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P. GSCHWEND ET AL

2,481,508

CLOSURE-FEEDING DEVICE

Filed June 27, 1947

Fig. 1

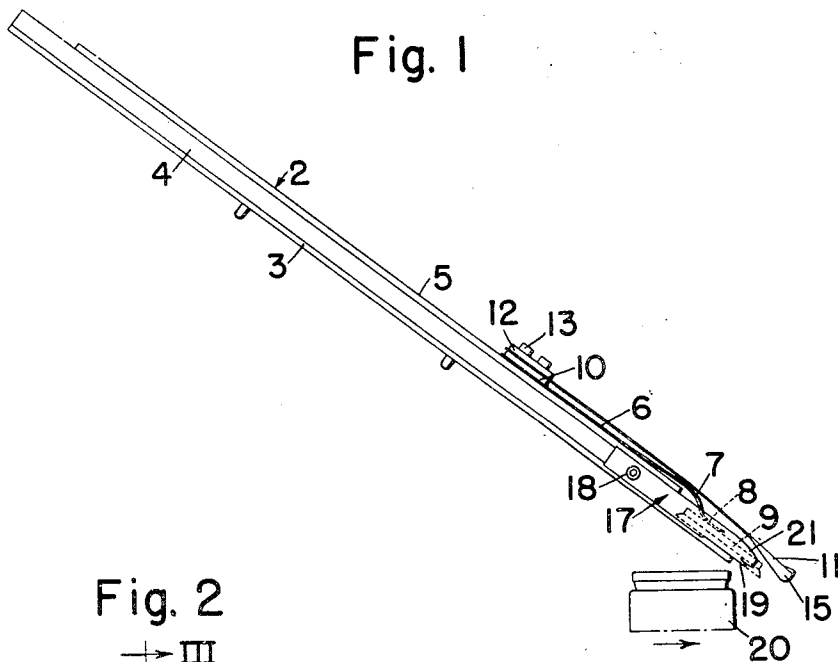


Fig. 2

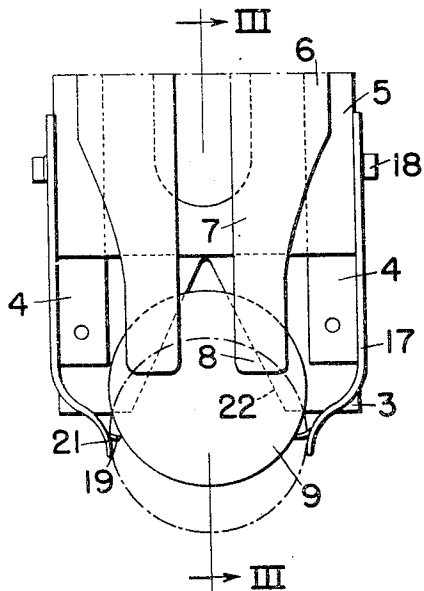
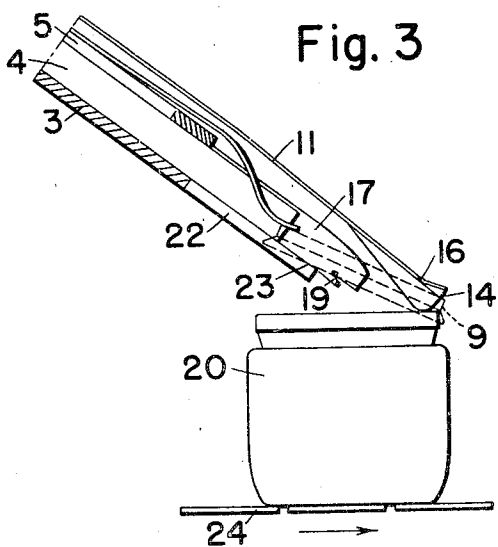


Fig. 3



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UNITED STATES PATENT OFFICE

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CLOSURE-FEEDING DEVICE

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Application June 27, 1947, Serial No. 757,530

8 Claims. (Cl. 226—88.1)

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This invention relates to a mechanism for feeding closures to containers for assembly. The invention is particularly useful in feeding press-on caps to glass jars but has general utility in the feeding of closures or lids to containers of various sorts, including metal cans, as well as glass bottles and jars.

The device may be combined with a vacuumizing machine. In such machines, it is customary to move the containers progressively in a series through the machine and automatically apply the closures thereto subsequent to the displacement of air within the head space of the container by steam or other vapor. It is important in such closing of containers to apply the cap accurately to the container mouth incident to final closing in order to avoid breakage of the containers and to insure the maximum retainment of vapor within the container. It is an object of the invention, therefore, to provide a feeding mechanism whereby closures may be accurately applied to moving containers with the container cooperating with the closure to effect release of the closure from the feeding mechanism.

A further object of the invention is to provide for proper control of the container closure as it is extracted from the closure-feeding mechanism to thus insure accurate positioning of the closure on the container, even though the container be moving through the machine at a high speed.

Another object of the invention is to provide a mechanism for positively and rapidly pressing the closure onto the container mouth as the container moves under the closure-applying mechanism in order to avoid the entrance of contaminating air into the container prior to final sealing.

Another object of the invention is to provide a mechanism for proper control of the closure throughout the whole of the closure-applying operation in order to avoid damage to the container or closure and to insure the attainment of the proper degree of pressure reduction within the container incident to vacuum sealing.

A further object of the invention is to provide a closure-feeding and applying device which can be actuated by the movement of filled jars driven by frictional engagement with a conveyor belt.

Other objects of the invention will be apparent from the specific description which follows, with reference to the accompanying drawing in which:

Figure 1 is a side elevation of the cap feeder

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and release mechanism showing a cap in position to be applied to a jar;

Figure 2 is a top plan view of the end portion of the mechanism of Figure 1 with the guiding horns removed; and

Figure 3 is a sectional view taken on the line III—III of Figure 2 with the guiding horn shown in position and with a cap and jar to be closed shown beyond initial release position.

Referring to Figure 1, the mechanism includes an inclined cap track or chute 2 which is formed with a bottom plate 3 upon which the caps rest in their movement through the mechanism. The angle of inclination of the chute 2 may be 37°, as indicated in Figure 1, and should be sufficient to permit the caps to slide by gravity along the chute. Edge guides 4 are fastened to the bottom plate 3, and a cover plate 5 is fastened to the edge guides 4. It will be noted that the cover plate 5 is shorter than the edge guides 4 which are, in turn, shorter than the bottom plate 3. This is illustrated in Figure 2.

The spacing between the edge guides 4 is slightly greater than the diameter of the caps being fed through the mechanism, and the distance between the top and bottom plates is greater than the height of the caps.

Mounted upon the top plate 5 is a pair of cap arresters 6. These arresters may be made of copper beryllium alloy or other material which will permit repeated flexing without fatigue. The ends of the arresters are curved downwardly, as indicated at 7 in Figure 1, and each has a portion 8 which lies generally in the plane of the top of the cap 9 as it is fed from the machine. The arresters are individually operable, being capable of upward flexure about their respective points of connection to the top plate 5, spacers 10 being provided, one for each of the arresters, to permit limited upward movement of the arresters. The arresters are so contoured and positioned that their portions 8 will engage the successive caps as they slide down the chute, holding the lowermost cap in the chute, as shown in Figure 1, in engagement with the bottom plate 3 and thus preventing the following cap from overriding the cap immediately in front of it. The arresters also serve to hold the cap 9 in flat engagement with the bottom plate 3 as the cap moves into engagement with the cap-release mechanism, preventing the cap from surmounting the cap stops. Another function of the arresters is to hold the cap 9 in engagement with the bottom plate 3 as the cap is extracted from the chute, guiding the cap along the bottom

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plate 3 during the cap-applying operation. These functions will be more completely described in connection with the operation of the cap-release mechanism.

Also mounted upon the top plate 5 are two guiding horns 11. A hold-down plate 12 is positioned above each horn 11, and hollow head machine screws 13 serve to secure each horn 11 and its companion arrester 6 to the top plate 5. The horns are preferably formed of copper beryllium alloy, although other materials capable of repeated flexure over long periods of use may be employed.

The horns are made as complementary pairs, one having a right-hand lateral guide 14, Figure 3, and the other a left-hand lateral guide 15, Figure 1. The horns are yieldable upwardly from their points of connection with the top plate 5 and are contoured and positioned so that the lateral guides 14 and 15 are spaced apart a distance which is slightly greater than the diameter of the top of the cap 9. Each horn is provided with a press-down surface 16 which is adapted to engage the head of the cap as it is extracted from the mechanism, the press-down surfaces being contoured so as to exert a continuous downward pressure to the cap as it is extracted, preventing forward motion of the cap at a rate faster than the forward motion of the jar to which the cap is applied and also forcing the cap downwardly onto the jar. The horns are each yieldable independently of the other and of the arresters. This insures that any tendency for the caps to tilt during extraction from the device will be overcome since greater force will be applied by the horn on the high side of the closure, forcing it to a level position. Slightly bent caps which may sometimes be encountered will also be better controlled during extraction and assembly by employing independently yieldable horns.

The cap-release mechanism shown in the drawing includes a pair of yielding cap-release fingers 17 which are secured to the edge guides 4 by hollow head machine screws 18, the fingers being yieldable from their respective points of connection with the edge guides. The fingers are preferably made of copper beryllium alloy or other fatigue-resistant material. Each finger includes a cap stop 19 which lies in the path of movement of the cap 9. The stops 19 are contoured and positioned to engage the skirt of the cap 9 and to hold it in proper position for engagement with the jar 20 which is to be closed. The closure is thus held in an inclined position with the closure skirt lying in the path of movement of the jar 20 to be closed. As shown in Figure 1, the lower surface of the stops 19 lies in the plane of the upper surface of the bottom plate 3 upon which the cap 9 rests, and the stops 19 are of limited height, projecting above the plate 3 a distance sufficient to arrest the movement of the cap 9 during normal operation of the machine and the vibration incident thereto, but permitting the cap to surmount the stops upon a slight upward movement of the cap.

The cap-release fingers 17 are also provided with guides 21 which serve to engage the skirt of the cap and guide the cap in its forward motion upon release from the chute. The distance between the guides 21 is less than the diameter of the cap 9 so that the guides exert their guiding influence from about the point of release of the cap from the stops 19 to a position where the

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center of the cap has passed the guides 21, and guiding is assumed by the horns 11.

The cap-release mechanism described above is the invention of Harold H. Borthwick and is described, illustrated, and claimed in his copending application Serial No. 757,477 filed June 27, 1947, and entitled "Closure-release mechanism."

In place of the release mechanism illustrated, other types may be employed. We have used a conventional pin type release with satisfactory results. In this type release mechanism, a pair of short pins is provided on the bottom plate 3, intersecting the path of movement of the caps thereover. The pins are so positioned and contoured that the caps are elevated over the pins by the forward motion of the jar. With the release illustrated, more complete control is exercised over the cap during extraction from the release mechanism, and we, therefore, prefer it over the pin type release.

The bottom plate 3 is cut away, as indicated at 22, to permit the cap 9 to move forwardly and downwardly as the jar extracts it from the mechanism, at the same time properly supporting the rear portion of the cap skirt throughout the extraction movement and insuring proper positioning of the cap on the jar. The dimensions of the cut-out portion 22 will vary with different sized closures. A tapered opening, as shown in Figure 2, is preferred because it thus provides a two-point support for the rear edge of the cap during extraction, preventing lateral tilting. As will be observed in Figure 3, as the cap is moved from its flat position on the bottom plate 3 to an inclined position, the edge of the skirt will pass through the opening 22, and the cap will be supported at spaced points on its periphery by engagement with the opposite legs of the bottom plate, one of these points being indicated at 23 in Figure 3. An opposite point of support would be provided on the other leg of the bottom plate 3 which is not shown in the sectional view of Figure 3, the section being taken along the center of the bottom plate.

The bottom plate 3 and the opening 22 therein are so constructed that the cap being extracted from the mechanism will gradually move from a position where its rim is in engagement with the bottom plate (Figure 1) to a position where the closure is in a plane almost parallel with the horizontal plane of the open mouth of the container (Figure 3), the cap moving into the opening 22. The cut-out portion 22 is such that the closure will then leave the bottom plate, dropping off from both points of support on the legs of the bottom plate simultaneously, avoiding any lateral tilting at the instant of "drop off." The jar and closure at such point will be in closely spaced relationship, and the closing motion will be short.

Mechanism, such as the conveyor 24 shown in Figure 3, is provided for progressively moving the jar to be closed through the capping station in the direction of the arrow. This may be part of a conventional steam or vapor vacuumizing machine. It will be observed that the jar is driven solely by frictional engagement between the bottom of the jar and the top surface of the conveyor. With the feeding and closing device of this invention, it is not necessary to positively drive the closure as is customary, using edge belts, star wheels, or worm conveyors, but such equipment may be employed.

The arresters 6, horns 11, and cap-release fingers 17 are all made of sheet metal, such as heat-treated copper beryllium alloy, and are contoured

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and supported in such manner that they exert proper controlling action on the closure, and at the same time, their flexural life is high. The arresters, horns, and release fingers are preferably so adjusted in their application of controlling forces to the cap that the cap may be extracted from the mechanism and applied to the container merely by the forward motion of a filled jar resting on and moving with a metal link belt conveyor. This simplifies the equipment necessary for conveying the jars and permits the attainment of higher closing speeds.

In the operation of the mechanism, jars properly filled with material to be packaged and ready for closing are conveyed progressively under the inclined chute, as indicated by the arrows in Figures 1 and 3. If desired, vapor may be disposed within the head space of the container, replacing the air therein. Any of the conventional steam vacuumizing machines may be used for this purpose, but we prefer the apparatus shown in the copending application of John M. Sharf, Serial No. 757,545 filed June 27, 1947, and entitled "Method and apparatus for sealing containers."

The cap chute 2 is preferably filled with closures being fed continuously thereto from a hopper or other feeding arrangement. Intermittent cap-feeding mechanism may be employed for feeding caps singly to the cap chute in advance of the passage of each jar through the machine, or the machine may be hand fed.

As each cap 9 moves down the chute 2, the arresters 6 will engage the top of the cap and retard forward motion thereof until the cap comes into engagement with the stops 19, as shown in solid lines in Figure 2. It will be observed that the stops 19 engage a lateral portion of the closure skirt, and the distance between the stops 19 is substantially less than the diameter of the cap 9. Thus, the cap will come to rest with a portion of its skirt projecting beyond the stop and will lie in an inclined position with the skirt of the cap intersecting the path of movement of the jar 20, as shown in Figure 1. This position is also shown in solid lines in Figure 2. As the jar moves forward, the lip thereof will come into engagement with the skirt of the closure 9, and the impact will raise the cap 9, lifting it over the stops 19, and the closure will be carried forward and will engage the guides 21, as indicated by the chain lines in Figure 2. The spacing between the guides 21 is less than the diameter of the cap when the guides are in their normal position. The guides 21 form part of the yielding fingers 17 which are capable of being flexed outwardly upon further forward movement of the closure. The spring action of the guides 21 is important in proper cap control, for when the closure is impacted by the oncoming container and elevated over the stops 19, there is a forward component of motion imparted to the cap, which motion is arrested by the guides 21. The arresters 6, while yieldingly urged into engagement with the top of the cap, apply only a very slight pressure thereto, since they must not so retard the forward movement of the caps by gravity in the chute 2 as to prevent proper movement of the lowermost cap into position against the stops 19. The yielding action of the arresters 6, therefore, is inadequate to prevent occasional displacement of the caps resulting from the impact of the jar, but this is overcome completely by the provision of the yielding guides 21.

As forward motion of the jar continues, the closure 9 is drawn between the yielding fingers 17,

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the fingers pivoting outwardly about their respective points of connection with the edge guides 4. The arresters 6 continue to apply downward force to the closure and hold it in engagement with the bottom plate 3 of the chute. As the cap is moved forward by the jar, the cap is tilted about the points of contact of the skirt with the bottom plate 3 in the cut-away portion 22, as shown in Figure 3. This brings the cap into engagement with the horns 11, with the lateral guides 14 and 15 serving to prevent lateral displacement of the closure. The cap now leaves the guides 21, and lateral guiding is assumed by the horns 11. As the cap is extracted from the cap-release fingers 17, its rearward edge continues to move along the bottom plate 3 in the cut-out portion 22, and the cap is moved from its inclined position to a position where it is substantially horizontal and overlies the mouth of the container. It will be observed from Figure 3 that the cap is supported at three points during the extraction movement. The front of the closure skirt is supported by the jar lip, and the rear of the closure skirt is supported by the legs of the bottom plate 3; thus, the closure is firmly held against lateral tilting during extraction from the feeding and closing device. During the whole of this movement, the horns 11 continue to exert a downward pressure upon the closure 9 while also preventing lateral displacement thereof. The press-down surfaces 16 of the horns engage the top of the cap, and as the cap reaches the drop-off position where it leaves the end of the bottom plate 3, the horns being flexed upwardly snap the closure down on the container into closed position. The container with its applied closure then moves to a sealing station where pressure is applied to the closure to force it over the container lip and effect a final proper hermetic seal.

It will be observed that the arresters 6 engage the lowermost closure in engagement with the stops 19 at a position to the rear of the center of the closure so that the arresters 6 will be free of the cap and in lowered position to arrest the following cap prior to the removal of the advancing cap from the bottom plate 3, the arresters 6 in such position engaging the oncoming cap and preventing it from overriding the cap being applied. By employing a pair of arresters and positioning them so as to engage the cap adjacent the periphery of the top, the arresters have an ample opportunity to return to their normal arresting position upon leaving the extracted cap. Since the caps are circular and engage only at a single point at the center of the cap chute, there is a clear space on opposite sides of this contact point into which the fingers may drop. This is best shown in Figure 2.

From the foregoing, it will be clear that the closure is under complete mechanical control throughout the whole of the feeding, releasing, and applying operations. It will also be apparent that with the device, it will be possible to quickly position the closure upon the container after the closure leaves the chute, thus insuring, where vacuum packing is employed, that the steam within the head space of the container is not deleteriously contaminated with air. In view of complete control over the closure, it is possible to operate the device at high speeds without improper feeding or release, as contrasted with the systems now in use where the impact of the jars often results in improper feeding and damaged or broken containers and closures. Also, the device permits extraction and application by a filled

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jar moving with a conveyor without the necessity for a positive container drive, making possible the attainment of higher closing speeds and simplifying the container-feeding and conveying equipment.

While we have illustrated and described certain preferred embodiments of our invention, it will be understood that the same is not limited thereto but may be otherwise embodied and practiced within the scope of the following claims.

We claim:

1. A closure-feeding and applying device comprising a closure support for receiving a closure in inclined position with its skirt intersecting the path of movement of a container to be closed, means for holding said closure in such position and from which the closure may be released by forward motion of the container, and downwardly directed upwardly yieldable guiding means disposed for coincidental engagement with lateral portions of the closure skirt on opposite sides thereof to maintain the closure in alignment with the container during application of the closure thereto.

2. A closure-feeding and applying device comprising a closure support for receiving a closure in inclined position with its skirt intersecting the path of movement of a container to be closed, means for holding said closure in such position and from which the closure may be released by forward motion of the container, and a pair of upwardly yieldable flexible guiding horns, each comprising a downwardly directed edge guide to engage a lateral portion of the closure, the edge guides cooperating to maintain the closure in alignment with the container to be sealed, and a press-down surface, the press-down surfaces cooperating to engage the top of the closure and press it into engagement with the container during forward motion of the container and the closure under the guiding horns.

3. A closure-feeding and applying device in accordance with claim 2 in which the guiding horns are independently upwardly yieldable.

4. A closure-feeding and applying device comprising a closure feed chute for receiving a closure in an inclined position with its skirt intersecting the path for movement of the container to be closed, stop means for holding said closure in such position and over which the closure may be elevated by the forward motion of the container, and a pair of upwardly yieldable arresters arranged to engage the top of the closure adjacent the stop and to the rear of the axis of the closure when the closure is in engagement with the stop to reduce the speed of movement of the closure as it approaches the stop and restrain the closure against surmounting the stop and to stabilize the movement of the closure as it is extracted from the closure feed chute.

5. A closure-feeding and applying device in accordance with claim 4 in which the upwardly yieldable arresters are independently yieldable.

6. A closure-feeding and applying device in accordance with claim 4 including a pair of independently upwardly yieldable flexible sheet metal guiding horns, each comprising a downwardly

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directed edge guide to engage a lateral portion of the closure, the edge guides cooperating to maintain the closure in alignment with the container to be closed, and a press-down surface, the press-down surfaces cooperating to engage the top of the closure and press it into engagement with the container during forward motion of the container and closure under the guiding horns.

7. A closure-feeding and applying device comprising a conveyor for progressively moving a container, an inclined support down which a closure may travel by gravity, stop means for arresting the movement of said closure and retaining the same in inclined position with its skirt intersecting the path of movement of a container to be closed moving with said conveyor, upwardly yieldable means for restraining said closure against upward movement in its travel along said closure support to its position of rest, said closure being extractable from said yieldable restraining means and said stop means by forward motion of the container, and downwardly inclined upwardly yieldable guiding means engageable with the top coincidentally of the closure and lateral portions of the closure skirt to guide the closure and press the same into engagement with the container as the container and closure move forwardly under said yieldable guiding means.

8. A closure-feeding and applying device comprising a chute including lateral guide members and a bottom plate against which the skirt of the closure is guided in its travel down said chute, stop means intersecting the path of movement of said closure and projecting above the plane of the closure-engaging surface of the bottom plate to stop the forward motion of a closure moving down said chute, said stop means being disposed on said chute in such position that a closure lying in engagement therewith will project below the chute with its skirt intersecting the path of travel of a container to be sealed, the stop means being so constructed that a closure may be released therefrom by forward motion of the container in engagement with the closure, upwardly yieldable means for applying downward pressure on said container closure as it moves forwardly with the container to be sealed, said bottom plate being cut away adjacent its end to permit a portion of the closure skirt to pass through the opening in the bottom plate as forward motion of the closure is effected, the bottom plate thus serving to support the closure at spaced points on the periphery of the skirt thereof and aid in maintaining the closure in proper alignment with the container to be closed during the extracting and closing operations.

PAUL GSCHWEND.
JOHN M. SHARP.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
882,728	Wilmore	Mar. 24, 1908
1,907,900	Tevander	May 9, 1933

Certificate of Correction

Patent No. 2,481,508

September 13, 1949

PAUL GSCHWEND ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 8, lines 23 and 24, for "engageable with the top coincidentally" read *coincidentally engageable with the top*;

and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 24th day of January, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.