by the cooperation of the stripper **14** and the knife ring **25** and which, at the instant of such contact, is engaged by the spring-pressed draw ring **21**. As the punch block continues its forward or closing movement, the cooperative action of the punch **9** and the knife ring **25** severs or blanks out a circular disc **27** which then constitutes a lid blank and is of sufficient size and shape as to produce the final lid.

The severing of the disc by the punch **9** also firmly clamps the disc so formed, between the lower end of the punch and the upper end of the draw ring **21**. As to this, it will be recalled that the draw ring is supported by the coiled spring **22** through the agency of the pin plate **23** and the pins **23***a*. As a result, the draw ring moves with the punch 9 as the punch advances beyond the cutting edge of the knife ring **25**.

During this movement of the punch block **7**, the disc **27** is engaged by the knockout **13**. At the time of such engagement the disc is in contact with the die ring **19** forming a part of the matrix member of the press. As indicated by Figure 2 of the drawings, the operating mechanism of the knockout **13** includes as a part thereof the coiled spring, the cam-actuated bar **34**, a cam, not disclosed by the drawings but forming a part of the operating mechanism of the press and a cam-actuated lever **36** which is pivotally mounted on the cross head **37** and which engages the bar **34**. The spring **28** operates in opposition to the cam and tends to hold the knockout **13** in its retracted position. The die ring **19** surrounds the matrix **18** and, like the matrix, is a stationary member secured to the die block **8** which, as previously noted, is supported on the bolster **8***a*. The cooperation between the knockout **13** and the die ring **19** is such that an intermediate annular portion of the blank **27** is firmly gripped by the two members **13** and **19** during the downward movement of the punch block **7** and, as will be later noted, this gripping or clamping action is continued during a portion of the upward movement of the punch block.

As the punch **9** continues its downward movement past the knife edge of the knife ring **25**, the edge of the severed disc **27** is yieldingly held between the lower end of the punch and the upper end of the draw ring. This edge, however, gradually pulls free of the two members **9** and **21** as those members continue their downward movement. During this withdrawal the adjacent portion of the disc is forced against and formed by the rounded edge of the die ring **19** and is eventually folded inwardly by the action of the rounded end and inner surface of the lower portion of the punch **9**, thus contributing to the formation of the annular flange **32** forming a part of the finished lid. To state this more briefly, the edge portion of the disc **27** is gripped by and yieldingly held between the lower end of the punch **9** and the upper end of the draw ring **21**, but is gradually withdrawn from engagement with these two members as they continue their downward movement. During this withdrawal the edge portion of the disc is simultaneously pressed against the rounded edge of the die ring **19**, thus initiating the formation of the flange on the lid being produced.

As the punch **9** moves downwardly the plunger **12** engages the disc **27** and, cooperating with the matrix member **18**, forms the central portion **27***a* of the finished lid, which is dome shaped as disclosed by Figures 2 and 5 of the drawings. It will be noted that the active surface of the die ring **19** is so contoured as to contribute to the formation of the gasket-receiving recess **29** which is disclosed by Figures 2 and 5 of the drawings. This recess is formed as a result of the cooperative action of the plunger **12**, the matrix part **18**, the die ring **19**, the lower end of the knockout **13**, the lower end and the inner peripheral face of the punch **9**. It will be apparent that the cooperative action between the die ring **19** and the knockout **13**, contributes materially to the completion of the lid and it is, therefore, noted that the upper surface of die ring is inclined toward the matrix member **18** and that the cooperating or lower face of the knockout **13** is correspondingly inclined. As the punch block assembly **7** continues its downward movement, both the central portion and the edge portion of the lid are being formed and both forming operations take place while the disc **27** is firmly clamped between the knockout **13** and the inner portion of the upper face of the die ring **19**.

After the die-forming or downward movement of the block **7** is completed and as it starts its upward movement, the knockout **13** remains stationary and continues to exert pressure on the disc **27** and to hold it in clamping engagement with the die ring **19**. This is accomplished by means of cams or similar devices not shown in the drawing, but which, in a press such as illustrated, operate through the medium of the cam-actuated bar **34**. The formation of the flange **32** of the lid is completed during the initial portion of the upward movement of the punch block **7**.

As a preliminary to the description of the final procedural step in the formation of a lid, I refer again to the initial formation of the flange portion **32** as the peripheral edge of the disc **27** is withdrawn from clamping engagement of the punch **9** and the draw ring **21**. As disclosed, the inner peripheral edge of the punch **9** is rounded. The adjacent edge of the draw ring **21** is beveled. It will be noted that the outer edge of the upper face of the ring **19** is so rounded that while it contributes to the formation of the completed lid, it is spaced from the adjacent portion of the face of the knockout **13** so that the rounded portion never exerts clamping pressure on a disc **27**. From the foregoing it will be apparent that as the punch **9** and the draw ring **21** move downwardly with the punch block **7** during the latter portion of the closing movement of the punch block, the portion of the disc **27** which is initially clamped between the punch and the draw ring,

is in effect folded around the curved outer edge of the upper end of the die ring 19 and the edge portion of the disc is forced toward the cylindrical surface of that ring by the downward movement of the punch 9.

Thus at the end of the closing movement of the die block 7, the edge of the then partially completed lid is held between the lateral surface of the die ring 19 and the adjacent cylindrical face of the punch 9. This relationship of parts is disclosed in Figure 2 and the final position of the punch 9 and draw ring 21 is also indicated by dot-dash lines in Figure 3. In Figure 3 the parts are shown in full lines in the relative positions they occupy during the early portion of the upward movement of the punch block 7. As there shown the beveled edge of the draw ring 21 has engaged the lower edge of the disc 27 and has moved that edge upwardly to a position such that even though the disc 27 is subjected to the clamping action of the knockout 13 and the die ring 19, the portion thereof previously engaging the rounded peripheral edge of the die ring is lifted free thereof under conditions such that the edge of the disc is forced inwardly against the cylindrical face of the die ring by the beveled edge of the draw ring and the transverse curvature of the disc adjacent the edge thereof, is reformed so that the radius of curvature thereof is substantially less than the radius of curvature of the rounded peripheral edge of the ring 19. This is clearly shown in Figure 3 and the figure makes it apparent that this reforming of the edge portion of the partially completed lid, increases the diameter of the lid to at least that of the inner peripheral surface of the punch 9. It also turns the free edge of the lid inwardly so that it is of less diameter than the shoulder portion of the lid.

When the crank of the press has moved approximately 30° past its lower dead center position during the upward movement of the punch block 7, the knockout 13 is abruptly moved upwardly, thus releasing the clamping action which has held the lid against the upper face of the ring 19. This lifting of the knockout 13 and the resulting relieving of the deforming stress imposed on the lid by the upwardly moving draw ring, causes the lid to move or spring out of contact with the die block assembly more rapidly than it is impelled by the upwardly moving draw ring 21. As a result, it is engaged by the inner peripheral surface of the punch 9 and then moves with the punch as the punch block continues through a portion of its upward movement.

In order to insure the rapid movement of each lid away from the die block assembly and, consequently, out of engagement with the die ring 19, I preferably employ a puff of compressed fluid such as compressed air, which is delivered to the interior surface of the lid, i. e., the surface in contact with the matrix member 18, through an aperture 35 formed in the matrix member. I have found that under normal operating conditions the delivery of air pressure through the aperture 35 is not always essential since the distortion of the lid occasioned by the upwardly moving draw ring against the pressure of the knockout 13 stresses the material of the lid to such an extent that when the knockout 13 is lifted the resilience of the material will itself cause the lid to spring out of contact with the ring 19 and other elements included in the die block assembly.

As the punch block 7 continues its upward movement, the stripper 14 becomes effective in removing the strip scrap material from the punch 9. As the punch block reaches or nears the top dead center position, the knockout 13 is cam or otherwise actuated to force the completed lid from its engagement with the inner surface of the punch 9. The lids so released drop free of the press by reason of the fact that the press is inclined, or so positioned that as the lid falls free of the punch it also falls free of the elements of the press. As soon as this happens the strip material 26 is again advanced and positioned over the die block assembly and the lid-forming cycle, as herein defined, is repeated.

Briefly stated the following procedural steps are employed in the formation of a closure such as is here under consideration. The strip material from which lids are formed is automatically advanced so that the forward end thereof is positioned over the knife ring 25. The stripper element 14 moving downwardly with the punch block 7 engages the strip material and in effect clamps it against the knife ring 25. The downwardly moving punch 9 engages the material held against the ring 25 and in cooperation with that ring severs a circular blank from the strip material. Substantially simultaneously with the severance of the blank, the blank is engaged by the draw ring 21 which is pressed forward by the coiled spring 22. As the punch 9 continues its downward movement the edge of the severed blank is clamped between it and the upper end of the spring pressed draw ring 21. During this downward movement of the punch the knockout element 13 engages the severed blank and, while contributing to the formation of the lid, clamps the blank against the die ring 19. The plunger 12 simultaneously contacts the blank and in cooperation with the matrix member 18 forms the central or arched portion of the finished lid.

During this operation the continued downward movement of the punch 9 and the draw ring 21, the severed blank is being pulled free of its engagement with those elements and is being drawn over and formed against the rounded outer peripheral edge of the die ring 19. The initial forming of the rim portion of the blank is initiated by the combined action of the punch and the draw ring and is followed by the action of the downwardly moving punch in forcing the rim of the disc toward the cylindrical surface of the die ring.

During this portion of the lid-forming operation the knockout element 13 remains in clamping engagement with the blank and continues to hold it against the die ring 19. As previously described the knockout 13 continues to hold the blank in clamping engagement with the die ring 19 after the punch block 7 has completed its downward stroke and starts moving upwardly. During this upward movement the punch 9 moves out of engagement with the rim portion of the blank and the circular edge of the blank is almost immediately engaged by the beveled edge of the upwardly moving draw ring 21. The continued upward movement of the draw ring forces the edge of the blank inwardly against the cylindrical surface of the die ring 19 and lifts the outer annular portion of the blank, which is not subjected to the clamping action of the knockout 13, out of contact with or away from the curved edge of the die ring. This portion of the operation is illustrated in Figure 3 and, as there shown, the cooperative action between the upwardly moving draw ring and the then stationary knockout 13 further distorts the rim portion of the blank by increasing the curvature of the portion thereof which constitutes the junction between the body and the flange 32 of the disc or blank.

As the punch block continues its upward movement and substantially immediately after the draw ring has reached the position shown in Figure 3, the knockout 13 is abruptly lifted out of contact with the now completely formed lid, and the lid under the impulse of its own resilience and a puff of air delivered through the aperture 35, is lifted off of the die-forming elements carried by the die block and is engaged by the inner peripheral surface of the punch 9. During the further upward movement of the punch the lid moves with it until again engaged by the knockout 13 as the punch block moves toward the upper end of its stroke.

From the foregoing it is apparent that the lid-forming operation is completed during the opening movement of the punch block 7, but that the illustrated die assembly completes a lid during each full cycle of the press. It is also apparent that the relative movements and also the cooperative functioning of the different parts of the illus-

trated apparatus, contribute to the carrying forward of the new procedure and that, at least to this extent, the press illustrated is novel even though each of the die-forming elements thereof is old and well known as a part of die-forming apparatus.

While I have defined and illustrated a single apparatus for carrying forward that procedure, it will be apparent that changes in the apparatus may be made without departing from the spirit and scope of my invention as defined by the appended claims.

What I claim is:

1. In combination in a lid-forming press a stationary member, a movable member movable forward toward and backward away from said stationary member; die-forming means carried by said movable member and including a centrally located plunger movable with said movable member, an annular knockout surrounding said plunger and movable relatively thereto, an annular punch surrounding said knockout, movable with said plunger and having an annular cutting edge formed thereon; die-forming means mounted on said stationary member and including a centrally located stationary matrix positioned to cooperate with said plunger; a stationary, annular die ring surrounding said matrix and positioned to cooperate with said knockout, an annular draw ring surrounding said die ring movably mounted on said stationary member, aligned with and positioned to cooperate with said punch, and an annular knife ring surrounding said die ring and having a cutting edge thereon positioned to cooperate with the cutting edge of said punch; means for moving said movable member toward and away from said stationary member and said punch into blank-cutting engagement with said knife ring and for continuing the movement of said punch past the cutting edge of said knife ring; separate means for moving said knockout into blank-clamping cooperative relationship with said die ring and for then continuing such blank-clamping relationship throughout the lid-forming operation; yielding means normally holding said draw ring in an operative position and for causing it and the punch to move together in blank-clamping engagement as said punch moves to different positions beyond the cutting edge of said knife ring, to thereby yieldingly engage the peripheral portion of a blank engaged by said knockout and said die ring and to fold such portion against the exposed peripheral surface of said die ring as such punch continues its forward movement and while said knockout is maintained in blank-clamping engagement with said die ring and for causing a beveled surface of said draw ring to move into engagement with the peripheral edge of such so folded blank as said punch moves through the initial portion of its backward movement, to thereby force such edge of such blank into moving contact with the peripheral surface of said die ring and to move adjacent portions of such blank out of engagement with said die ring while said knockout is maintained in blank-clamping relationship with said die ring.

2. In combination in a lid-forming press a stationary member, a movable member, movable forward toward and backward away from said stationary member; die-forming means carried by said stationary member and including a centrally located stationary matrix, a stationary, annular die ring surrounding said matrix and having the outer peripheral edge of the upper end thereof rounded, an annular draw ring surrounding said die ring and movable relatively thereto and relatively to said stationary member; die-forming means carried by said movable member and including a centrally located plunger movable with said member into and out of blank-forming engagement with said matrix; an annular knockout surrounding said punch, aligned with said die ring and movable relatively to said punch and said movable member; an annular punch surrounding said draw ring and movable with said movable member and said plunger; means for moving said movable member forward and back, said plunger into blank-forming engagement with said matrix and said punch into blank-holding engagement with said draw ring; separate means for moving said knockout into blank-clamping engagement with said die ring; yielding means for normally holding said draw ring in an operative position and for causing the same to move with said punch as said punch moves to different positions after moving into cooperative relationship with said draw ring, to thereby cause said punch in cooperation with said draw ring to fold the portion of the blank overhanging said die ring into engagement with the rounded edge and the outer peripheral portion of said die ring as said punch continues its forward motion and for causing a surface of said draw ring to move past the peripheral edge of a so folded blank and then to move into engagement with such edge after said punch reverses its movement and moves through the initial portion of said backward movement, to thereby force the peripheral edge of such blank into moving contact with the outer peripheral surface of said die ring and to move the adjacent portion of said blank out of engagement with said die ring and the rounded adge thereof while said knockout is retained in blank-clamping relationship with said die ring.

References Cited in the file of this patent

UNITED STATES PATENTS

1,575,300	Weeks	Mar. 2, 1926
1,884,708	Jeneson	Oct. 25, 1932
1,975,150	Henry	Oct. 2, 1934
1,995,357	Liss	Mar. 26, 1935
2,098,906	White	Nov. 9, 1937
2,162,734	Lyon	June 26, 1939
2,492,886	Punte	Dec. 27, 1949
2,585,047	Scibelli	Feb. 12, 1952
2,591,108	Vigneault	Apr. 1, 1952