

Jan. 15, 1963

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3,073,090

MEANS FOR SEALING THREADED-TYPE CONTAINERS

Filed Sept. 15, 1959

6 Sheets-Sheet 1

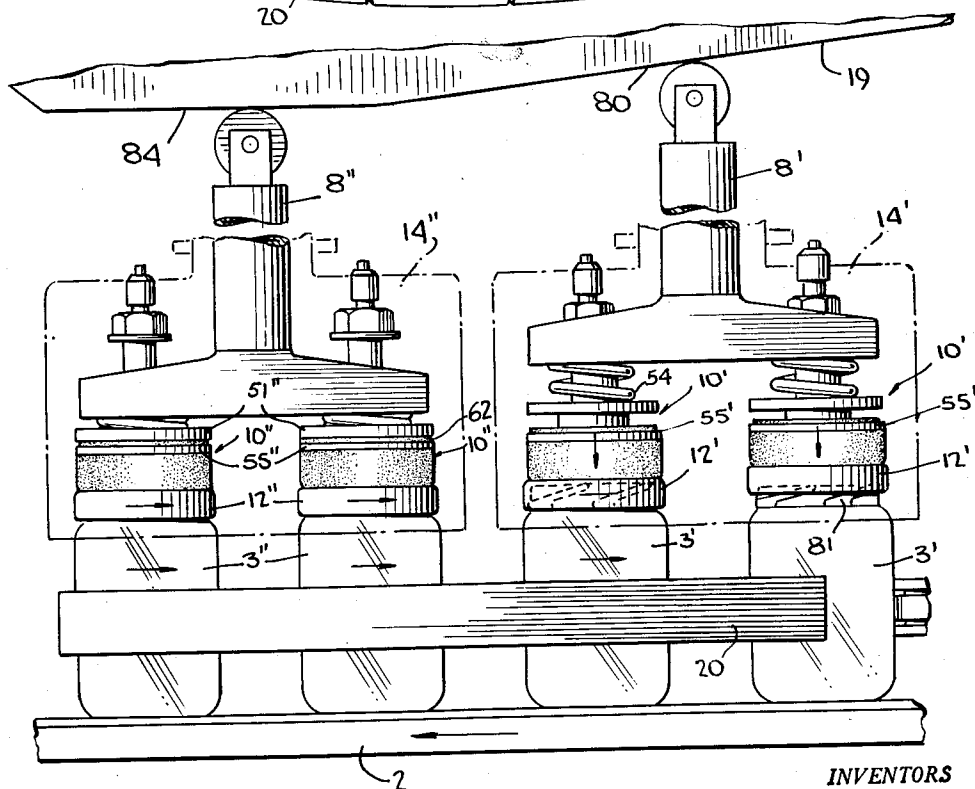
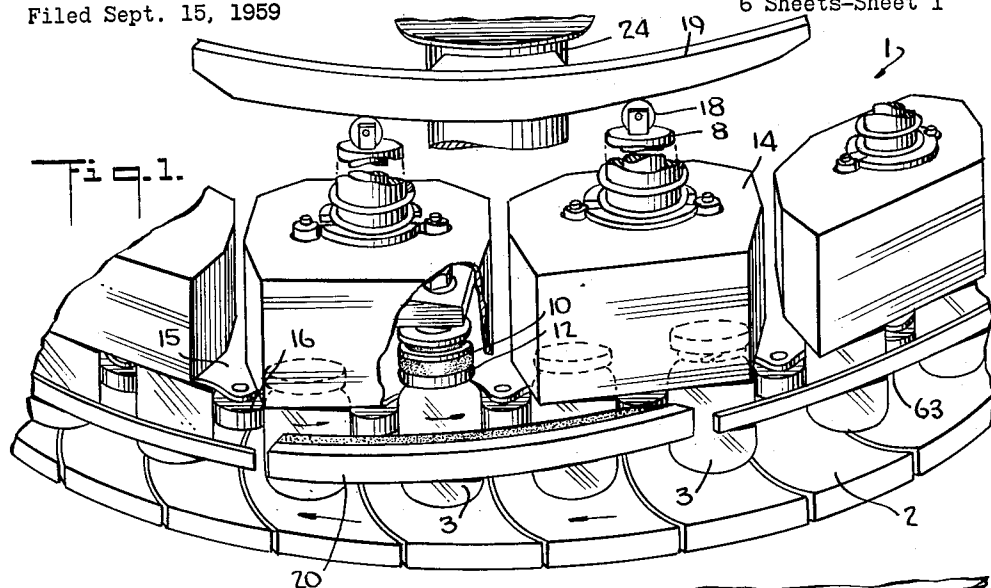


Fig. 2.

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6 Sheets-Sheet 2

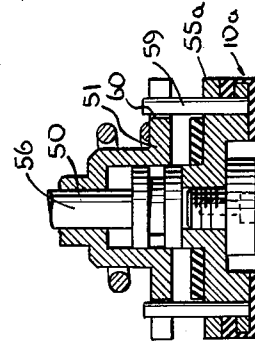
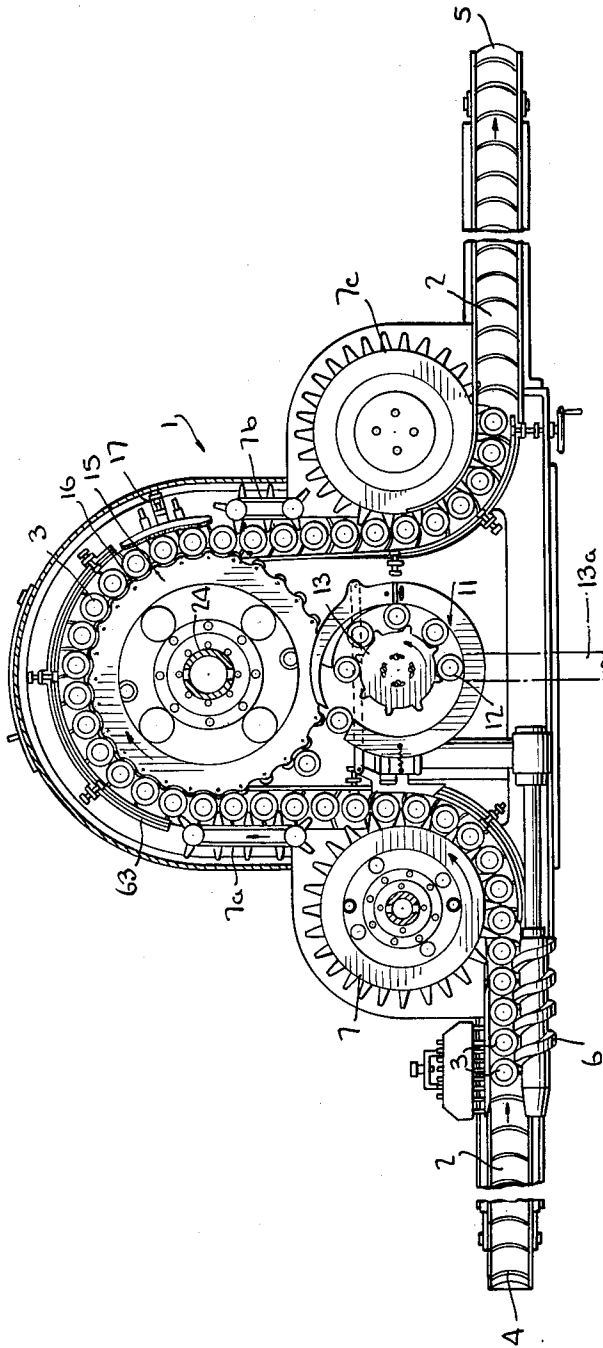


Fig. 15.

Fig. 2.

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6 Sheets-Sheet 3

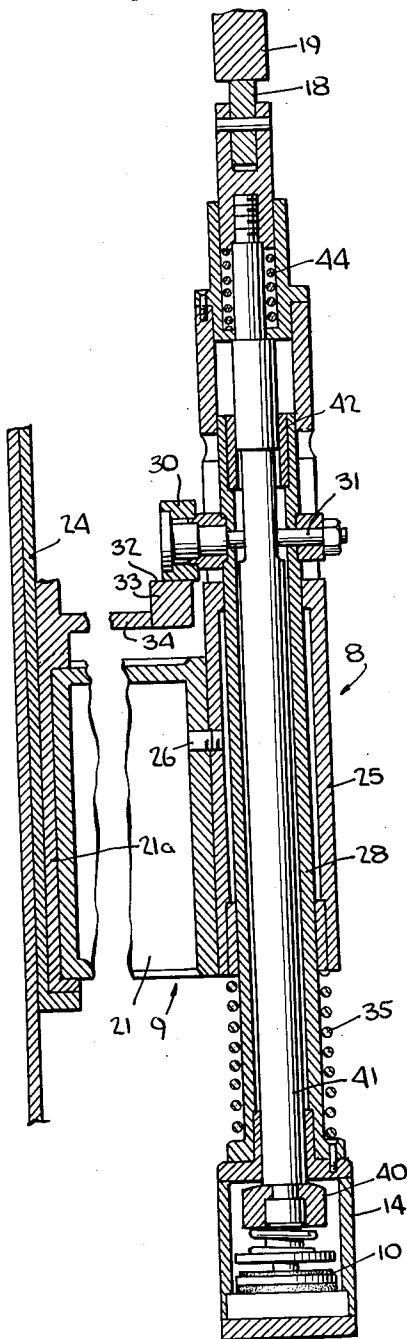


Fig. 3.

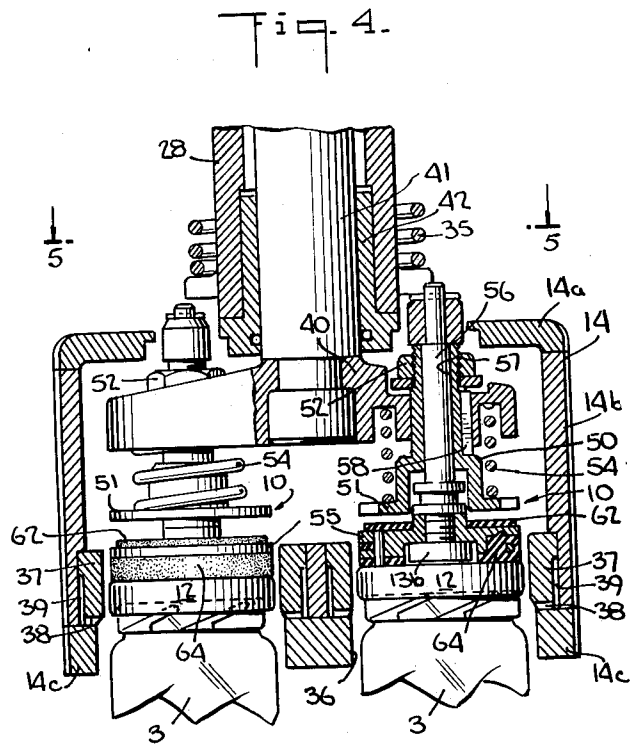
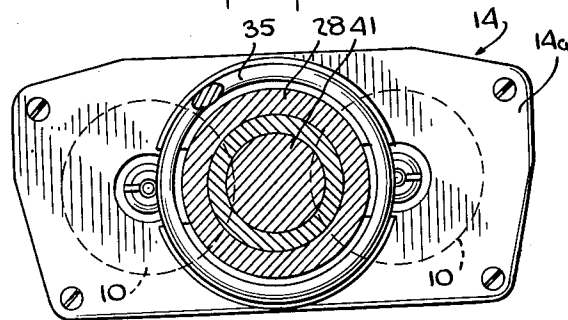


Fig. 5.



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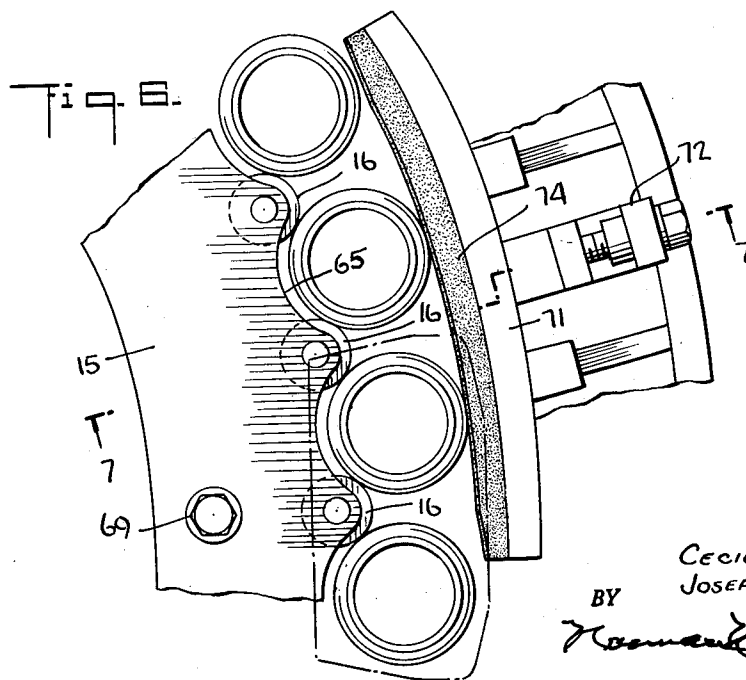
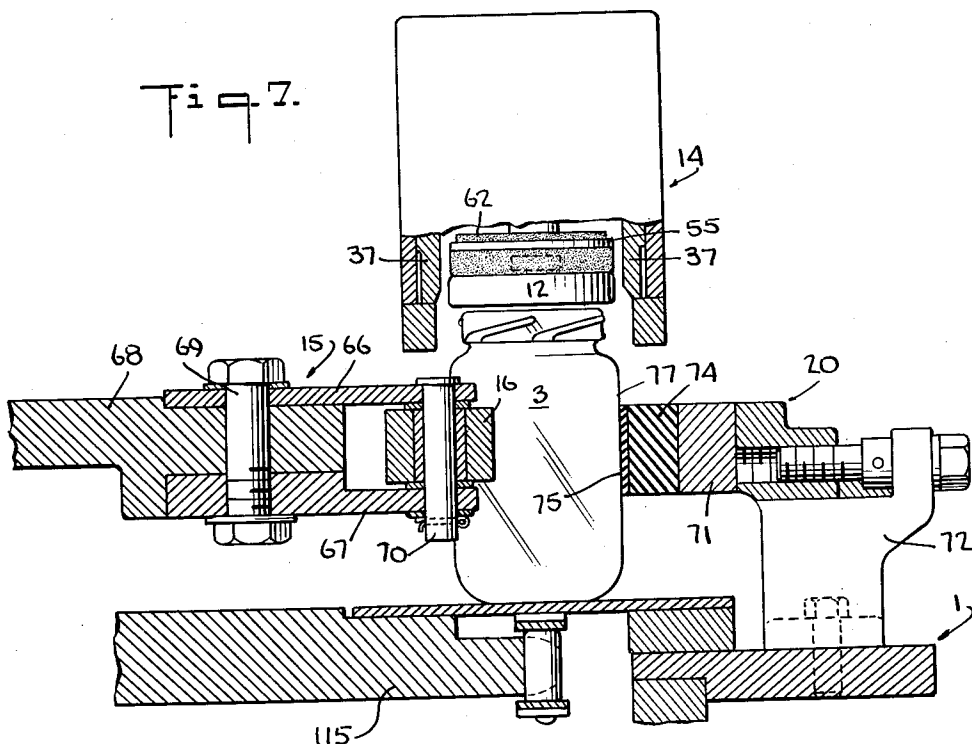
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6 Sheets-Sheet 4



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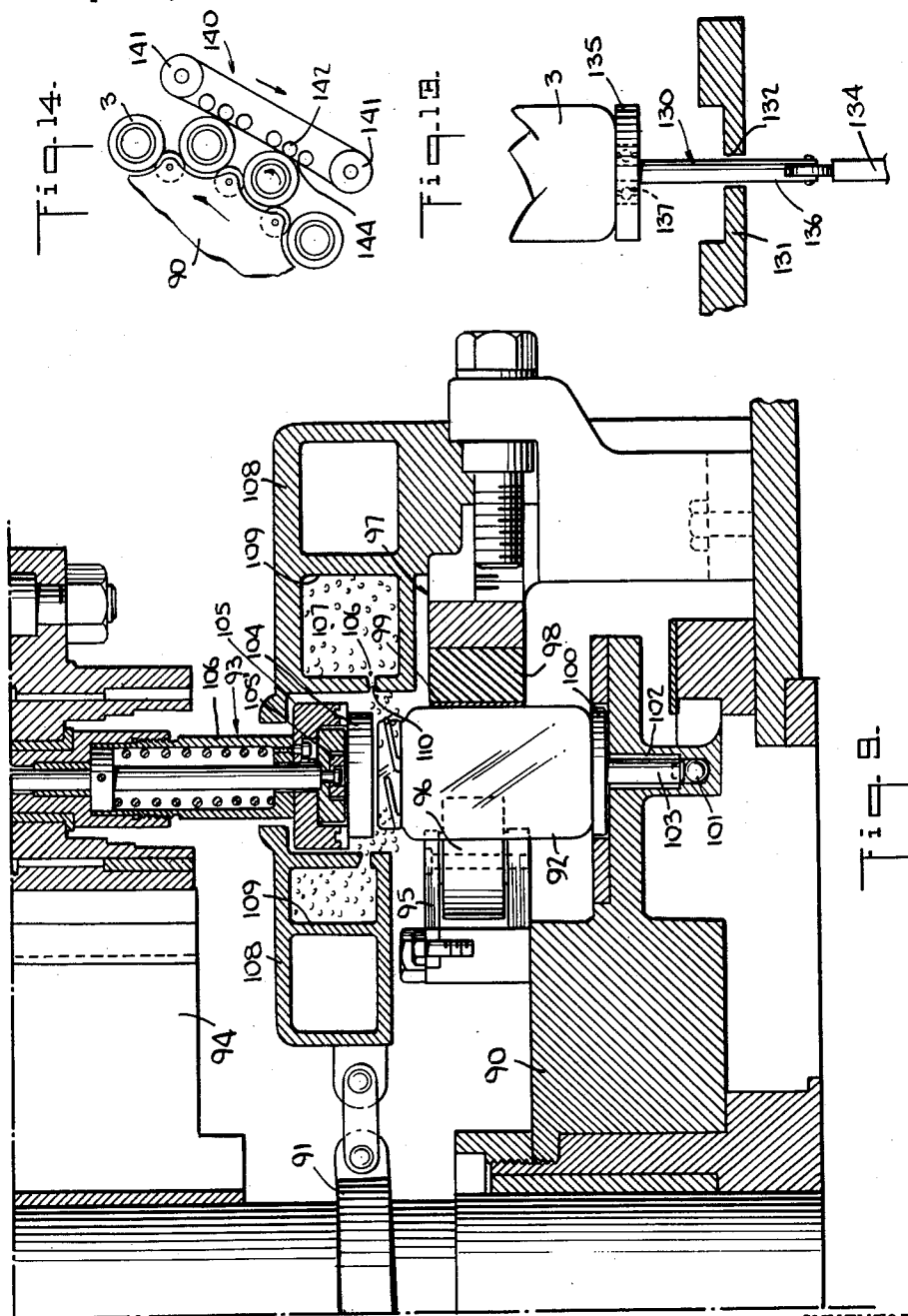
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MEANS FOR SEALING THREADED-TYPE CONTAINERS

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6 Sheets-Sheet 5



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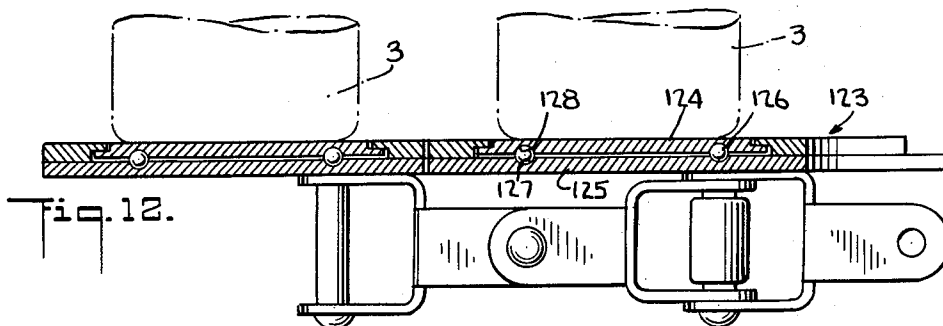
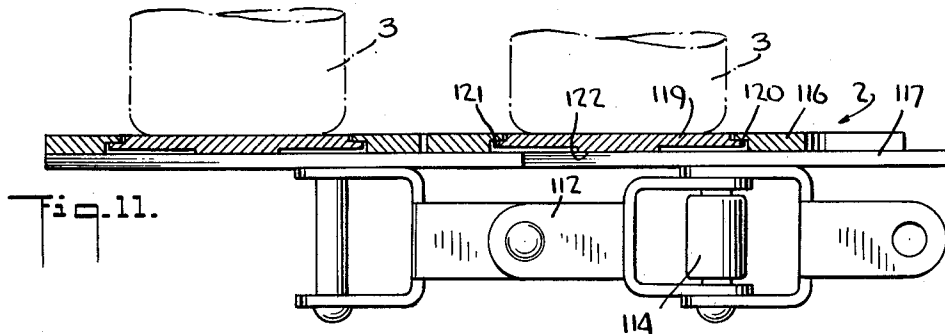
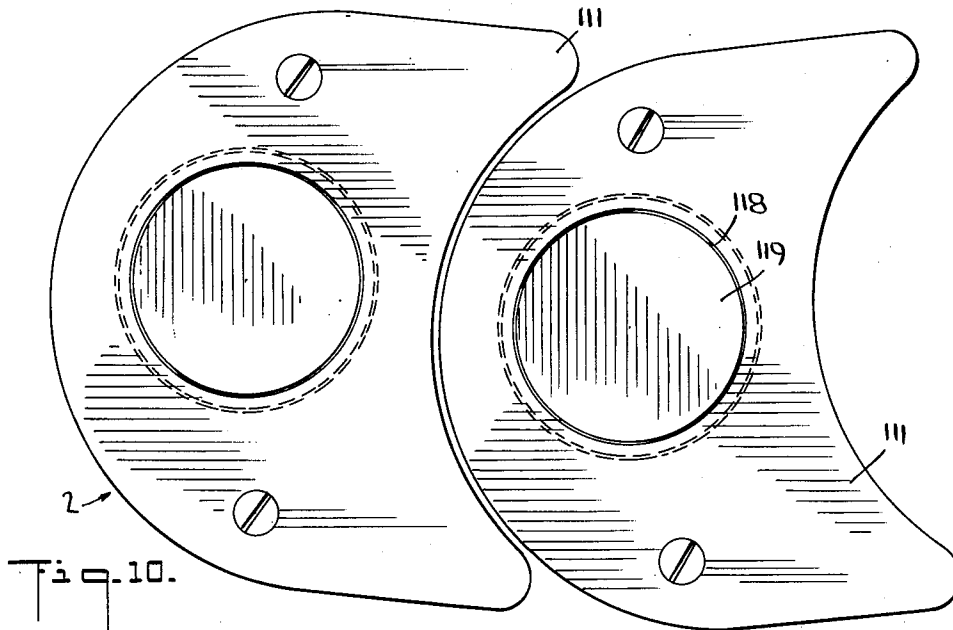
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MEANS FOR SEALING THREADED-TYPE CONTAINERS

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6 Sheets-Sheet 6



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3,073,090 MEANS FOR SEALING THREADED-TYPE CONTAINERS

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caster, Ohio, a corporation of Delaware
Filed Sept. 15, 1959, Ser. No. 840,150
6 Claims. (Cl. 53-331.5)

The present invention relates to the sealing art and more particularly to a means for applying screw-type closures to containers with continuous threads, interrupted threads, lugs, and the like.

It has been found that in general consumers have a preference for screw-type closures and that this preference is particularly pronounced in the case of products which are used intermittently and where the consumer has occasion to open and reclose the container from time to time as the product is consumed.

There are two particularly significant problems connected with the use of screw-type closures. The first of these is the relative difficulty which is experienced in applying these closures in the first instance at high speeds and with a proper seal so that the sealing operation can be performed in a rapid and practical manner at an acceptable cost. The second problem has been the difficulty occasionally encountered by the consumer in removing screw-type caps where they are applied with excess torque or where their sealing gasket has frozen or adhered to the container finish.

The present invention provides an improved sealing machine for screw-type closures which overcomes both of these problems and which therefore makes the use of screw-type closures for high-speed sealing operations practical. In particular the present invention provides an improved rotary-type sealing machine with a speed much higher (i.e. 800 to 1,000 jars a minute) than customary.

The present invention also provides improved screw-type sealing by a means which is relatively simple and effective and which is also readily adjusted so that the machine may be used with a variety of container and closure sizes to apply them with a predetermined amount of torque. The improved sealing machine of the present invention is particularly adapted for high-speed and continuous operation, and the machine is therefore adapted for high-volume sealing lines where a high capacity is required in the sealing machine in combination with ruggedness, dependability, and the ability to operate with a minimum amount of supervision.

Accordingly, an object of the present invention is to provide an improved means for sealing threaded-type containers.

Another object of the present invention is to provide a relatively simple high-speed rotary sealing machine for use with threaded-type closures.

Another object of the present invention is to provide a sealing machine for threaded-type closures which is adaptable for operation at very high sealing speeds.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings, forming a part of the specification, wherein:

FIG. 1 is a fragmentary perspective view of the improved sealing means showing the rotary sealing action;

FIG. 2 is a top plan view partially in section of an improved sealing machine in accordance with the invention;

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FIG. 3 is a sectional view of a sealing head of the machine;

FIG. 4 is an enlarged detailed sectional view of the sealing chucks mounted at the lower end of the sealing head of FIG. 3;

FIG. 5 is a sectional view of a sealing head taken along the line 5-5 of FIG. 4;

FIG. 6 is a plan view of a portion of the sealing star wheel;

FIG. 7 is a fragmentary sectional view of the sealing section of the machine according to the invention showing the sealing star wheel and the container rotating shoe taken along the line 7-7 of FIG. 6;

FIG. 8 is a diagrammatic view of the sealing section of the machine showing the operation of the container rotating means and the sealing cam;

FIG. 9 is a vertical sectional view of another embodiment of sealing means in accordance with the present invention;

FIG. 10 is an enlarged detailed top plan view of another embodiment of the conveyor belt;

FIG. 11 is a vertical sectional view of the conveyor belt of FIG. 10;

FIG. 12 is a vertical sectional view corresponding to FIG. 11 of another embodiment of the conveyor belt;

FIG. 13 is an enlarged detailed side elevational view partially in section of another embodiment of the container support;

FIG. 14 is a top plan view of another embodiment of the container sealing section of the sealing machine; and

FIG. 15 is a sectional view of another embodiment of the sealing chucks.

General Description

As illustrated in FIGS. 1 and 2, the sealing machine 1 comprises a horizontally disposed endless conveyor belt 2 which receives filled and unsealed containers 3 at a loading point 4 and which carries the containers 3 past a sealing means and discharges the sealed containers 3 at a discharge point 5. The containers 3 remain in position on the conveyor belt 2 during their entire passage through the machine 1. The conveyor belt 2 first carries the filled containers 3 to a suitable container spacing means comprising the helicoid 6, rotating container feed star wheel 7, and a roller chain guide 7a which spaces the containers 3 on the conveyor 2 prior to the movement of each container 3 beneath one of the sealing heads 8 mounted on the rotating sealing turret 9 (FIG. 3).

In the preferred embodiment illustrated, each of the sealing heads 8 has a pair of sealing chucks 10 mounted on its lower end, and the helicoid 6, the star wheel 7, and the chain guide 7a position the containers 3 so that two of them will be properly positioned beneath the sealing chucks 10 of each of the rotating sealing heads 8 as the conveyor 2 moves beneath the sealing heads 8 on the rotating sealing turret 9.

Prior to the movement of the sealing heads 8 above the unsealed containers 3 each of the sealing heads 8 moves its pair of sealing chucks 10 over a closure feed station 11 in which closures 12 are supplied to the sealing chucks 10 by a suitable closure feed star wheel 13 from a cap feed 13a. The moving sealing chucks 10 pass over the closures 12 in the closure feed star wheel 13 and a suitable magnet 13b (FIG. 4) mounted in each chuck 10 lifts and holds a closure 12 on the lower surface of each of the chucks 10.

After the sealing heads 8 are moved above the moving containers 3 on the conveyor belt 2, the hoods 14 on the lower ends of the sealing heads 8 are lowered over the mouths of the containers 3 to permit the injection of steam or an inert gas or a mixture of steam and an inert gas into the headspaces of the containers to form a

vacuum or an inert atmosphere in the headspace of the sealed containers. As the containers 3 move beneath the sealing heads 8, each container 3 is simultaneously moved against a sealing star wheel 15 mounted concentrically with the sealing turret 9 and having a plurality of rollers 16 (FIG. 6) mounted on its periphery. Each container 3 is moved between two or more rollers 16 on the sealing star wheel 15. The conveyor 2 with the container 3 positioned thereon and the sealing head 8 positioned thereabove now move in synchronism to the sealing section of the machine 1 indicated generally at 17 (FIG. 2).

As will be more fully described below, a roller 18 on the top of each of the sealing heads 8 cooperates with a sealing cam 19 to lower the sealing chucks 10 of the sealing heads 8 so that the lugs or threads on the closures 12 engage the threads or lugs on the containers 3. Simultaneously, the side walls of each of the containers 3 engage an elongated container rotating shoe 20 mounted outwardly of the sealing star wheel 15. The shoe 20 engages each of the containers 3 and simultaneously holds it against the rollers 16 and causes the container 3 to rotate about its vertical axis due to the frictional engagement of the shoe 20 with the side walls of each container 3. The simultaneous lowering of the closure caps 12 and the rotation of the containers 3 causes the containers 3 to be turned into sealing engagement with the closures 12.

Thereafter, the conveyor 2 and the chain guide 7b and the star wheel 7c move each of the sealed containers 3 to the discharge point 5.

The basic drive mechanisms, including those for the helicoid 6, the star wheels 7, 13, and 15, as well as the sealing turret 9, may be provided as illustrated in detail in United States Patent No. 2,510,568, owned by the assignee of the present invention.

Any suitable cap feed may be used to feed the closures 12 to the closure feed star wheel 13. A cap feed suitable for this use has been disclosed in United States Patent No. 2,863,588, issued on December 12, 1958, to Harry E. Stover and assigned to the owner of the present invention.

The sealing means of the present invention is for use with all types of screw-type closures including continuous threads, interrupted threads, and lugs adapted to cooperate with continuous or interrupted threads or lugs on the container. One type of closure which may be used is the lug type disclosed in Patent No. 1,805,623 to Hammer or a concealed lug closure as disclosed in Patent No. 2,348,464 to Geertsema. These lug-type closures are applied in a fraction of a turn of the container in the sealing section.

The Sealing Heads

The sealing heads 8 according to the present invention are illustrated in detail in FIG. 3. The sealing heads 8 are mounted at the outer edge of a casting 21 rotatably mounted on a stationary vertical post 24 by a suitable central bearing. In the preferred embodiment the sealing heads 8 each comprise an outer cylindrical member 25 fixed to the casting 21 at 26. The casting 21 has a central bearing 21a adapted to be telescoped over the center post 24. A second cylindrical member 28 is slidably mounted in each of the outer cylindrical members 25, and it has secured to its lower end the hood 14 adapted to extend about and to partially enclose the upper end of a container 3 during the sealing operation. The position of the hood 14 with relation to the containers 3 is controlled by a cam roller 30 rotatably mounted on a suitable shaft 31 fixedly attached to the cylindrical member 28. Cam roller 30 engages the upper surface 32 of a circular cam 33 which is attached to the bearing 21a on the center post 24 by means of suitable brackets 34. The spring 35 above hood 14 resiliently urges the cam roller 30 against the cam 33.

A preferred embodiment of the hood 14 is shown in FIGS. 4 and 5 of the drawing. In this preferred em-

bodiment the hood 14 is adapted to partially enclose two sealing chucks 10. However, other numbers of chucks may be used as desired and the hood 14 may enclose one, two, or more chucks 10.

The hood 14 comprises a hollow enclosure having a top portion 14a, side walls 14b, and a bottom plate 14c. These portions are attached together to form an airtight enclosure having two cylindrical openings 36 at its bottom adapted to receive the upper portions of the containers 3. Adjacent to each of the openings 36 is mounted a vapor distributing manifold 37 having vapor outlets 38 positioned to inject a vapor or an inert gas or a mixture thereof into the headspaces of containers 3 prior to the sealing operation to form a vacuum or an inert atmosphere in the container headspace in the known manner. These vapor outlets 38 are connected to a suitable vapor inlet in each of the hoods 14 by vapor distributing channels 39. The inlet for each hood is connected to a vapor or gas distributing manifold by suitable piping, as illustrated in United States Patent No. 2,510,568. The vapor distributor is adjustable to supply steam or another gas to the container headspace through the vapor outlets during the portion of the container travel beneath the sealing head 8 prior to and during the application of a closure 12 to a container 3. Where a high vacuum seal is desired, super-heated steam is injected into the container headspace. A lesser vacuum of predetermined amount is provided by mixing predetermined amounts of a gas with the condensable vapor or steam.

The Improved Closure Applying Chucks

As illustrated in FIG. 4, the preferred embodiment of the sealing head 8 has two cylindrical closure applying chucks each adapted to lift a closure 12 from the closure feed star wheel 13 and to thereafter apply it to the threads of rotating container 3 at the sealing section 17 of the machine. Different numbers of chucks may be used on the sealing heads, i.e. one may be used for larger closures and two or more where the machine size or the closure size permits. The two chucks 10 are mounted within the hood 14 for vertical movement independently of the hood 14 by being attached to a horizontal foot 40 attached to the end of a vertically reciprocable rod member 41. The rod member 41 is slidably mounted on suitable bearings 42 within the cylindrical member 28, and a cam roller 18 at the upper end of the rod 41 engages the sealing cam 19 to control the vertical position of the chucks 10 above the mouth of the containers 3. Spring member 44 holds the cam rod 41 in its upward position and urges the roller 18 against the sealing cam 19.

The chucks 10 are mounted on the foot 40 with a floating mount which comprises the mounting stud 50 having a flanged portion 51 which comprises the upper portion of the chuck 10. A suitable nut 52 attaches the stud 50 to the foot 40. A spring 54 yieldably holds the stud 50 in its lowermost position on the foot 40.

In order to provide for an initial light sealing pressure to allow the closure 12 to be coaxed into the proper position for the commencement of the threading action, chuck 10 has a slidably mounted lower portion 55. The lower portion 55 is fixedly attached to the lower end of the rod 56 which is slidably and rotatably mounted in the hollowed-out center 57 of stud 50. The weight of the lower portion 55 and the stud 50 urges the lower portion 55 into a normal downward closure engaging position as illustrated in FIG. 4.

When the chuck 10 is lowered by the operation of the sealing cam 19 through the intermediation of roller 18 and rod member 41 in the final sealing action, the lower portion 55 engages the closure 12 and the upper portion 51 of the chuck 10 moves downwardly toward the lower portion 55. The stud 50 of the chuck 10 is splined at 58 to the foot member 40 to prevent rotation of the stud 50 or the upper portion 51 of the chuck 10.

A friction disc 62 positioned between the lower portion 55 and the upper portion 51 of the sealing chuck 10 arrests the rotation of the lower portion 55 as soon as it engages the upper portion 51 and the resultant reduction of the speed of rotation of the closure 12 on the chuck 10 causes it to be screwed onto the finish of the rotating container 3. A suitable annular closure gripping member 64 is attached to the bottom of each chuck 10 to permit the chuck 10 to tightly engage each closure 12 during the final portion of the closure application to cause the closure 12 to remain stationary and to spin onto the container 3 when the friction disc 62 connects the upper portion 51 and the lower portion 55.

An alternate embodiment of the closure applying chuck is illustrated at 10a in FIG. 15. In this embodiment the lower portion 55a is fixedly mounted on the rod 56 which is rotatably and slidably mounted in stud 50 in a manner similar to that for the above-described chuck 10; however, pins 59 are fitted in the lower portion 55a and are slidably fitted in apertures 60 in stud 50 to prevent rotation of the lower portion 55a. When the closure 12 engages the container 3, the lower floating portion 55a will coax the closure lightly into position on the container threads. The closure slips on the lower surface of the chuck 10a when the closure is fully tightened on the container 3.

Container Rotating Means

The container rotating means is illustrated in detail in FIGS. 6 and 7. It comprises the circular sealing star wheel 15 which is attached to and rotates with the sealing heads 8. The sealing star wheel 15 has a plurality of container spacing pockets 65 formed around its periphery and suitably positioned rollers 16 are mounted at the pockets 65 so that two or more rollers cooperate to engage and position each of the containers 3 as they are fed into the rotating sealing star wheel 15 by the container feed star wheel 7.

A suitable arcuate rail 63 (FIG. 2) maintains each of the containers 3 in position in a pocket 65 between two or more of the rollers 16 as the moving conveyor belt 2 carries the containers 3 in their arcuate path beneath the sealing heads 8. As seen in the sectional view of FIG. 7, the preferred embodiment of the sealing star wheel 15 comprises an upper ring 66 and a lower ring 67 each fastened to a sealing star wheel hub 68 by suitable bolts 69. Each of the rollers 16 is mounted between the upper and lower ring portions 66 and 67, respectively, on suitable shafts 70.

At the sealing section 17, the rail 63 is replaced by the elongated container rotating shoe 20. As illustrated in FIGS. 6 and 7, the container rotating shoe 20 has a backing member 71 adjustably positioned on the edge of the sealing machine 1 on adjustable brackets 72 and having a resilient pad 74 formed of a soft resilient material with a friction facing 75 adapted to frictionally engage the side walls 77 of the containers 3 to thereby cause them to rotate about their vertical axis in cooperation with a pair of the rollers 16 as the containers 3 are moved along the container rotating shoe 20.

The cooperation between the container rotating means and the sealing heads 8 in the application of the closures 12 to the containers 3 will now be described in greater detail with particular reference to FIG. 8.

FIG. 8 is a diagrammatic representation of the container rotating means and the closure applying chucks illustrating the relative positions of the chucks, the sealing cam, and the container rotating shoe during the closure applying operation. The containers 3' and 3'' in FIG. 8 are positioned on the conveyor belt 2 and are being moved from right to left by the cooperating conveyor belt 2 and the sealing star wheel 15. As described above, each of the containers 3 is positioned in a pocket 65 in the sealing star wheel 15 between two or more rollers 16. FIG. 8 illustrates two sealing heads 8' and 8'' being moved

through the sealing section 17. In this section the hoods 14' and 14'' have been lowered by cam 33 (FIG. 3) so that the vapor outlets 38 in the hoods 14 are adjacent the mouths of the containers 3 and so that the steam or other gas which flows from the vapor outlets 38 is passing into the container headspace and about the container finish. The sealing head 8' at the right-hand side of FIG. 8 has just moved beneath the sealing cam 19 of the cam surface. When the sealing head 8' is in engagement with the coaxing surface 80 of the cam 19, the sealing chucks 10' have been urged downwardly an initial small amount so that the closure 12 is resting lightly on the threads 81 of the containers 3'. The vertical position of the lower portion 55' of the sealing chucks 10' will be determined by the particular position at which the lugs or threads on the closure 12 engage the threads 81 on the containers.

In FIG. 8 the containers 3' and 3'' have been moved into engagement with the friction shoe 20 so that they are rotated thereby. The right-hand closure cap 12' has engaged the container threads 81 at a higher portion of the threads than the left-hand closure 12'. The right-hand closure 12' has caused an upward and accommodating movement of the chuck portion 55'. The containers 3' rotate in a direction to apply the closure 12' to the container 3'. Since at this position the closure 12' is only held lightly downwardly against the container threads, only a very light screwing force will result as the freely mounted lower portion 55' on the sealing chuck 10 rotates with the container 3' or as the closure 12' slips on the lower surface to cause an initial light engagement between the lugs of the closure 12' and the threads of the container 3'. This initial coaxing action positions the closure 12' on the container threads for the final sealing action.

This final sealing action occurs when the sealing head 8' has moved to the position indicated by the left-hand sealing head 8'' in FIG. 8. When the sealing head 8'' reaches this position, the sealing chucks 10'' are lowered downwardly with a greater pressure by the sealing portion 84 of the sealing cam 19. This causes a compression of the relatively strong springs 54 (FIG. 4) and forces closures 12'' tightly against the container threads so that the lower portions 55'' of the sealing chucks 10'' will be frictionally engaged with the upper portion 51'' by the friction disc 62. This will hold the lower portion of the sealing chucks 10'' in position and cause a strong rotational force to be exerted between the stationary closures 12'' and the rotating container 3''. When the closure has been twisted to its final sealing position with the desired amount of force, the friction disc 62 permits slippage between chuck portions 55'' and 51'' to prevent breakage of the container or bending of the closure cap. The downward position of the cam surface 84 is adjusted to provide this result.

In the embodiment illustrated in FIG. 15 where the lower portion 55a of the chuck 10a is locked against rotation, the chuck pressure and lower surface are designed to permit closure 12 to slip on the chuck when the closure is fully tightened.

Further movement of the conveyor belt 2 will move the containers out of contact with the sealing shoe 20 and will move the sealing heads 8 clear of the sealing cam 19, thereby terminating the container rotation and permitting the chucks 10 to lift clear of the sealed containers.

In order to facilitate the rotation of the containers 3 on the conveyor 2 as the containers 3 are moved through the sealing section 17, rotatable container pads may be provided on the conveyor belt 2. Two embodiments of sealing pads for the conveyor belt 2 are illustrated in FIG. 10-12.

FIGS. 10 and 11 illustrate a short section of the conveyor belt 2 comprising two individual belt links 111 coupled by the flexible linkage means 112 and having the usual drive rollers 114 adapted to contact the drive sprocket 115 (FIG. 7). Each of the links 111 has upper and lower plates 116 and 117, respectively. The upper

plate 116 has a circular cutout 118 into which a pad 119 is rotatably mounted. A flange 120 on the pad 119 fits within the counter bore 121 to rotatably hold the pad 119 in place. A suitable bearing portion 122 is provided on the bottom of the pad 119 to permit it to rotate freely on the upper surface of the lower plate 117. The helicoid 6, the star wheel 7, and the side belt 7a (FIG. 2) are synchronized so that the containers 3 are centrally positioned on the pads 119 when the containers 3 are moved under the sealing heads 8 by conveyor 2.

FIG. 12 is a sectional view of two belt links 123 generally similar to links 111 illustrated in FIG. 11. On links 123 the pads 124 are rotatably supported on the lower plate 125 by suitable ball bearings 126 fitted into cooperating grooves 127 and 128 in the pad 124 and the lower plate 125, respectively.

Another embodiment of the sealing section using a moving belt is illustrated in FIG. 14. In this embodiment the stationary friction shoe 20 is replaced by the moving belt 140 having end pulleys 141 and guide pulleys 142 which position the inner run 144 of the belt so that it engages the walls of the containers 3 and rotates them to apply the closures 12. The belt is driven at a different speed than the moving containers so that the containers are rotated by the belt 140. In the embodiment illustrated the belt 140 is moving faster than the containers 3 so that the containers rotate counterclockwise as shown.

Additional Embodiment

The sealing means has been described above in connection with a rotary machine using a continuous conveyor belt 2 which carries the containers 3 through the entire sealing mechanism. The containers 3 are seated on the metal surface of the belt 2 and during the sealing operation they spin on the relatively smooth metal surface of the belt.

The sealing means of the present invention may also be used with rotary machines having a regular circular rotating table which carries the containers around a central shaft.

The modified embodiment of the invention is illustrated in FIG. 9, which is a vertical sectional view of the sealing section of the machine.

Thus, FIG. 9 illustrates a horizontal circular rotating table 90 being driven about a vertical central post 91 and carrying the containers 92 beneath sealing heads 93 which are mounted in the well-known manner about the circumference of the rotating turret 94 also mounted on the central post 91.

As illustrated in FIG. 9, a circular sealing star wheel 95 is mounted concentrically of the rotating table 90 having container positioning rollers 96 mounted thereon in the same manner as described above for the sealing star wheel 15. At the sealing section of this machine, each of the containers 92 is moved into contact with an elongated container rotating shoe 97 which is similar to the above-described shoe 20 and which has a resilient pad 98 and a container engaging friction surface 99.

In order to facilitate rotation of the container 92 on the table 90, a rotatably mounted container support 100 is positioned on the table 90 between each set of rollers 96 and beneath each sealing head 93. The container support 100 has a suitable thrust bearing 101 and a cooperating vertically disposed bearing 102 rotatably supporting its vertical shaft 103.

The sealing heads 93 are each provided with a single container applying chuck 105 having a closure gripping magnet 105' therein. These chucks are mounted on a vertically reciprocable shaft 106 which lowers the chuck under the action of a suitable cam to apply the closure 104 to the threads of the container 92 as the container 92 is rotated by the shoe 97. When the sealing machine in FIG. 9 is used to apply screw-on type closures with the container rotating means illustrated in FIG. 9, the

chuck 105 is locked against rotation by a suitable spline for shaft 106.

In order to provide the desired vacuum or inert atmosphere in the container headspace, a vapor tunnel 108 is provided along the path of travel of the containers. A gas or vapor distributing channel 109 runs along each side of the tunnel 108 to deliver the gas or vapor to the container headspace through vapor outlets 110. This tunnel preferably will extend along the arcuate container path for at least a short distance in advance of the sealing section to permit the container headspace air to be replaced by the vapor or gas and it also preferably extends through the sealing section to prevent air seepage before the seal is completed. The tunnel may be used in place of the hoods 14 in the embodiment of FIGS. 1-8 or a suitable hollow hood generally similar to hood 14 may be used in the additional embodiment of FIG. 9 in place of the tunnel 108.

In place of moving the sealing heads 8 and the closures 12 downwardly onto the containers 3, all or part of the relative motion between the closures 12 and the containers 3 may be provided by raising the container 3. FIG. 13 illustrates a container holder 130 slidably mounted on a table 131 by bearing 132 so that the holder 130 will lift the container 3 under the influence of the circular cam 134 to move the container threads against the closure threads during the time that the container 3 is rotated in the sealing section 17. The upper pad 135 of the holder 130 is rotatably mounted on the shaft 136 by bearings 137.

Operation

Referring principally to FIGS. 1 and 2, the filled but unsealed containers 3 are carried through the sealing machine by the conveyor belt 2 which, as illustrated in FIG. 2, first carries each of the containers 3 past the rotating helicoid 6, the star wheel 7, and the roller chain spacer 7a, which space the containers 3 on the conveyor 2. Thereafter, the container 3 passes beneath a rotating sealing turret 9 which has a plurality of individual sealing heads 8 mounted thereon. Each of the sealing heads 8 picks up closures 12 from the closure feed station 11 and thereafter carries the closure above an unsealed container 3 being carried beneath the sealing head 8 by the conveyor 2.

As illustrated in FIG. 1, each of the sealing heads 8 has a hoodlike enclosure 14 on its lower end adapted to partially enclose the tops of the filled containers and also mounting therein a pair of closure applying chucks 10. During the initial portion of the sealing operation as the containers 3 and the sealing heads 8 move in corresponding arcuate paths, the hood 14 is lowered over the tops of the containers by the cam 33 and steam or a gas or a mixture thereof is injected into and about the container sealing finish and headspace. During this time each of the chucks 10 holds a closure 12 in spaced relationship above the top of a container 3 to permit the entry of the steam or gas into the container headspace to form a vacuum or an inert atmosphere in the headspace of the sealed containers. The steam or inert gas or a mixture thereof will be termed gas in the claims appended hereto.

When each container 3 and the corresponding sealing head 8 arrive at the sealing section 17, the container sealing action commences as is best illustrated in the diagrammatic illustration in FIG. 8. As seen in FIG. 8, each sealing head moves beneath an arcuate elongated sealing cam 19, and the cam rollers 18 on the sealing heads lower the sealing chucks 10 to move the closures 12 against the threads on the container tops. The lower surface of the sealing cam 19 has two principal portions at successively lower levels, and these portions cooperate in the following manner to accomplish the sealing of the containers. The first downwardly sloping cam section 80 is provided for an initial seating or coaxing period wherein the closure is pressed lightly against the container

top for the initial engagement of the closure lugs with the container threads. As illustrated in FIGS. 4 and 8, the lower portion 55 of the chuck 10 will move upwardly with respect to the foot 40 and the hood 14 to accommodate itself for the particular point at which the closure lugs engage the container threads. Thus, if the closure lugs happen to strike a relatively high portion on the container threads 81 as illustrated by the right-hand container 3' in the right-hand sealing head 8' (FIG. 8), the lower portion of chuck 10' will rise vertically with respect to the foot 40 and the hood 14 and will hold the closure 12' lightly against the threads and in a level disposition. If, however, the lugs on the closure strike a relatively low portion on the threads 81 as illustrated by the left-hand closure 12' and container 3' under sealing head 8', the lower portion of the chuck 10' will remain in its normal downward position. As is also illustrated in FIG. 8, shortly after the closures are lightly applied to the containers under cam portion 80, the container side walls engage the container rotating shoe 20 or the moving belt 140 for the embodiment of FIG. 14, which causes the containers to rotate on the conveyor belt 2 and against the rollers 16 on the sealing star wheel 15.

Each sealing head thereafter moves under the sealing portion 84 of the sealing cam 19, at which point this cam portion moves each of the closures downwardly and tightly against the container threads while the containers continue to rotate under the influence of the container rotating shoe 20. This additional downward movement of the foot 40 and the two sealing chucks mounted thereon causes the upper portion 51'' of the sealing chuck to be moved toward the lower portion 55'' with the friction disc 62 gripped therebetween. The friction disc prevents further rotation of the lower portion of the chuck 55'' and thus causes a relative rotation between the fixed closure 12'' and the threads 81 of the rotating container 3''. This relative motion turns the closure tightly into sealing engagement with the container finish. The friction disc 62 is proportioned and the downward movement of the chucks 10 is adjusted to permit slippage between the lower portion 55'' and the upper portion 51'' of the chuck 10'' when the closure has been applied with a predetermined amount of torque. This prevents breakage of the containers or bending of the closures during the final portion of the container movement through the sealing section 17. In the embodiment of FIG. 15 where the lower portion 55a is locked against rotation, the closure 12 slips on the lower surface of the chuck 10 when the closure 12 is fully tightened.

Thereafter, each of the sealing heads moves from beneath the sealing cam 19 and the sealing chucks are lifted clear of the sealed containers. The hoods 14 are also raised clear of the sealing containers by the circular cam 32, and the vapor supply is turned off by the action of the vapor distributing manifold. The sealed containers are now delivered to the discharge point 5 of the conveyor 2.

The above-described sealing means is readily adjusted for variations in container and closure sizes.

Where the diameter of the container is changed, the machine is easily adjusted by a re-positioning of the helicoid 6 and an adjustment of the star wheel 7 together with suitable positioning of the guide rail 63 and the container rotating shoe 20. The star wheel 15 is adjusted by replacing the rollers or a variable pitch star wheel may be used and suitably adjusted. When the container heights are changed, suitable adjustments are made on the vertical positions of the circular hood height control cam 32 and the sealing cam 19. The hoods 14 and the chucks 10 are each adaptable for use with a fairly wide range of container and closure sizes. However, should appreciably larger or smaller containers or closures be used, the hoods 14 and chucks 10 are easily replaced with suitably sized and generally similar hoods and chucks. The sealing machine described above is

suitable for a wide range of sealing speeds and has been successfully operated at speeds of from 800-1,000 containers a minute.

The sealing means illustrated in FIG. 9 operates in a manner generally similar to that described above for the principal embodiment of the invention. The rotation of the containers 92 in this embodiment is facilitated by their being positioned on the rotatable container supports 100 as they are moved onto the rotating turntable 90. Thus when these containers move into the sealing section 97, each container is rotated about its vertical axis on the rotatable container support 100 by the co-operating container rotating shoe 97 and a pair of the container engaging rollers 96.

It will be seen that an improved means for sealing threaded-type containers has been provided whereby the threaded containers are sealed at a high speed. The means disclosed provides for high-speed sealing and for a compact and reliable sealing for high-volume packing operations.

As various changes may be made in the form, construction and arrangement of the parts herein without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in a limiting sense.

Having thus described our invention, we claim:

1. A closure holding chuck for a sealing machine comprising an upper portion, a lower portion, said lower portion having a closure engaging means thereon, said lower portion being rotatably mounted on said upper portion, means urging said portions apart, and a friction disc member positioned intermediate said portions and adapted to frictionally connect said portions when said lower portion is moved upwardly against said upper portion as a closure on said lower portion is moved downwardly against a container top.

2. The chuck as claimed in claim 1 in which said closure engaging means comprises a magnet.

3. A sealing machine for containers having threaded-type closure engaging means comprising means to successively move containers about an arcuate path, means to hold a threaded-type closure above the mouth of each container, means to move the closure downwardly against the container mouth, and means to simultaneously rotate said container with respect to the closure whereby the closure is screwed onto said container, said means to rotate the container comprising an elongated friction shoe fixedly disposed along the arcuate path and adapted to frictionally engage the side walls of the containers, said means to move the closure downwardly comprising a cam having a first portion positioned to move said closure lightly against the container closure engaging means and a second portion positioned to move said closure tightly against the container closure engaging means during the rotation of the container and said means to hold the closure comprising a chuck member having an upper portion and a lower portion, said lower portion having a closure engaging means thereon, said lower portion being rotatably mounted on said upper portion, and a friction member positioned between said portions of said chuck member adapted to frictionally connect said portions when the closure is moved tightly against the container by said second portion of said cam.

4. The sealing machine as claimed in claim 3 in which said closure engaging means comprises a magnet.

5. A sealing machine for containers having threaded-type closure engaging means comprising means to successively move containers about an arcuate path, means to hold a threaded-type closure above the mouth of each container, means to move the closure downwardly against the container mouth, and means to simultaneously rotate said container with respect to the closure whereby the closure is screwed onto said container, said means to rotate the container comprising friction means disposed

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along the arcuate path and adapted to frictionally engage the side walls of the containers, said means to move the closure downwardly comprising a cam having a first portion positioned to move said closure lightly against the container closure engaging means and a second portion 5 positioned to move said closure tightly against the container closure engaging means during the rotation of the container and said means to hold the closure comprising a chuck member having an upper portion and a lower portion, said lower portion having a closure engaging 10 means thereon, said lower portion being rotatably mounted on said upper portion, and a friction member positioned between said portions of said chuck member adapted to frictionally connect said portions when the closure is moved tightly against the container by said second portion 15 of said cam.

6. A sealing machine for containers having threaded-type closure engaging means comprising means to successively move containers about an arcuate path, means 20 to hold a threaded-type closure above the mouth of each container, means to move the closure downwardly against the container mouth, and means to simultaneously rotate said container with respect to the closure whereby the closure is screwed onto said container, said means to rotate the container comprising an endless belt having one run 25 disposed along the arcuate path and adapted to frictionally engage the side walls of the containers, said means

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to move the closure downwardly comprising a cam having a first portion positioned to move said closure lightly against the container closure engaging means and a second portion positioned to move said closure tightly against the container closure engaging means during the rotation of the container and said means to hold the closure comprising a chuck member having an upper portion and a lower portion, said lower portion having a closure engaging means thereon, said lower portion being rotatably mounted on said upper portion, and a friction member positioned between said portions of said chuck member adapted to frictionally connect said portions when the closure is moved tightly against the container by said second portion of said cam.

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