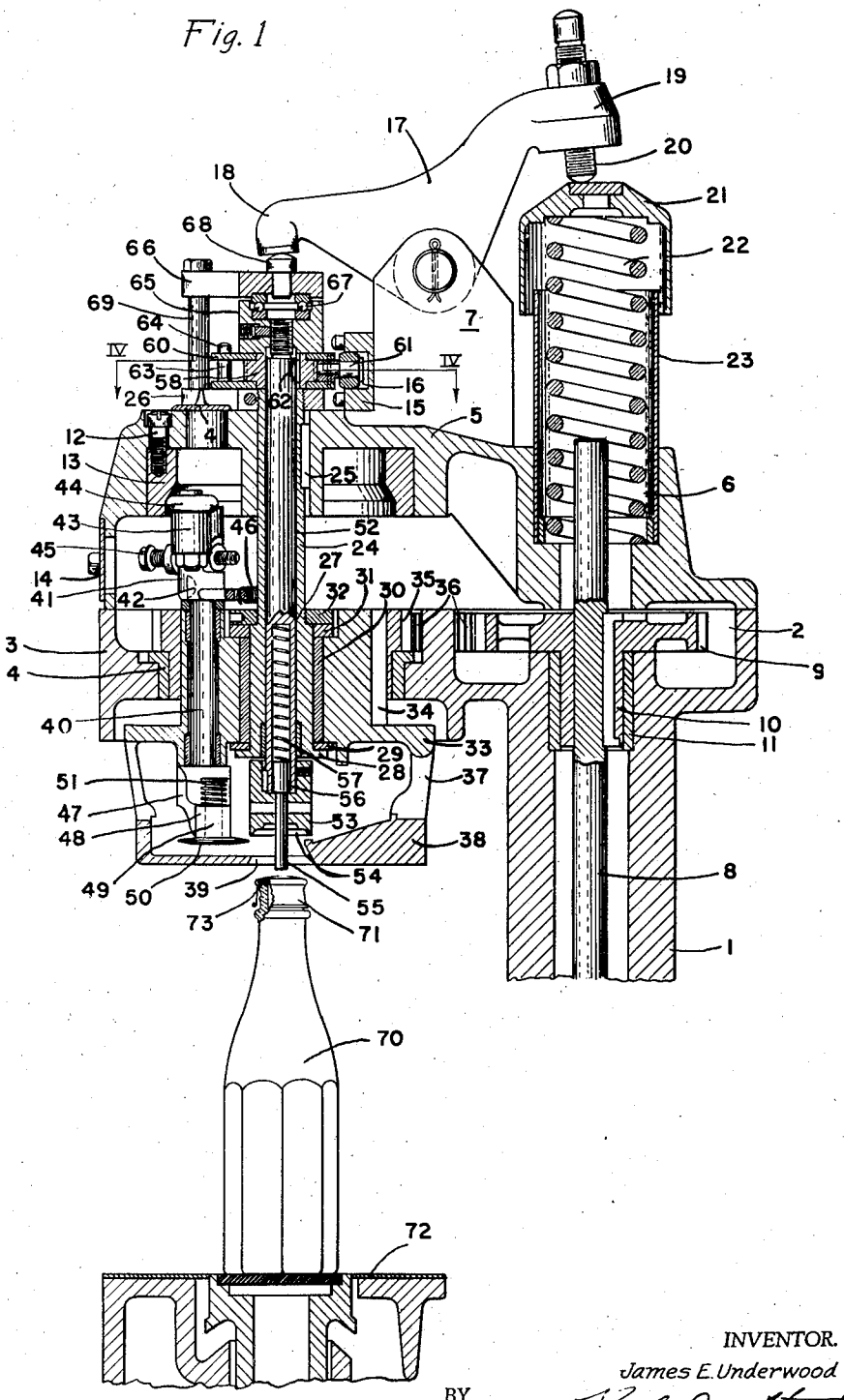
March 20, 1945. J. E. UNDERWOOD 2,372,138

SEALING MACHINE

Filed Sept. 10, 1942 2 Sheets-Sheet 1

Fig. 1



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Fig. 3.

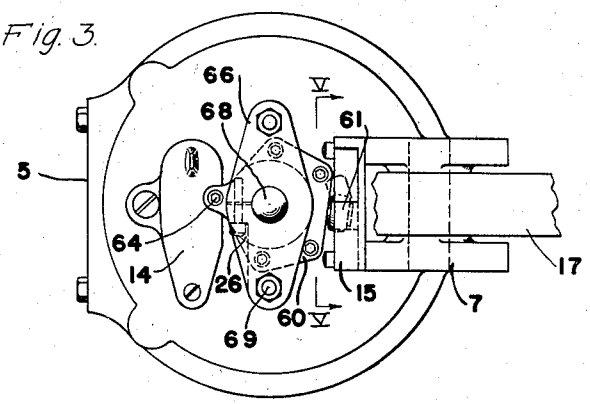


Fig. 5.

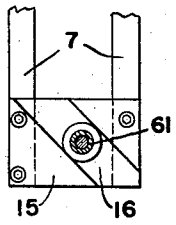


Fig. 4.

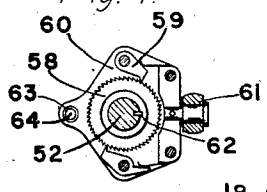


Fig. 2.

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UNITED STATES PATENT OFFICE

2,372,138

SEALING MACHINE

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Application September 10, 1942, Serial No. 457,826

7 Claims. (Cl. 226—87)

This invention relates generally to sealing machines and it concerns, more particularly, a machine for affixing closures to containers and the like.

It is well known to place a closure cap in position upon the mouth of a container with the skirt of the cap fitted loosely over screw threaded members on the neck of the container and to roll or spin the skirt into close engagement with the neck of the container. By this operation, the container is sealed and threads are formed in the skirt of the cap which serve to hold the cap in sealing position and permit the cap to be screwed on and off the container and to be used as a reclosure.

While this rolling or spinning operation is taking place, the closure generally is subjected to top pressure to force an internal sealing gasket or liner of rubber or cork or other suitable material, commonly provided in the upper portion of the closure, against the mouth of the container, the force usually being sufficient to cause the rim or mouth of the container to press into the liner. This provides a tight sealing condition initially. When the top pressure is removed from the cap after the sealing operation and the sealing stress is assumed by the cap, however, a slight stretching may occur in the cap and there may be a slight "spring back" in the deformed skirt wall. Such stretching and "spring back" may result in a shifting of the cap on the container and cause the initially tight sealing condition to be partially lost. This difficulty can be overcome by imposing extremely high top pressure against the cap and container so that even after completion of the sealing operation the mouth of the container remains pressed into the liner with sufficient force to provide a tight seal. Such a high pressure, however, may cause the container to break.

In accordance with the present invention, relatively low top pressure is employed and sufficient rotation of the cap is effected after formation of the threads thereon to screw the cap further upon the container and effectively tighten the seal.

It is an object of this invention to provide an improved sealing machine adapted to spin the sidewall of a closure positioned upon the neck of a container into contact with the container finish in which the cap is retained in spinning position under relatively low top pressure.

The invention has for another object the provision, in such a sealing machine of means for effecting rotation of the closure to tighten the same upon the container after its sidewall is spun into engagement with threaded configurations in the container finish.

A further object of this invention is to provide an automatic mechanism for deforming the depending skirt of a closure positioned over the mouth of a container into engagement and conformity with threads on the neck of the container and for screwing the closure into tight sealing relationship with the container.

Another object of the invention is to provide a sealing machine of the type referred to which is of generally simplified, compact, and improved form, and wherein all moving parts operating at relatively high speeds and requiring lubrication are fully encased for maximum cleanliness and safety of operation.

Other objects and purposes will appear in the following description of the invention and in the accompanying drawings, in which:

Fig. 1 is a fragmentary vertical sectional view showing the spinning head and adjacent members of a preferred embodiment of the invention with the parts in the relative positions they assume prior to bringing the package into position to initiate the spinning operation;

Fig. 2 is a view similar to Fig. 1 showing the relative positions which the parts assume after the package has been elevated to a position to cause the spinning operation to take place;

Fig. 3 is a top view of a portion of the spinning head illustrated in Figs. 1 and 2;

Fig. 4 is a horizontal sectional view taken on the line IV—IV of Figs. 1 and 2; and

Fig. 5 is a vertical sectional view taken on the line V—V of Fig. 3.

The machine in general comprises a suitable closed base casing or housing (not shown) having an upwardly extending hollow column 1, only partially shown in Figs. 1 and 2, provided with a cup-like portion 2 in its upper extremity and an annular seat member 3 spaced radially therefrom. The seat member 3 is vertically bored for the reception of a bearing ring 4 in which a rotary tool head assembly, hereinafter described, is journalled. A cover 5 is secured to the upper face of the cup portion 2 and the annular seat member 3. The cover 5 cooperates with the cup portion 2 and the annular seat member 3 to form a substantially sealed housing and support for the mechanism contained therein. The cover is recessed as depicted by reference numeral 6 and carries standards 7 on its upper side. A shaft 8 is disposed in the hollow column 1 and is

preferably driven from suitably driven mechanism contained in the base casing.

Suitably fixed on the shaft 8 is a gear 9 disposed within the cup portion 2, the gear having a depending hub 10 which fits within a bushing 11 seated in the upper end of the column 1 to provide a supporting bearing for the gear 9 and the upper end of shaft 8.

Secured in a recess in the inner face of the cover 5 and preferably held by screws 12 is an annular abutment or ring member 13 having an inclined inner surface forming a trackway, the ring member being coaxial with the bearing ring 4. Openings normally closed by the caps 14 permit access to the interior of the housing should it be desirable to adjust the parts contained therein.

Suitably mounted above the cover 5 and preferably supported by the standards 7 is a cam 15 having a trackway 16 extending vertically in a diagonal direction as shown in Fig. 5. The standards 7 also carry a rocker 17 having arms 18 and 19. Arm 19 is provided with an adjustable tappet screw 20, the lower end of which rests upon a cap 21 seated upon the top of spring 22. The spring 22, encased within tube 23, urges arm 19 upwardly, thereby forcing arm 18 downwardly.

Supported by the cover 5 and passing through an aperture therein and into the housing is a sleeve 24. This is keyed to the cover 5 by key 25 which permits axial movement of the sleeve but prevents its rotation, a stop nut or collar 26 on the upper end of the sleeve limiting the extent of downward movement of the sleeve. An intermediate portion 27 of the sleeve 24 is threaded and its lower extremity 28 is outwardly flanged.

Seated upon the flange 28 is a spacing member 29 of suitable bearing material. This supports a bearing liner or bushing 30 which is held between the spacing member 29 and a similar spacing member 31, and this assembly is locked in position upon the lower portion of the sleeve 24 by a nut 32, which engages the sleeve at its threaded portion 27.

A tool head 33 is axially supported between the spacing members 29 and 31 and is rotatable about the sleeve 24, the liner 30 forming a bearing surface upon which the rotation takes place. Circumferentially disposed on the tool head 33 and fixed thereto by suitable means such as a key 34 is a gear 35. The assembled sleeve and tool head unit with its gear 35 is housed in the bearing ring 4 and rotatably supported thereby. The gear 35 meshes with an intermediate idler gear 36 (Fig. 1) which, in turn, meshes with the gear 9 on shaft 8 whereby the tool head is caused to rotate about sleeve 24. Vertical movement of the sleeve and tool head unit with respect to the gear 35 is afforded without breaking the driving connection between the tool head unit and the gear.

At its outer periphery, the tool head 33 is provided with a plurality of spaced depending fingers 37. These support at their lower extremities a guide bell 38 having an opening 39 in its center.

Suitably mounted at spaced intervals in the tool head 33 are a plurality of rock shafts 40. These are of identical construction well known to the art, being shown in detail in the U. S. patent to Sharp 1,674,266 and in the U. S. patent to Hogg 2,178,664, and they are herein described with reference to but one of the rock shafts and its associated elements.

Each rock shaft is mounted in an aperture in the tool head 33, its upper end extending above the tool head and being provided with a two-part lever. The lower portion of the lever comprises a boss 41 keyed to the rock shaft at 42 while an arm 43 mounted on the extremity of the rock shaft and carrying a roller 44 forms the upper portion of the lever. A bolt having a coiled spring 45 provides a yieldable connection between the upper and lower portions of the lever while permitting relative movement therebetween.

Spring connections 46 join the several rock shafts and urge the outer extremities of the arms 43 carrying the rollers 44 into abutting relationship with the inclined trackway of abutment member 13.

Attached to the lower extremity of each rock shaft is an inwardly extending foot 47 provided at its lower end with an apertured boss 48, within which a stub shaft 49 carrying a spinning disc 50 is journalled. The upper portion of stub shaft 49 extends above the boss 48 and carries a spring 51 for resiliently urging the spinning disc 50 upwardly.

A shaft 52 threaded at its upper end and centrally cored at its lower end is mounted within the bore of the sleeve 24. An apertured pressure block 53 is secured to the lower end of the shaft 52 and has a recess 54 to receive the top of a closure cap during the sealing operation. A longitudinally reciprocable plunger 55 passes through the pressure block 53 and is provided with a head 56 disposed within the cored lower end of the shaft 52. The plunger 55 is normally maintained in its fully extended position by a spring 57.

Above the cover 5 and carried on the shaft 52 is a ratchet assembly. This comprises a ratchet wheel 58, one or more pawls 59 (Fig. 4) pivotally mounted between parallel discs 60, and a headed cam follower 61. The ratchet wheel 58 is keyed to the shaft 52 at 62 and is provided with hubs upon which the discs 60 are seated, the discs being suitably held in rigid spaced relationship by spacer sleeves 63 and bolts 64. The teeth of the ratchet wheel 58 are engaged by the pawls 59 to permit counterclockwise movement of the discs 60 with respect to the ratchet wheel. The cam follower 61 also is rigidly held between the discs 60, its head being positioned in the diagonally extending trackway 16 of the cam 15. During upward movement of shaft 52 and the ratchet assembly, the cam follower moves upwardly in the trackway 16 and to the left, as viewed in Fig. 5, imparting counterclockwise rotation to the discs 60 with respect to the shaft 52. During downward movement of the shaft and the ratchet assembly, however, when the cam follower moves downwardly in the trackway 16 and to the right, the pawls so engage the teeth of ratchet wheel 58 as to prevent relative movement between the discs 60 and the ratchet wheel, and this forces clockwise rotation of the entire ratchet assembly and the shaft 52 keyed thereto.

A block 65 is suitably secured to the upper end of the shaft 52 and supports a cap or plate 66. The adjacent faces of the block 65 and the cap 66 are recessed to receive a roller bearing 67 whereby free relative rotary motion between the block 65 and cap 66 is permitted. A button 68 fits in the top of cap 66 and its head forms a seat upon which arm 18 of rocker 17 rests. Preferably a rigid connection is provided between cap 66 and stop nut 26 by studs 69.

Reference numeral 70 indicates a container having a closure 71 in position upon its mouth,

and reference numeral 72 indicates a rest supporting the container. Preferably closure 71 is provided with an internal sealing gasket 73. The rest 72 is adapted to be moved upwardly and to be lowered by cam driven means not shown, thereby bringing the container into position for the sealing operation.

In the operation of the machine, a container 70 supported upon the rest 72 and having a closure 71 fitted loosely over its mouth is raised upon the rest from the position shown in Fig. 1 toward the sealing head. The cap portion of the container contacts the lower extremity of plunger 55, forcing the plunger upwardly until the top of the closure fits within the recess 54 of pressure block 53 whereby the cap and the upper end of the container are securely held in place for the cap deforming or sealing operation.

During the upward travel of the container, its mouth passes through the opening 39 of guide bell 38 at which time the container is centered so as to be in proper position for the sealing operation.

Continued upward movement of the container causes the pressure block 53 and shaft 52 to be forced upwardly and, through the rocker 17, effects compression of spring 22. This creates considerable pressure between the underside of the cap and the container and compresses the gasket 73 into sealing relationship with the mouth of the container. The amount of pressure exerted by the spring 22 upon the cap and container may be controlled by adjusting the tappet screw 20. The sleeve 24 and the tool head 33 also are moved upwardly relative to the annular abutment member 13 with the elevation of shaft 52, and the upward movement of the tool head raises the rock shafts 40. This causes the arms 43 on the rock shafts to be swung radially inwardly due to the coaction of the rollers 44 with the inclined inner surface of abutment member 13. The inward swinging movement of the arms 43 effects turning of the rock shafts, thereby swinging the feet 47 radially inwardly so that the peripheries of the spinning discs 50 are brought into contact with the skirt portion of the closure cap 71 at a point near the open mouth of the container. Rotation of the driven tool head 33 carries the spinning discs 50 around the neck of the container, the discs following progressively the threaded configurations formed on the container neck and pressing the skirt of the closure cap 71 into conformity with those configurations. In downwardly following the threaded configurations, the discs 50 compress the springs 51 until the discs reach the lower portion of the thread formations on the container, as shown in Fig. 2.

While the construction of the rock shafts is designed to permit the spinning discs 50 to be urged against the skirt of the closure cap with sufficient force to press the skirt into intimate contact with the thread-like configurations in the neck of the container, the rock shafts, by virtue of the resilient connection formed by the bolt and spring 45 between the two-part levers attached to their upper portions, also are so constructed that the force with which the spinning discs bear against the closure is relieved to accommodate any irregularities or deformations that may be encountered on the neck of the container. This prevents the occasional breakage of containers that might otherwise result if the force could not be relieved.

Upon completion of the thread spinning operation, the sealed container 70 moves downwardly on the rest 72 and the members in the sealing head revert to their original positions, as shown in Fig. 1.

During the sealing operation, the shaft 52, as it is lifted by the upwardly travelling container, carries the ratchet assembly keyed thereto upwardly with respect to the cam 15. The cam follower 61 travels laterally within the diagonally extending cam trackway 16, causing the discs 60 to turn freely in a counterclockwise direction with respect to the shaft 52 and ratchet wheel 58. When the shaft 52 and the ratchet assembly move downwardly, however, the cam follower 61 causes the discs 60 to turn in a clockwise direction, thereby imparting rotative movement to the shaft 52 through the pawls and ratchet wheel. This rotation of the shaft is transmitted through pressure block 53 to the cap so as to screw the same on the container and effectively tighten the seal.

It will be appreciated that the embodiment by which the invention has been illustrated is capable of adjustments to adapt it for sealing operations using various types and sizes of containers and closure caps. For example, the container rest can be set at different heights to accommodate containers of different sizes, and the pressure exerted by the spinning discs 50 can be varied by adjustment of the resilient spring connection between the upper and lower portions of the two-part levers carried by each rock shaft. Also, it will be appreciated that the sealing operation may be accomplished by lowering the sealing mechanism into engagement with the container as well as by raising the container toward the sealing mechanism. Also, the amount of rotation imparted to the shaft 52 and the degree to which the closure is turned upon the container may be varied by changing the angle of the cam trackway 16 or by altering the distance in which the cam follower 61 travels therein. It also will be understood that the invention may be utilized in association with machines having means other than those illustrated herein for applying closures to containers by thread-forming operation, and that various changes, modications, and additions that will occur to those skilled in the art are intended to be included within the scope of the invention as defined in the appended claims.

I claim:

1. In a sealing machine, a sealing head, a tool carried by said head for deforming the skirt wall of a closure into conformity with screw thread configurations on a container adjacent its mouth, a closure-engaging member for maintaining said closure in sealing engagement with the container during deformation of said skirt wall by said tool, and means for rotating said closure-engaging member to turn said closure and tighten its sealing engagement with the container.

2. In a sealing machine, a sealing head, a tool carried by said head for deforming the skirt wall of a closure into conformity with screw thread configurations adjacent the mouth of a container, a closure-engaging member, means for maintaining said container with the closure upon its mouth and said closure-engaging member in engagement to hold said closure in sealing relationship with the container during deformation of said skirt wall by said tool, and means for rotating said closure-engaging member to turn said closure and tighten its sealing relationship with the container.

3. A sealing machine comprising a support, a fixed abutment secured thereto, a vertically reciprocable closure-engaging member carried by

said support, means for bringing a container with a closure cap upon its mouth and said closure-engaging member into engagement to raise said member with respect to said fixed abutment and to maintain said closure in sealing engagement with the container, thread-forming means associated with said closure-engaging member for bringing the skirt of said closure cap into conformity with thread-like configurations in the neck of said container, said thread-forming means being moved into operative contact with said closure upon elevation of said closure-engaging member relative to said fixed abutment member, and means for turning said closure-engaging member upon completion of the thread-forming operation to tighten the seal effected between said closure cap and said container.

4. In a sealing machine, a sealing head, a tool carried by said head for deforming the skirt wall of a closure into conformity with screw thread configurations adjacent the mouth of a container, a vertically reciprocable closure-engaging member, means for bringing said container with the closure upon its mouth and said closure-engaging member into axially aligned engagement to maintain said closure in sealing relationship with the container during deformation of said skirt wall by said tool and to effect upward movement of said closure-engaging member, and means for turning said member during its downward travel whereby to turn said closure and tighten its sealing relationship with said container.

5. In a sealing machine the combination of a sealing head and a fixed cam having a vertically inclined trackway, said sealing head comprising a tool for deforming the skirt wall of a closure into conformity with screw thread configurations adjacent the mouth of a container, a vertically reciprocable closure-engaging member, means for bringing the container with the closure cap upon its mouth and said closure-engaging member into axially aligned engagement and to raise said member and maintain said closure in sealing relationship with the container during deformation of said skirt wall by said tool, and means for turning said closure-engaging member during its downward travel to tighten the seal effected by said closure cap upon said container, said last named means comprising a rotatable element journalled to said closure-engaging member, a cam follower secured to said rotatable element and adapted to move within the vertically inclined trackway of said cam and to turn said rotatable element upon vertical reciprocation of said closure-engaging member, and means adapted to cause rotation of said closure-engaging member as said member travels downwardly.

6. A sealing machine comprising a support, a fixed abutment secured thereto, a fixed cam having a vertically inclined trackway, a vertically reciprocable closure-engaging member carried by said support, means for bringing a container with a closure cap upon its mouth and having screw thread configurations in its neck and said closure-engaging member into engagement to raise said member with respect to said fixed abutment and to maintain said closure in sealing engagement with the container, thread-forming means associated with said closure-engaging member for bringing the skirt of said closure cap into conformity with the screw thread configurations in the neck of said container, said thread-forming means being moved into operative contact with said closure upon elevation of said closure-engaging member relative to said fixed abutment, and means for turning said closure-engaging member upon completion of the thread-forming operation to tighten said closure cap upon said container, said last named means comprising a rotatable element journalled about said vertically reciprocable shaft, a cam follower secured to said rotatable element and adapted to move within the trackway of said fixed cam and to turn said rotatable element upon vertical reciprocation of said closure-engaging member, and means adapted to prevent relative movement between said rotatable element and said closure-engaging member as said member travels downwardly.

7. In a sealing machine the combination of a sealing head and a fixed cam having a vertically inclined trackway, said sealing head comprising a tool for deforming the skirt wall of a closure into conformity with screw thread configurations adjacent the mouth of a container, a vertically reciprocable closure-engaging member, means for moving the container with the closure cap upon its mouth into engagement with said closure-engaging member to raise said member and to maintain said closure in sealing relationship with the container during deformation of said skirt by said tool, and means for turning said member during its downward travel to tighten the sealing relationship between said closure cap and container, said last named means comprising a ratchet fixed to said closure-engaging member, a rotatable element journalled to said member, a cam follower fixed to said rotatable element and adapted to move within the trackway of said fixed cam and to turn said rotatable element upon vertical reciprocation of said closure-engaging member, and a pawl for engaging said ratchet to prevent relative movement between said rotatable element and said closure-engaging member as said member travels downwardly.

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