HERMETIC SEALING MACHINE WITH VACUUM CONTROL MEANS

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The present invention relates to sealing machines for applying closures to containers and more particularly to additions to and improvements in the sealing machine of my prior application Ser. No. 558,226, now Patent No. 2,610,588, issued June 6, 1950, filed in the United States Patent Office on October 11, 1944, and owned by the assignee of the present invention.

In the sealing of products such as coffee under vacuum, the lightness of the product, and its tendency to be drawn out of the container by the rush of air through it, has proven quite troublesome. In addition, the light particles get into the parts of the machine and tend to clog it, preventing effective operation. Packers prefer screw closure caps for sealing many products because the cap can be removed and replaced to keep the package tightly sealed while the product is being used. The use of screw closures introduces additional complications in the sealing and vacuumizing operation.

The present invention aims to minimize or overcome the above problems and to improve the machine of said application Ser. No. 558,226.

An object of the present invention is to provide an improved sealing machine for sealing closure caps to containers, particularly glass containers.

Another object of the invention is to provide an improved sealing machine for sealing screw closure caps to containers.

Another object of the invention is to provide an improved sealing head for sealing closures to containers.

Another object of the invention is to control the connection of a sealing head to a source of vacuum to prevent the application of vacuum except when a container is within the head.

Another object of the invention is to provide an improved control for the application of vacuum to the product which gradually increases the tendency to remove the air from the container up to or shortly prior to the time of sealing.

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 perspective view of a preferred embodiment of the sealing machine;

Fig. 2 is a top plan view of the sealing machine;

Fig. 3 is a sectional view along the line 3—3 of Fig. 2, illustrating the interior of the machine and the operation thereof;

Fig. 4 is a vertical sectional view through one embodiment of sealing head;

Fig. 5 is an enlarged fragmentary sectional view of the lower portion of the sealing head shown in Fig. 4 with a container in position therein;

Fig. 6 is an enlarged sectional view of another embodiment of sealing head with the lower portion shown in elevation;

Fig. 7 is an enlarged fragmentary sectional view of the lower portion of the sealing head shown in Fig. 6 with a container in place therein;

Fig. 8 is a sectional view along the line 8—8 of Fig. 3 illustrating an improved mechanism for controlling the vacuum to which the container is subjected;

Fig. 9 is a sectional view along the line 9—9 of Fig. 8 illustrating details of the mechanism of Fig. 8;

Fig. 10 is a detailed sectional view along the line 10—10 of Fig. 8 illustrating means for adjusting the position of the control bar;

Fig. 11 is a view of a modified form of valve for slowly subjecting the product to vacuum;

Fig. 12 is a vertical sectional view along the line 12—12 of Fig. 11;

Fig. 13 is a detailed flattened view of features of the modified valve;

Fig. 14 is a top plan view, partly diagrammatic, illustrating the sealing machine combined with a filling machine and a modified conveyor therefor; and

Fig. 15 is a detailed view illustrating features of the closure feed.

A preferred embodiment of the invention has been chosen for illustrative purposes without any intention of limiting the invention beyond the comprehensive scope of the claims, and for simplification will be described under the headings:

(1) General description,
(2) Drive,
(3) Sealing turret,
(4) Sealing heads,
(5) Modified sealing heads,
(6) Vacuum control,
(7) Modified vacuum control,
(8) Cap feed,
(9) Combined filling and sealing,
and (10) Operation.

General description

Referring more particularly to Figs. 1, 2 and 3, the machine comprises an enclosed base 1 having
a conveyor 2 which is mounted on pulleys at the respective ends secured to extensions 4 bolted to the base of the machine. The conveyor is of the type illustrated in my prior application Ser. No. 558,226 and comprises links having plates 5 attached thereto which flex vertically and laterally to give, in effect, a universal movement. By means of the conveyor a horizontal sprocket mounted on the vertical axis of the star wheel and on the vertical axis of the turret and which bends to go around the vertically mounted sprockets at the ends of the machine. The mounting of the conveyor may be and preferably is the same as in my said prior application.

Filled containers 6 are placed on the conveyor at one end of the machine and are moved past a bumper 7 into a helicoid 8 (Fig. 2) where the containers are properly spaced to enter the recesses 9 of a star wheel 10. The star wheel, helicoid and bumper may likewise be similar to those in my prior application. The containers then move (from the star wheel) 10 to a star wheel 11 mounted on the column 12 of the sealing turret and are held in the star wheel by an adjustably mounted guide 14. The star wheel 11 registers the containers with the sealing heads 15. The conveyor, on leaving the sealing machine, passes about a sprocket (not shown) similar to the sprocket on the opposite side of the machine.

Closures may be fed to the machine by hand but in the preferred embodiment a hopper 16 is utilized for feeding the closures to a guideway 17, and the closures are delivered to recesses 18 in a star wheel 19 which moves the closures under the sealing heads 15 where they are picked up by the sealing heads and carried therein until the sealing head registers with the mouth of a container. At that time the closure is held directly above the container in engagement with or spaced slightly from the mouth of it. The head drops down on the container, as shown in Fig. 5, and forms a seal with the shoulder of the container by means of the gasket 20. Thereafter the container is subjected to vacuum during a substantial part of its movement, preferably about 150 degrees about the turret, and after a suitable vacuum is formed in the container the closure is forced down and rotated by means of a cam 25 (Fig. 3) and a gear 22 to apply the closure to the container. The sealing head is then raised by a cam 24 and the sealed container passes out of the machine on the conveyor 2.

The parts described above and their operations will be described in greater detail hereinafter.

Drive

While any suitable driving arrangement may be utilized, the preferred embodiment shows a reduction gear 25 (Fig. 3) attached to a bracket 26 which is bolted to the base 1 of the machine. A pulley 27 with a belt 28 thereon drives the reduction gear. A suitable speedometer 29 may be operatively connected through the flexible cable 30 to a shaft 31 for indicating the speed of the machine. Preferably the belt 28 is connected to a motor having a V-shaped pulley forming a part of a Reeves drive whereby the motor may be moved toward and away from the pulley 27 to increase and decrease the speed of the operation. Preferably the position of the motor is controlled by any suitable connection from a hand wheel 32 (Fig. 1). A vertical shaft 34 extends upwardly from the reduction gear 25 with the gear thereon meshing with a gear 36 for driving the cap feed and with an idling gear 37 meshing with gear 35 bolted to a member 39 rotatably mounted on the column 12 of the sealing turret. The star wheel 11 and the conveyor sprocket 40 are bolted to the rotatable member 39. The other conveyor sprocket and the conveyor the sprocket which in turn is driven by the sprocket 40 bolted to the rotatable member 39.

The hopper 16 for the closures may be driven in any suitable manner but preferably by a vertical shaft operatively connected to the shaft of the sprocket (not shown) at the right of the machine.

Sealing turret

Referring more particularly to Figs. 1, 2 and 3, the sealing turret carrying the sealing heads 15, herein illustrated as sixteen in number, is mounted about a central column 12 in the form of a hollow casting bolted at its lower end to the base 1 as shown at 41. The lower end of the column 12 as described above has the drive gear 38 bolted to a member 39 rotatable thereon. The member 39 likewise has bolted to it the star wheel 11 for registering the containers with the sealing heads 15 and also the sprocket 40 for driving the conveyor 2.

The upper end of the column 12 has a second casting 44 telescoped about it and secured against rotation with respect to it by means of a bar 45 fitting in vertical slots 46 in the column 12. The vertical slots 45 permit vertical movement of the casting 44 by means of a hand wheel 47 having a shaft 48 threaded into a cap 49 bolted to the upper end of the column 12. The casting 44 carries a casing 50 nested about its upper end and having a flange 51 at its lower end carrying a cam 24 at its outer periphery. The flange 51 likewise carries a circular gear 54 mounted adjacent its outer periphery and adapted to mesh with gear 32 for rotating the chuck in the sealing heads 15 for screwing closures onto containers.

The column 12 has a rotatable head 55 mounted about its center on flange 44 and carries the sealing heads 15 about its periphery. The casings 11 of the sealing heads are bolted to the rotatable head 55 and the parts inside the casing are supported by the cam rollers 55 on the cam 24. The details of the sealing heads will be described hereinafter.

The rotatable member 55 is driven by a series of vertical members 58 secured at their lower ends to the star wheel 11 and slidably mounted at their upper ends in recesses 59. This permits the rotatable member 58, with the sealing heads and cam 24 thereon, to be raised and lowered by means of the hand wheel 47 to accommodate containers of different heights.

In order to effect sealing of the closures, there is provided on the upper end of the casting 50 a bracket 60 having a bell crank 61 pivotally mounted thereon with the lower end 62 operatively connected to a sleeve 64 resiliently forced toward the column by means of a spring 65 held in position by an adjustable collar 66. The opposite end 67 of the bell crank has bolted to it a cam 68 adapted to engage a cam roller 69 on the outer end of the respective sealing heads (Figs. 3 and 4). As each sealing head passes under the feed of the central shaft of the sealing head carrying the rotating chuck and the closure are forced down on the container to screw the closure thereon.
A vacuum conduit 10 extends upwardly through the hollow column 12 and is attached at its upper end to a valve 71 which subjects the sealing heads to vacuum prior to the closure being applied. The valve 71 will be described in more detail hereinafter but generally comprises a lower stationary member 12 and an upper rotatable member 74. The upper rotatable member has conduits 75 connected to each of the sealing heads 15, as shown more particularly in Fig. 5. As each sealing head passes the effective portion of the valve 71, the conduits 75 and the sealing heads are subjected to vacuum in order to remove the air from the containers without drawing with it the product, even though it be a light, granular material such as coffee.

Sealing heads

Referring more particularly to Figs. 4 and 5, a preferred embodiment of the sealing head is illustrated. The purpose of the head is to form a chamber about the upper end of the container while air is being exhausted from the container and then to apply a cap for sealing the container. Preferably the cap is of the screw type which requires rotation to thread it on the container.

The hood forming the sealing chamber is shown in enlarged section 6 as being a generally cup-shaped hood 76 having a threaded collar 77 at its lower end clamping in position an annular gasket 78. The gasket fits against the shoulder of the container as shown in Fig. 5 and forms a seal with it. The inside of the cup-shaped member 76 has an annular recess with a collar 79 therein and a screen 80 back of the collar. Suitable openings 81 in the collar 79 form ports to the inside of the hood. The space back of the screen 80 is operatively connected to the vacuum conduit 75 by means of a conduit 82 (Fig. 4). The opening through the conduit 82 is controlled by a trip valve 84 which may comprise a pin 85 having an enlarged upper end 86 held against a shoulder 87 by means of a spring 88 which is compressed and held in position by a threaded nut 89. The lower end of the pin 85 passes through a packing gland 90 and has attached to its lower end a container-contacting member 91 which may be made of rubber if desired, but the pressure required is not excessive for rubber. Metal may be used without breaking containers. The engagement of the trip 84 with the container raises the pin 85 to cause the recess 82 to register with the conduit 82. This subjects the interior of the cup-shaped member 76 and the chamber about the upper end of the container to a vacuum. The hood or cup-shaped member 76 rotates with the turret but does not rotate about its own axis.

After the vacuum is formed a closure 94 is screwed on the upper end of the threaded container 6. This is accomplished by a disc 93 having magnets 95 which engage the cover of the closure to hold it in position directly above the container. An annular chuck 96 is adapted to engage the outer periphery of the closure to screw it on the container. The chuck 96 is secured to a generally cup-shaped member 97 on the vertical shaft 98; the member 97 may be secured to the shaft 98 by bolts. The disc 95 is likewise secured to the vertical shaft 98 by means of a bolt 99 and a coil spring 103 which forces the disc 95 into its lower position. When the shaft 98 moves down, the closure is first forced against the rim of the container through the intermediation of the spring 100, and as the spring compresses, the chuck 96 engages the outer periphery of the closure to screw it on the container.

The mechanisms will now be described for operating the hood 76, which consists essentially in raising and lowering the hood, and for operating the chuck 96, which consists essentially in lowering and rotating the shaft 98.

The hood 76 is operatively secured, as by bolts 103, to a hollow shaft member 101 having an enlarged lower end 102 threaded at 104. A bushing 105 permits the shaft 98 to rotate within the hollow member 101. A suitable packing gland is formed between the shaft 98 and the hood 76 by means of an annular packing ring 106 formed of any suitable packing material. The outside of the packing ring is held in position by the inside of the enlarged end 102 of the hollow member 101. The upper side of the packing is held in place by a ring 107. The tightness of the packing may be adjusted by means of the screw collar 108 which is in engagement with a collar 109 having pins 110 passing through slots 102 in the enlarged end 102 and engaging the upper side of the ring 107. By rotating the collar 108 the ring 107 on the upper side of the packing may be forced down or up to increase the effectiveness of the packing.

The hollow member 101, fixed to the hood 76, extends upwardly about the shaft 98 and its associated parts, and within the outer casing 111 which may be accurately located in position by a dowel pin fitting into an aperture 113 and bolted to the rotary head 59 of the machine. The upper end of the hollow member 101 extends about a cross pin 112 having a cam roller 55 thereon shown in engagement with the upper surface of the cam 24. As the sealing head rotates with the turret about the machine, the cam roller 55 is raised and lowered by the cam 24 to raise and lower the hood or cup-shaped member 76 through the hollow member 101 which is attached at its lower end to the cup-shaped member 76.

The pin 112 extends through a slot 114 in the shaft 98a which permits movement relative to the shafts 98 and 98a. Suitable slots 115 in the outer casing member 111 likewise permit vertical movement of the pin 112. A suitable coil spring 116 interposed between the lower end of the casing member 111 and the enlarged end of the member 101 tends to retain the head in its lower position. The weight of the head may in some instances be sufficient without the spring, but the addition of a spring is preferred.

The cam 24 has a suitable inclined portion 24a (Fig. 3) for lowering the hood onto the shoulder of a container and a similar portion for raising the hood off the container after it has been sealed. In addition, the cam holds the hood in proper position to the shaft 98, to which the cup-holding disc 95 is substantially flush with the end thereof to facilitate picking up a closure from the closure feed, as will be described hereinafter. Referring now to the means for operating the chuck for screwing the closure on the container, the shaft 98, to which the chuck 96 is attached by means of the member 97 and to which the cap-retaining member 95 is attached by means of the bolt 99 and spring 103, has a recess or bearing 117 at its upper end extending about the reduced lower end 118 of the shaft 98a which is a continuation of the shaft 98. However, the
rod 98a does not rotate. In order to facilitate relative rotation between the shaft 98 and the rod 98a a ball thrust bearing 118 is provided. A suitable clutch member 120 may be force-fitted to the reduced upper end of the member 98 and may have a conical upper part 120a fitting into a conical part 21a which forms a part of the gear 22 extending about the rod 98a.

The conical surfaces 22a and 120a are forced toward each other by means of a sleeve 121 held in its downward position by means of a spring 122 adjustable secured in position by a threaded collar 124. Suitable slots 121c permit the sleeve 121 to move up and down without interfering with the pin 112. A suitable roller bearing 125 may be interposed between the sleeve 121 and the gear member 22. The upper end of the rod 98a is bolted to a member 126 slidably fitting in a cup member 127 bolted to the upper end of the member 111 fixed to the turret 58. A suitable cam roller 65 is secured to the member 125 by a pin 128.

Where the cam roller 69 is engaged by the cam 68, as shown in Fig. 3, the member 125 is forced down in opposition to a spring 129 to force the rod 98a down and also the shaft 90. The closure on the holder 55 is forced down on the member of the container. Further downward movement of the shaft 98 compresses the spring 100 until the chuck 96 engages the closure. The spring 122, through the intermediation of the threaded collar on the rod 98a, forces the gear member 22 and the conical clutch part 22a there-of against the conical clutch part 120a of the member 120 on shaft 98 to rotate the chuck 96 continuously. The chuck may be of the type which will slip on the closure when it becomes sufficiently tight on the container but preferably the friction clutch is adjusted by means of the threaded ring 124 to slip when a given torque is reached. If preferred, a combination of these two may be used in applying the closure.

As a sealing head passes around the turret, it first picks up a closure by means of the magnets in the closure holder disc 95 (Fig. 5). Thereafter the head moves until it registers with a container whereupon the hood 75 drops down on the shoulders of the container, as shown in Fig. 5. Simultaneously the member 94 engages the shoulder of the container to open the vacuum conduit 82 and to subject the space about the container to a vacuum. When a sufficient vacuum is obtained, by the container being exposed to the vacuum for a predetermined period, that is, through a predetermined arc of its movement, the cam roller 65 engages the cam 53, as shown in Fig. 3, which forces the rod 98a and the shaft 98 downwardly. This causes the cap holder 95 to move down with the chuck 96 and when the closure engages the container the cap holder 95 moves upwardly in opposition to the spring 100 until the chuck 96 engages the rim of the closure, whereupon the conical portion 22a and 120a of the friction clutch, forced together by the spring 122, rotates the chuck to apply the closure. By adjusting the compression in the spring 122 by means of the threaded collar 124, any desired amount of tightness may be obtained in screwing the closure on the container.

Modified sealing heads

Referring more particularly to Figs. 6 and 7, a modified form of sealing head is illustrated. This sealing head is adapted to accomplish the same general objective as the sealing head described above with reference to Figs. 4 and 5, but the preferred embodiment has additional advantages.

A suitable hollow casting 111 is attached to the turret of the machine by a suitable locating dowel pin fitting in the recess 131 and bolts (not shown) and moves about the machine in the same vertical position. Housing 131 in this casting are the vertically movable and rotatable parts which screw the cap on the container under vacuum.

A hood 15a is adapted to fit about the upper end of the container 6 and has a gasket 78a vulcanized or otherwise secured into a ring 78b which is held in position by a screw ring 71a. The gasket 78a rests on the shoulder of the container to form a seal with it. The upper end of the hood 15a is bolted to a flange on a cylindrical member 132 which has a reduced portion about its lower outer periphery to form an annular chamber 134 within the hood. The chamber 134 is connected by an annular port 135a formed by the space between the lower end of the cylindrical member 132 and the upper side 135 of the shoulder at the bottom of the hood 15a and operatively connected to the vacuum conduit 75 for exhausting the air from the head space.

The upper end of the cylindrical member 132 is bolted to a flange on the member 101a which extends upwardly within the housing casting 111 having an opening 101b permitting access to the head of 54 and having a pin 112a extending through its upper end with a cam roller 65 thereto adapted to engage the cam 24. The pin 112a may move up and down in the recess 115a in the casting 130. Thus the hood 15a is moved up and down in response to the cam 24 so that the hood may be dropped over a container to form a chamber about the upper end for exhausting the air from the container and also for moving up to permit the container to be removed and the cap holder to be flush with the lower end of the hood in order to facilitate picking up a closure from the closure feed.

In some cases a container may not be fed to a particular head of the machine. In that case it would be undesirable for the vacuum to go on the container, so a pin 136 passes through an aperture in the gasket 78a so that it is engaged by the shoulder of the container when the head rests on it. This forces the pin upwardly against a spring 137 to move the enlargement 138 from over the port 133 so that the vacuum becomes effective on the chamber 134. Any other suitable means may be utilized for cutting off the vacuum when a container is not within the head.

A closure holder 95a is mounted within the head 15a having a series of magnets 93a for holding the closure in position. The holder 95a has an upwardly projecting part 95a threaded into a shaft 90b. The shaft 90b has a recess 114a which permits it to move vertically with respect to the pin 112a and has a recess 148 at its upper end to accommodate a pin 141 and to permit a limited vertical movement with respect to the pin and the outer casting 111. As the hood drops down on the container, the cap holder 95a drops also and is supported by the closure engaging the mouth of the container. In view of the fact that the closure is of the screw type, this does not interfere with the withdrawal of the air from the head space of the container; in
fact, it tends to prevent small particles of coffee or a similar product from being drawn out of the container.

A suitable chuck 96c, which may comprise a rubber or leather member secured to a ring member 96d, having an interlaced flange, is held in position on the lower end of a member 22c by means of a threaded ring 96d. A suitable annular friction member 142, which may be made of leather or a similar material, is interposed between the upper end of the member 96c and the flange 22d, on the lower end of the member 22c, to provide a friction drive for rotating the chuck for applying the closure.

A suitable gasket member 144 may be interposed between the member 22c and the sleeve 145 to seal the parts. Additional sealing may be obtained by utilizing a heavy grease or lubrication. A further sleeve 146 provides a bearing between the part 22c and the sealing head supporting member 161c. The member 26c has a gear 22f formed on its upper end meshing with the gear 54 so that the chuck and its supporting member 22c are rotated by the gear 54 as the head is moved in its circular path about the sealing machine.

A suitable snap ring 147 is provided at the upper end of the member 22c to hold the parts in position on the inner member 145 and to permit rotation with respect thereto. The inner member 145 extends on up with suitable slots for vertical movement with respect to the pins 112a and 141 and is integral with the upper end of the member 166c and held in its upper position by means of a spring 148. A cam roller 69 is secured in the upper end thereof for engagement with the cam 68 (Fig. 3).

Engagement of the cam roller 65 with the cam 63 forces the member 145 down and with it the member 22c geared to the gear 54 and holding at its lower end the chuck 96c. Since the inner rod 96b, having the cap holder 95a at the lower end thereof, rests upon the closure on the upper end of the container, the chuck 96c will force the cap over the end of the closure. Since the chuck is being rotated by the gear 54, meshing with the gear 22b thereon, the cap is screwed on. While certain types of chuck will slip on the closure when it is sufficiently sealed, the friction head in intermediate 142 intermediate members 96c and 22d permits slipping at the point of connection between the chuck members and the member 22c to prevent excessive tightening of the closure. This friction drive also permits the use of a chuck which will not slip on the closure and provides uniform tightening of the closures on the container.

In the operation of the sealing head, the cam 24 permits the sealing head 16a operatively connected to the pin 112a, having the cam roller 55 thereon, to drop over the upper end of the container 6, as shown in Fig. 7. The weight of the sealing head is sufficient for this purpose but preferably a spring 116a is utilized to aid gravity in this respect. When the sealing gasket 71a engages the shoulder of the container, the pin 156 of the cam is moved upwardly to uncover the end of the vacuum conduit 75. The airtight space of the vacuum conduit 75 subjecting the head space of the container and the inside of the hood to vacuum and withdrawing the air therefrom. The lowering of the sealing head also lowers the cap holder 155 and its supporting rod 98b so that the closure during this time is resting on the mouth of the container.

After the container has been subjected to a vacuum for a predetermined period, the cam 68 (Fig. 3) engages the cam roller 65 which in opposition to spring 148 moves downwardly the sleeve 145 which carries, through the snap ring 147, the rotatable sleeve 22c geared by means of the gear 22b thereon to the gear 54. The lower end of the rotating member 22c carries the chuck 96a which moves down on the closure and screws it on. The tightness of the closure will depend on the friction member 142 and the tightness with which it is held in position by the screw ring 96d. After the closure is screwed on, the head, the sealing chuck and the closure holder are raised upwardly until the head is flush with the closure holder to permit the conveyor to move the sealed container from the sealing head end to permit the closure holder to pick up a closure from the closure feed.

**Vacuum Control**

In order to withdraw the air from the head space of the container, it is necessary to connect the vacuum conduit 70 (Fig. 3) extending upwardly through the center of the machine to the vacuum conduit 75 leading to the hoods 15 of the sealing heads. The preferred embodiment of the construction illustrated for accomplishing this is shown more particularly in Figs. 3 and 8 to 10.

Referring more particularly to the section in Fig. 3 and the enlargement of the central portion thereof in Fig. 8, the vacuum conduit 70 is operatively connected to an annular member 12 bolted to a flange 44a on the cylindrical member 44 which is held against rotation by the cross member 45. The member 72 has an arcuate port 145 extending substantially 145 degrees about the circumference as illustrated in Fig. 8. Just above the member 72 and the port, a member 143, secured to the turret 56 and separated from the member 44 by a bushing 155, carries an annular member 74 to which the conduits 75 leading to the sealing heads are connected at one end as illustrated more particularly in Fig. 3. A suitable connection 152 (Fig. 9) may be utilized for lubricating the surface between the members 72 and 74. The surfaces are held resiliently together by means of springs 154 on bolts 155.

As each sealing head passes the portion of the machine in front of the arcuate port 145, the conduit 75 connecting the sealing head to the member 74 will be exposed to the port so that the sealing head or hood 15 will be subjected to a vacuum. With many products, such as ground coffee which is relatively light in weight and contains a mass of air within the product, a sudden vacuum will draw some of the product out with the air. This is objectionable. The present invention provides means whereby the product is subjected to the vacuum slowly and to an increasing extent to prevent substantial disturbance of the product.

The mechanism for this purpose is illustrated in Figs. 3, 8, 9 and 10 and preferably comprises an arcuate bar 158 extending centrally of the arcuate port 145 having its upper surface in registry with the outlets 75b (Fig. 3) to the conduit 75. This bar, when flush with the bottom surface of the member 74, closes off the outlets 75b. The rate of withdrawing the air can be regulated by spacing the bar 158 from the lower surface of the member 74. This is accomplished by forming slots 157 (Fig. 10) in the bar 158 and mounting the bar on eccentrically mounted pins or shafts.
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160 fitting in said slots. By rotation of the pins the bar may be raised or lowered to any desired extent. In actual operation the bar is raised until it is nearer the lower surface of the member 74 at the forward end of the vacuum port; that is, to the left of it, and the spacing is increased by means of the other three pins 160 until the port is fully open at the opposite end on the right of Fig. 8. In this way a very accurate regulation can be obtained and the adjustment may be quickly made. Suitable cross pins 160 are swaged into the apertures in the bar 155 to hold it centrally with respect to the port 148, as shown more particularly in Figs. 8 and 10.

In this manner, the respective sealing heads may be subjected slowly to vacuum and the rate of withdrawal of the air regulated to get maximum results without drawing out or disturbing the product being sealed.

Modified vacuum control

A modified construction for regulating the withdrawal of air from containers is illustrated in Figs. 11 to 13. The vacuum conduit 76a extending upwardly through the central part of the machine passes through an aperture in the cylindrical column member 15 and connects with a member 72a which in turn connects with a port 161 operatively connected to the conduit 75 leading to the sealing heads 15 at the aperture 75c. The arcuate port 148a corresponds to the port 148 in the embodiment previously described with reference to Figs. 8 to 10.

The part 72a is stationary as it is fixed to the cylindrical member 12 and likewise the part 162 fitting about the member 12 is stationary. The annular member 164, having the opening 78c for connections to the vacuum conduit 75, rotates with the turret. The rotation of this part is achieved by bracket 165 connected to the star wheel 11 by means of rods 166. In order to avoid air leakage, a suitable packing 161 may be held in place by the members at the top and bottom. The member 164 is held in position by an annular ring 169 threaded onto the member 162.

In order to obtain slow withdrawal of air at the commencement and an increase as the evacuation continues, there is provided a grooved member 170, shown in detail in Fig. 13, fixed in close proximity to the outlet 75c. As the outlets pass over this member they are first subjected to a single groove as shown at 170a and further on to a second groove 170b and any number of additional grooves, here illustrated as four, to give the gradual withdrawal desired. Toward the end of the port all of the grooves register with the opening 75c which gives a wide open port. While the embodiment illustrated in Figs. 8 to 10 is preferred, the present embodiment has certain advantages as an alternative form.

While the machine and the valves have been described herein with reference to removing the air by exhausting it, it will be understood that vapor may be utilized to fill the head space with vapor and seal the closure while the head space is thus filled, so that when the vapor condenses a vacuum will be formed. This is illustrated in detail in my prior application, and the means and mechanism could be utilized herein for the application of screw closures. In that case the vapor could be injected into the heads through the conduits 70 and 75 through which the air is now withdrawn in the present machine. In the use of vapor the gasket for forming a seal with the shoulder on the container could be omitted as a seal at this point would not be necessary or, alternatively, the hood could be spaced from the shoulder of the container by the adjustment of the machine.

Cap feed

As described hereinbefore, any suitable means may be utilized for feeding closures to the star wheel 19 out of which the closures are picked up by the closure holders in the hoods 15. As illustrated herein, a suitable hopper 16 (Fig. 1), which may be purchased in the open market, is provided having a guideway 17 leading from it with the end of the guideway terminating adjacent the star wheel 19 as shown in Figs. 2 and 15. The closures are released from the guideway by means of a pin 171 operatively attached to a bell crank 172 having its other arm attached to a rod 174. The rod 174 (Fig. 2) is connected to an arm 175 on a shaft 178 which has a lower arm attached to a rod 171 connected at its opposite end to an arm 178 on shaft 178 having an arm 170 in the path of the containers passing through the star wheel 10. As a container engages the arm 180, the arm is moved outwardly, moving the arm 178 to the left together with the rods 171 and 174, which in turn pulls the bell crank 172 down moving the pin 171 down to release a closure. The released closure moves forward until it is stopped by the curved end portion 173 of the cap chute and so held until removed by the star wheel 19, the pin 171 returning to upward position beneath substantially the center portion of a succeeding cap. Thus a closure is released each time a container passes the arm 180 and only a single cap is released at a time. If a container fails to pass the arm, a closure is not released and will not be fed to the head which would normally register with the particular container.

As shown more particularly in Fig. 3, the hood 15 is raised upwardly flush with or slightly above the caps 160 at the cap chute 170 over the star wheel 19 and over a closure therein, the magnets 93 in the cap holder draw the cap upwardly and carry it along with the sealing head so that it registers with the container fed in through the star wheels.

Combined filling and sealing

It is desirable in many instances to combine a filling machine with a sealing machine and to operate the two as a unit. The construction illustrated in Fig. 14 is primarily adapted for this purpose. The filling machine is illustrated diagrammatically at 181 driven from the sealing machine through the intermediation of gears 182 and 184 and shaft 185 operatively connected to suitable gears 186 on the machine drive. In this way the filling machine may be driven as a unit with the sealing machine. Where a filler is combined in this manner, the conveyor in the present machine is not sufficiently long to reach the filling machine and leave sufficient space between the two. It is therefore desirable to have an extension of the conveyor which is illustrated in Fig. 14 at 188. The extended conveyor may be substantially similar to the conveyor of the present machine but is preferably driven direct from the sealing machine through the intermediation of shaft 189 operatively connected at its opposite end to the drive for the sealing machine. A suitable guide 190 may be utilized to guide the containers from one conveyor to the other.
in 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 my invention, I claim:

1. In a device of the class described, the combination of a hood for enclosing at least a portion of a container to form a chamber about the container to permit air to be withdrawn therefrom, an annular port in said hood extending about the upper end of a container through which the air may be withdrawn to vacuumize the container, an annular chamber within the hood communicating with said port, a screen extending about said chamber and covering said annular port to screen the air withdrawn from the chamber to prevent particles from clogging the air-withdrawing mechanism, and means within the hood for applying a closure to a container.

2. In a machine of the class described, the combination of a turret, a plurality of sealing heads mounted on said turret, each head comprising a hood for forming a sealing chamber about at least a part of a container and a chuck within the head for applying a closure to the container, a vacuum conduit connected to said sealing chamber for drawing the air therefrom, an elongated arcuate vacuum port, control means for said conduit comprising an opening adapted to pass over said elongated arcuate vacuum port, and an arcuate elongated member located within said port and adjustable relative thereto for varying the effective area of said port.

3. In a machine of the class described, the combination of a turret, a plurality of sealing heads mounted on said turret, each head comprising a hood for forming a chamber about at least a part of a container and a chuck within the head for applying a closure to the container, a vacuum conduit connected to said sealing chamber for drawing the air therefrom, an elongated arcuate vacuum port, control means for said conduit comprising an opening adapted to pass over said elongated arcuate vacuum port, and means comprising an arcuate bar spaced from said opening and means for adjusting the position of said bar with respect to said opening.

4. In a machine of the class described, the combination of a turret, a plurality of sealing heads mounted on said turret, each head comprising a hood for forming a chamber about at least a part of a container and a chuck within the head for applying a closure to the container, a vacuum conduit connected to said sealing chamber for drawing the air therefrom, an elongated vacuum port, control means for said conduit comprising an opening adapted to pass over said vacuum port, and means for varying the effective area of said vacuum opening while said opening is passing over said port, said means comprising an arcuate bar spaced from said opening and means for adjusting the position of said bar.

5. In a machine of the class described, the combination of a turret, a plurality of sealing heads mounted on said turret, each head comprising a hood for forming a chamber about at least a part of a container and a chuck within the head for applying a closure to the container, a vacuum conduit connected to said sealing chamber for drawing the air therefrom, an elongated vacuum port, control means for said conduit comprising an opening adapted to pass over said vacuum port, and means for varying the effective area of said opening while said opening is passing over said port, said means comprising a bar in said port over which said opening passes, and means for raising and lowering said bar to fix one end closer to said opening than the other end as it passes over the bar.

6. In a machine of the class described, the combination of a turret, a plurality of sealing heads mounted on said turret, each head comprising a hood for forming a chamber about at least a part of a container and a chuck within the head for applying a closure to the container, a vacuum conduit connected to said sealing
chamber for drawing the air therefrom, an elongated vacuum port, control means for said conduit comprising an opening adapted to pass over a vacuum port, means for varying the effective area of said opening while it is passing over said port, said means comprising a bar in said port over which said opening passes, and a plurality of eccentric supports for raising and lowering said bar to move one end closer to said opening thereby as it passes over the bar.

6. In a sealing machine, the combination of: a turret, a plurality of sealing heads mounted on said turret, vacuum conduits operatively connected one to each of said sealing heads, a slide member mounted on said turret connected to said vacuum conduits and exposing openings at the ends of the conduits, a stationary member engaging said slide member having a port therein operatively connected to a vacuum and adapted to register with the ends of said conduits on said slide member during a portion of their travel with the turret, and a bar adjustably mounted within said port for restricting the openings in said slideable member as they become exposed to the vacuum port.

7. In a sealing machine, the combination of: a turret, a plurality of sealing heads mounted on said turret, vacuum conduits operatively connected to said sealing heads, a slide member mounted on said turret connected to said vacuum conduits and exposing openings at the ends of the conduits, a stationary member adjacent said slide member having a port therein operatively connected to a vacuum and adapted to register with the end openings of said conduits on said slide member during a portion of their travel with the turret, and means within said port for restricting the openings in said slideable member as they become exposed to the vacuum port, said means comprising an arcuate bar adjustably mounted in the port so that one end may be held closer to the end openings of the conduits than the other end thereof.

8. In a machine of the class described, the combination of: a turret, a plurality of sealing heads mounted on said turret comprising means for forming a chamber about at least a portion of a container from which air may be withdrawn, means for subjecting said chamber to a vacuum including an elongated continuous port over which a vacuum connection moves, a member located within said elongated port and adjustable with respect to said elongated port for progressively and gradually increasing the opening of said port to subject said chamber to a vacuum slowly at first and then to increase the rate of withdrawal of air.

9. In a device for sealing closures to containers, the combination of: a hood having a portion thereof encompassing the upper end of a container to form a vacuum chamber about said upper end of the container, a holder for supporting a screw closure out of contact but in registry with the container, means for relatively moving the holder and container to place the closure on the container, a chuck within said hood mounted to move downwardly over said holder for screwing the closure on the container, and means for rotating said chuck.

10. In a device for sealing closures to containers having shoulders, the combination of: a hood having a portion thereof encompassing the upper end of and engaging the shoulder on a container to form a hermetic seal therewith and to provide a chamber about the upper end of the container whereby the air may be withdrawn from said chamber and from the head space of the container, means for supporting a closure out of contact in registry with the mouth of the container, means for relatively moving the supporting means and container to place the closure on the container, and a chuck within the hood mounted to move downwardly over said closure supporting means for screwing the closure on the container.

11. In a device for sealing closures on containers having shoulders, the combination of: a hood having a portion thereof encompassing the upper end of and engaging the shoulder on a container to form a hermetic seal therewith and to provide a chamber about the upper end of the container whereby the air may be withdrawn from said chamber and from the head space of the container, means for supporting a closure out of contact but in registry with the mouth of the container, means for relatively moving the supporting means and container to place the closure on the container, and a chuck within the hood mounted to move downwardly over said closure supporting means for screwing the closure on the container, and a shaft extending through the upper part of the hood for supporting and rotating the chuck.

12. In a device of the class described, the combination of: a chuck for applying screw closures to containers, a hood extending about said chuck having a portion encompassing a container and forming a vacuum sealing chamber about the upper end thereof, a shaft extending through the upper part of said hood for supporting and rotating said chuck, a closure holder including a magnet for engaging and supporting a closure independently of the container, said holder being resiliently mounted on said shaft whereby said chuck and closure holder may move relative to each other in the application of a closure to a container, and a chuck within the hood mounted to move downwardly over said closure holder for screwing the closure on the container.

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