March 10, 1953 J. HOHL ET AL 2,630,957

METHOD AND APPARATUS FOR SEALING CONTAINERS

Filed March 29, 1950 5 Sheets-Sheet 1

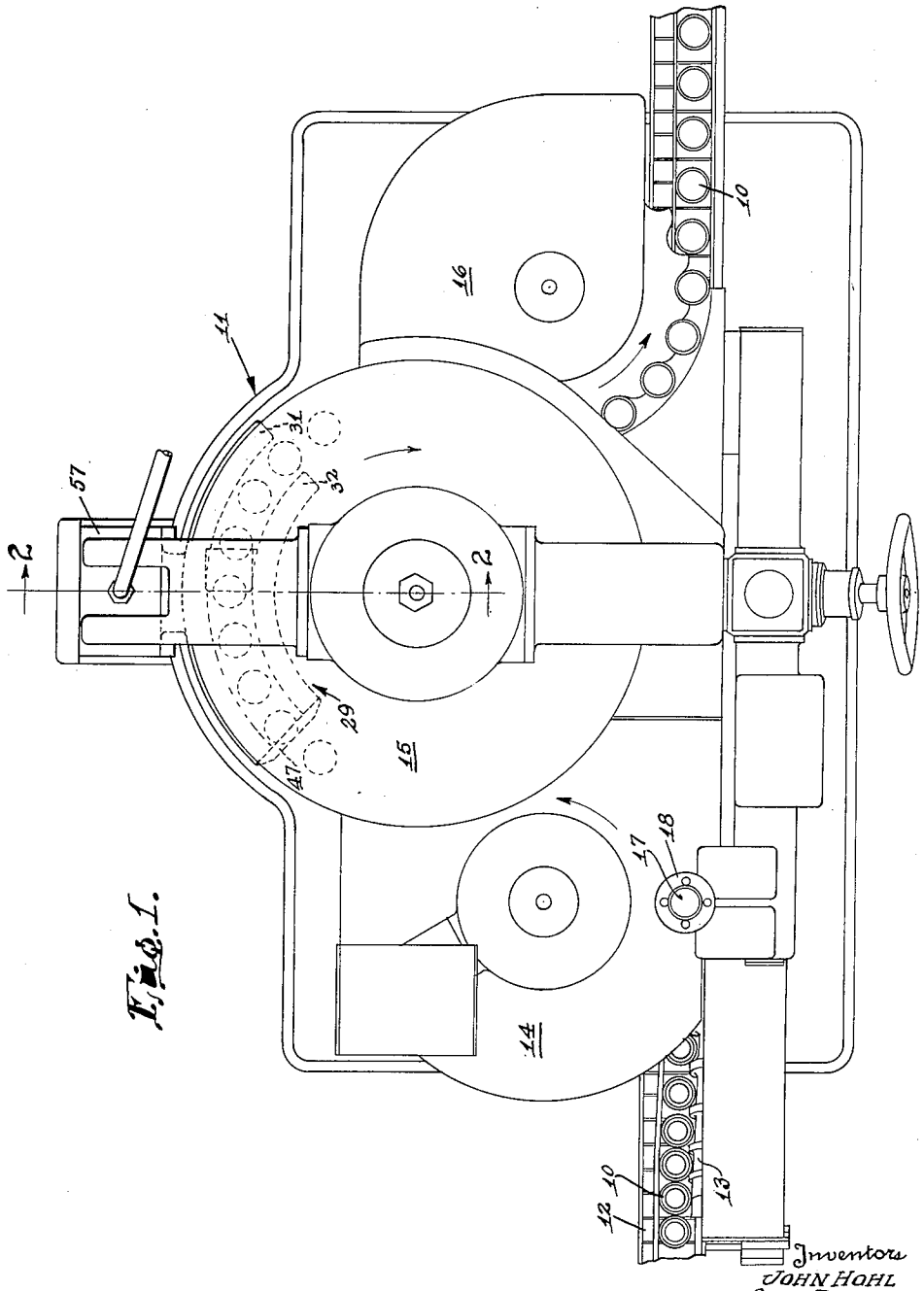

Fig. 1.

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METHOD AND APPARATUS FOR SEALING CONTAINERS

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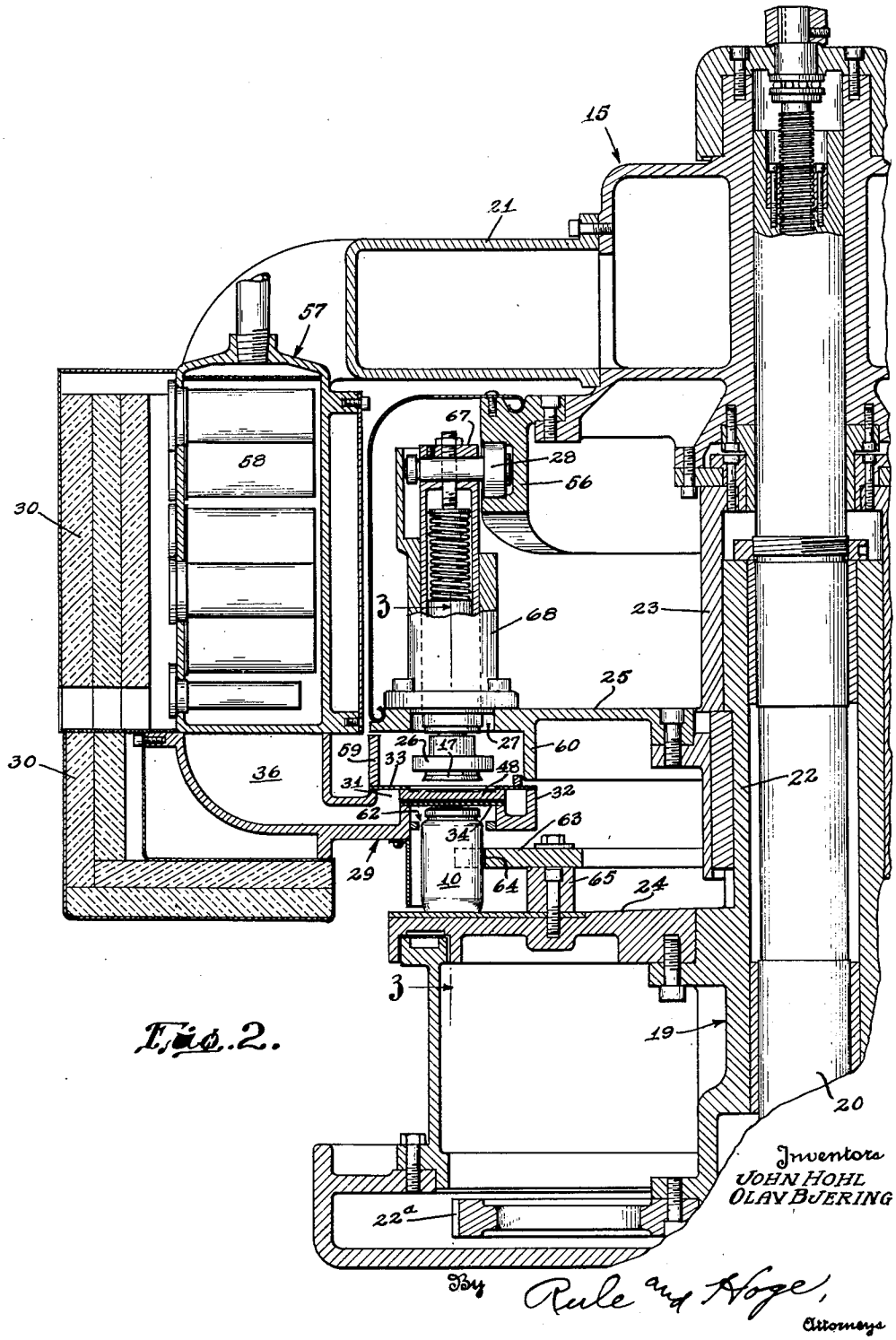

Fig. 2.

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METHOD AND APPARATUS FOR SEALING CONTAINERS

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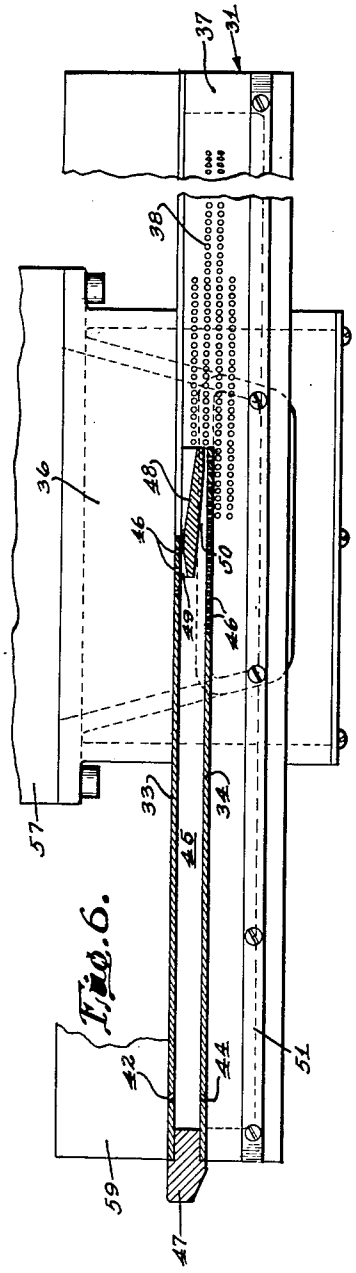

Fig. 6.

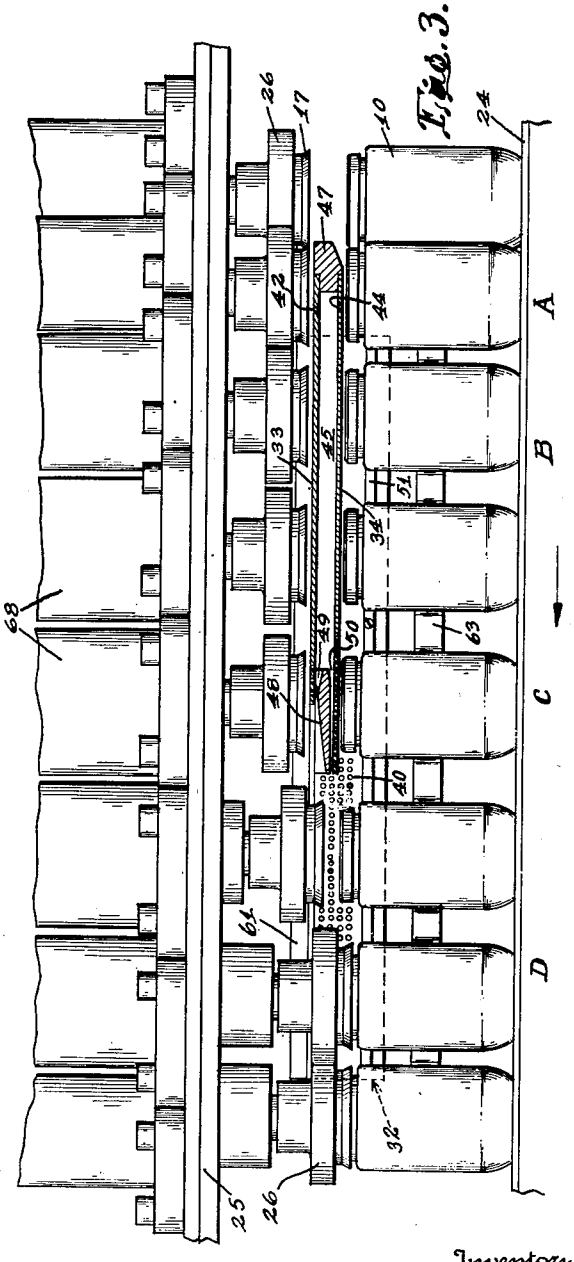

Fig. 3.

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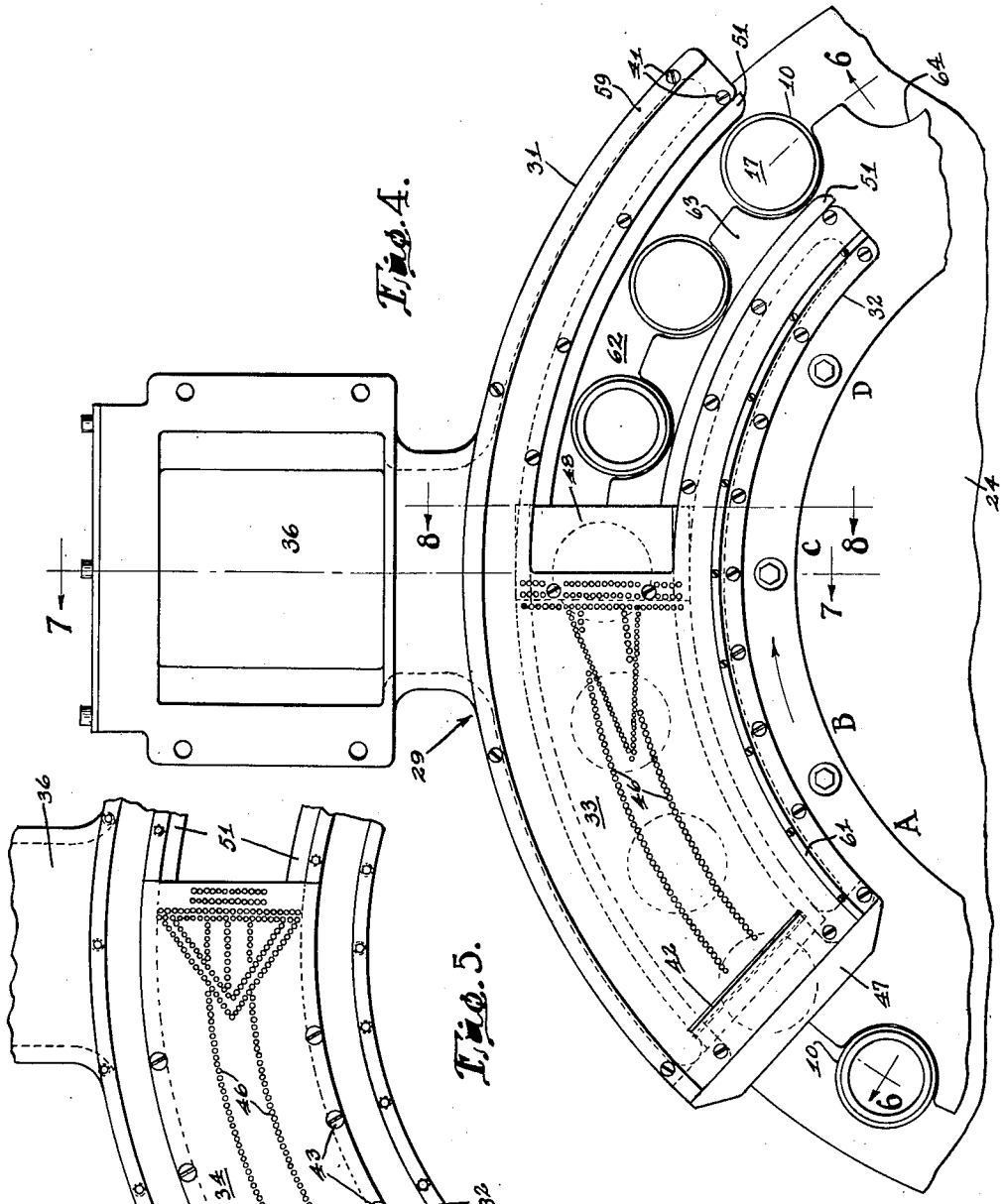
METHOD AND APPARATUS FOR SEALING CONTAINERS

Filed March 29, 1950 5 Sheets-Sheet 4



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METHOD AND APPARATUS FOR SEALING CONTAINERS

Filed March 29, 1950 5 Sheets-Sheet 5

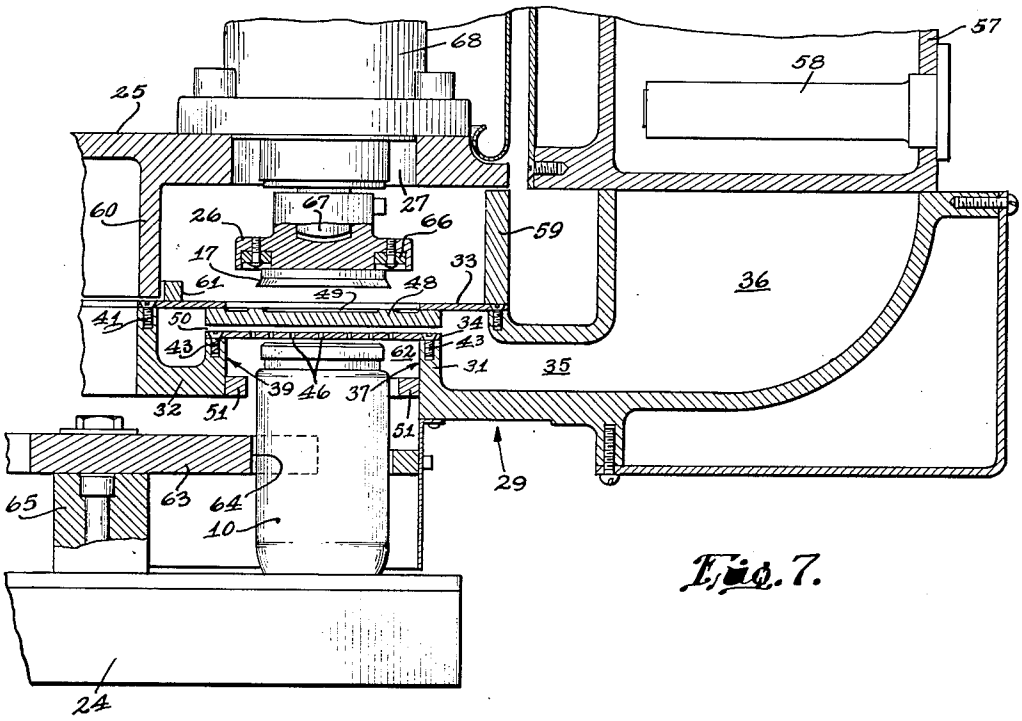

Fig. 7.

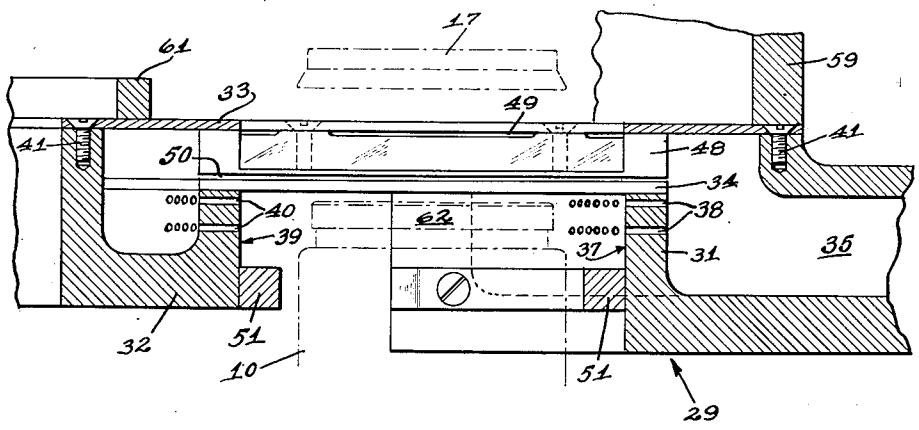

Fig. 8.

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Patented Mar. 10, 1953

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UNITED STATES PATENT OFFICE

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METHOD AND APPARATUS FOR SEALING CONTAINERS

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Application March 29, 1950, Serial No. 152,541

13 Claims. (Cl. 226—82)

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This invention relates to the packaging of commodities in containers and particularly to an apparatus and method for producing an inert atmosphere in the sealed containers.

A common principle employed in the sealing of commodities in containers is to displace the air in the container with an inert gas or to displace the air with a vapor such as steam, which, after sealing and during cooling of the container, condenses and creates a partial vacuum. Our invention relates to a new and improved method and apparatus for employing this principle in the displacement of air from both the cap and container.

An object of the invention is to provide a method and means for distributing inert gas or vapor wherein the greater portion of the air is quickly removed from the closure cap and container.

Another object of the invention is to provide a method and means for preventing the infiltration of air into the distributing area.

Another object of the invention is to provide a method and means for concentrating the flow of inert gas or vapor at the point where the closure cap and container are brought together.

Another object of the invention is to provide a method and means such that the final sealing of cap and container takes place in a flowing atmosphere of gas or vapor.

A further object of our invention is to provide a method or apparatus in which steam, such as superheated or dry steam, is used to drive the air out of both the container and the cap, and in which the steam serves to heat both the cap and the cap holding chuck in a manner to prevent any substantial condensation of the steam within the cap or container prior to the sealing of the cap on the container and thereby provide a high vacuum within the sealed container by which the usual discoloration of the contents of the container is prevented and in which the head space within the sealed container is substantially devoid of free oxygen or air.

Other objects of the invention will appear hereinafter.

Basically, our invention comprises a method and apparatus for sealing containers by continuously moving caps and containers in register above and below a gas or steam distributor and subjecting each to a series of sheets or streams of inert gas or vapor and finally sealing the caps to the containers while subjecting them to an atmosphere of gas or vapor.

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This application discloses and claims subject matter also disclosed in our co-pending applications, Serial No. 152,542, filed March 29, 1950, and Serial No. 193,653 filed November 2, 1950, titled "Method and Apparatus for Sealing Containers."

Referring to the accompanying drawings:

Fig. 1 is a diagrammatic plan view of a rotary sealing machine in which the present invention may be embodied and produced;

Fig. 2 is a part sectional elevation at the line 2—2 on Fig. 1;

Fig. 3 is a part sectional view at the line 3—3 on Fig. 2;

Fig. 4 is a plan view of the distributor;

Fig. 5 is a fragmentary plan view of the distributor with the upper plate removed;

Fig. 6 is a sectional view at the line 6—6 on Fig. 4;

Fig. 7 is a sectional view at the line 7—7 on Fig. 4;

Fig. 8 is a sectional view at the line 8—8 on Fig. 4.

Referring to Fig. 1, previously filled containers 10 are fed into a sealing machine 11 by suitable means, herein shown as a conveyor 12, and spiral spacer and timer 13. The sealing machine comprises three sections 14, 15, and 16. As the containers pass through the first section 14, caps or closures 17 are brought into register with the containers by suitable means shown schematically as 18, and travel above and in register with the containers.

The containers are then transferred to the center or second section 15. In this section, the caps and containers are subjected to the inert gas or vapor and sealed as hereinafter described. The sealed containers are then removed by the third section 16. As herein described, the apparatus uses superheated steam but it should be understood that inert gases might be used if desired. This would necessitate obvious changes such as the removal of the superheater.

As shown in Fig. 2, the center section 15 comprises a carriage 19, arranged for rotation about a stationary vertical shaft 20. A non-rotating frame member 21 is positioned over the carriage and arranged for up and down adjustment on the shaft 20.

The carriage 19 comprises an inner sleeve 22 and an outer sleeve 23 splined to the sleeve 22 and adjustable up and down on said sleeve 22. The carriage also includes a circular table or platform 24 bolted to the sleeve 22. The con-

tainers 10 are supported on this platform 24 as they are carried through the gas or steam distributor by the carriage. The containers are spaced on the platform by means of a spacing ring 63 (Figs. 2 and 7) formed with pockets or recesses 64, in which the containers are held, the ring 63 being bolted to the platform 24 and spaced thereabove by spacing blocks 65.

A chuck supporting table 25 is bolted to the outer sleeve 23, and supports an annular series of magnetic chucks 26. Each chuck 26 carries a series of small magnets 66 (Fig. 7) by which it is magnetized for holding the caps. The chuck is keyed to a spindle 67 movable up and down in a casing 68, mounted above an opening 27 in the platform 25. The spindle 67 carries a roll 28 running on a cam track formed in the cam 56 which is bolted to the housing 21. The carriage is rotated by a gear 22a bolted to the sleeve 22. The gear is rotated by suitable means (not shown).

A superheater 57 is bolted to the member 21 and comprises electrical heating elements 58. A distributor 29 for the steam is fastened to the superheater 57. Suitable insulating materials 30 are provided around the superheater 57 and the distributor 29.

The distributor 29 is arc shaped as shown, for example, in Figs. 1 and 4. Structurally, it comprises outer and inner wall forming members or channels 31 and 32, U-shaped in cross section, thereby forming channels which extend substantially the full length of the distributor and in which an atmosphere of steam is maintained and circulated as hereinafter described. The channels 31 and 32 are spaced apart to provide a tunnel or passageway 62 (Figs. 4 and 7), into which the upper ends of the jars 10 project as they travel through the distributor. An upper plate 33 overlies and forms a cover for the channels 31 and 32 and is attached to the channel walls by screws 41 (Fig. 8). The plate 33 extends the full width of the distributor throughout the left-hand portion thereof (Fig. 4) and thereby bridges the space between the channels. From the middle to the right-hand end of the distributor, the upper plate 33 is extended in the form of comparatively narrow strips covering the channels and leaving the tunnel 62 open, thus permitting the caps 17 to be lowered to sealing position (Fig. 3) as presently described.

A lower plate 34 (see Figs. 3 and 6) is positioned beneath and parallel with the upper plate 33, the plates being spaced to provide a chest or compartment 45 through which the steam is circulated. The lower plate 34 bridges the space between the channels 31 and 32, and, as shown in Figs. 7 and 8, is seated on the inner walls of the channels, being secured by screws 43. The inner channel walls are lower than the outer walls for a portion of their length in order to space the plates 33 and 34. With this construction, the chest 45 is wide open to the adjoining channels throughout its length.

An end piece 47, Fig. 6, is positioned to seal one end of the passageway 45. A mouthpiece 48 is positioned at the other end of the passageway 45 and is shaped so that slits or openings 49 and 50 are formed each having forwardly converging upper and lower walls.

As shown in Figs. 4 and 6, the upper plate 33 is provided with a slot 42 extending across the plate near the end which the containers first approach. The slot 42 extends diagonally upward and rearward through the plate. A slot 44 is provided in the lower plate below the slot 42 in the upper plate and extends across the plate and diagonally downward and rearward through the plate.

The upper plate 33 and lower plate 34 are also each provided with a multiplicity of narrowly spaced perforations 46. These perforations are arranged as shown in Figs. 4 and 5 so that the greatest number is at or near the end of the said plates under which the containers last pass.

The inner channel walls, 37 and 39, are provided with perforations, 38 and 40 respectively, in the portions which are not lower than the outer walls (Fig. 6). As shown in Fig. 7, the outer channel 31 is provided at the center of its outer wall with an opening 35 to a steam inlet 36 which in turn is open to the superheater 57.

Guide rails 51, Figs. 4 and 7, extend along the sides of the channels 31 and 32. As shown in Fig. 7, a wall 59 is provided between the plate 33 and the chuck supporting table 25. This wall 59 extends along the outer edge of the plate 33. A projection 60 of the chuck supporting table 25 provides a similar wall along the inner edge of the plate 33. A sealing rail 61 is provided along the inner edge of the upper plate 33, as shown in Figs. 4 and 7.

Referring to Fig. 3, as a container 10 approaches the steam distributor 29, a cap 17 is maintained in register with it by means of the magnetic chuck 26. As the container and cap continue their travel, they pass successively into and through what may be termed zones A, B, C and D, of the steam distributor. Steam is supplied to the inlet 36, Fig. 2, of the distributor from the superheater 57 and flows freely through the opening 35 to the channel 31, the steam chest 45 and channel 32, and thereby to every part of the distributor and out of each of the openings and slots, as hereinafter described.

As the cap and container approach zone A (Fig. 3) they are subjected to the action of the streams or sheets of vapor emanating outwardly and rearwardly from the slots 42 and 44. These streams scavenge or sweep the air out of the cap and the opening of the container and also serve as a wall or curtain to prevent the infiltration of air into the zones of the distributor.

The cap and container next move into zone B where they are subjected to an atmosphere of vapor provided by steam flowing vertically through the perforations 46 (Figs. 4 and 5) in the plates.

As the cap and container continue their travel, they enter zone C where the concentration of vapor is greater due to the greater number of proximate perforations. Also in zone C, the cap and container move through the streams or sheets of vapor emanating in a forward direction from the slits 49 and 50. The combination of the greater concentration of vapor and the stream movement of vapor provides a final scavenging or sweeping action whereby any remaining air is removed from the cap and opening of the container.

The cap and container then move into zone D where an atmosphere of vapor is provided by fine streams of vapor from the openings 38 and 40 in the channel walls of the steam distributor. In this zone, the cap is moved down and sealed on the container by the chuck 26 which is actuated by the cam 56 (Fig. 2). The sealed container is

then removed from the machine by the section 16 (Fig. 1).

As shown in Fig. 7, the guide rails 51, in addition to aiding in the spacing of the containers serve as a means of retarding the infiltration of air into the space below the steam distributor. The walls 59 and 60 and the sealing rail 61 serve the same purpose above the distributor.

The particular arrangement of the perforations 46 shown in Figs. 4 and 5 has been found preferable but it should be understood that the arrangement may be modified without deviating from the spirit of our invention.

The invention is herein described as applied to a rotary type sealing machine but it should be understood that this does not limit the application of our method or apparatus to the rotary type since it may be satisfactorily applied to other types.

The invention as herein illustrated and described is adapted for use with superheated steam which we have found is desirable for use in packaging and sealing certain products and may also be used with steam at lower temperatures or steam vapor which is preferable for use with certain other products. Still other inert gases may be used, heated if desired. The term "inert gas" as herein used, includes superheated steam, steam vapor and any other gases such, for example, as nitrogen and carbon dioxide, which do not include free oxygen or oxidizing agents and which are suitable for the specified purposes of our invention, and also includes combinations of such gases.

Modifications may be resorted to within the spirit and scope of our invention as defined in the appended claims.

We claim:

1. The method of sealing containers which consists in continuously moving caps and containers in register above and below inert gas distributing means respectively and successively subjecting each cap and container as it is moved along in register to a series of sheets and streams of vapor emanating from the distributing means and including successively a diagonal sheet of inert gas directed outwardly and rearwardly, a series of fine vertical streams of gas, a concentrated group of vertical streams of gas or vapor, and a horizontal sheet of gas directed in the direction of travel, and sealing said caps to said containers while subjecting same to a series of fine transverse streams of gas.

2. In a rotary sealing machine, a steam distributor comprising an outer arc-shaped channel, an inner arc-shaped channel spaced inwardly from said outer channel, said channels having openings adjacent to said space for a portion of their length, plates interposed between said channels above and below said openings thereby forming an enclosed space between said channels, one end of said enclosed space sealed by suitable means, slots extending through said plates near the sealed end and extending across the width of said plates and upwardly and outwardly away from said closed space and toward the sealed end, a mouthpiece placed in the other end of the distributor and having a thickness less than that of the said enclosed space such that two converging openings or slits are provided at the end of said distributor, said plates being provided with perforations in the space between said slits and said mouthpiece, the greatest concentration of said perforations being at or near said mouthpiece, and means for introducing steam to said distributor so that it may flow through said openings, spaces, and slots.

3. In a container sealing apparatus, a steam distributor, means for continuously moving containers below a portion of said steam distributor, means for moving caps for said containers above a portion of said steam distributor and in register with said containers, said steam distributor comprising slots near the point of entrance such that a stream of vapor is directed upwardly and rearwardly against each said cap, and downwardly and rearwardly against the opening of each said container, vertical perforations in said steam distributor progressively along the path of said containers and caps such that fine vertical streams of vapor are directed upwardly into each said cap and downwardly into each said container, the greater number of perforations being placed near the exit to said steam distributor, means for concentrating the flow of said steam at the exit of said steam distributor, said steam distributor being provided with perforations along the sides, and means for sealing said caps to said containers while in the zone of said perforations.

4. The apparatus as defined in claim 3, said means for concentrating the flow of said steam comprising a multiplicity of vertical perforations and a mouthpiece arranged to provide two flat horizontal streams of steam directed along the path of the moving caps and containers respectively.

5. The method of sealing containers which consists in continuously moving caps and containers in register above and below steam distributing means respectively, and successively subjecting each cap and container as it is moved along in register to a series of sheets and streams of vapor emanating from the distributing means and including successively a sheet of vapor directed outwardly and rearwardly, a series of fine streams of vapor, a concentrated group of vertical streams of vapor and a horizontal sheet of vapor directed in the direction of travel, and sealing said caps to said containers while subjecting same to a series of fine transverse streams of vapor.

6. In apparatus of the character described, means for conveying open filled containers and closures spaced thereabove along a horizontal path, a steam distributor positioned between the containers and closures in a part of the path of travel of said containers and closures, said distributor including means for directing steam downwardly into the containers and upwardly into and about the closures, the last-named means in part also directing steam both upwardly and downwardly substantially at the extremities of said distributor to thereby provide curtains of steam for retarding ingress of outside air to the spaces immediately above and below the distributor, and means for attaching the closures to the containers immediately following their movement beyond said distributor and simultaneously entrapping steam within the containers.

7. In apparatus of the character described, means for conveying open filled containers and closures spaced thereabove along a horizontal path, a steam distributor positioned between the containers and closures in a part of the path of travel of said containers and closures, said distributor including means for directing steam downwardly into the containers and upwardly into and about the closures, the last named means in part also directing steam both upwardly and downwardly substantially at the extremities of said distributor to thereby provide curtains of steam for retarding ingress of outside air to the

spaces immediately above and below the distributor, means for attaching the closures to the containers immediately following their movement beyond said distributor and simultaneously entrapping steam within the containers, and means for directing steam across the path of travel of the containers and closures in the zone of attachment of the closures to the containers.

8. The method which comprises positioning a downwardly facing hollow closure cap over, in register with, and spaced above an open mouth container, advancing the container and cap while maintained in said relative position through a zone in which an atmosphere of inert gas is maintained, directing blasts of gas in upwardly and downwardly inclined directions respectively toward and into said closure cap and container as they enter said zone and thereby expelling the atmospheric air and replacing it with the inert gas, and thereafter bringing the closure cap into sealing engagement with the container while passing through the inert gas within said zone.

9. Apparatus for use in closing and sealing containers in which a commodity is packaged, said apparatus including a distributor for an inert gas, said distributor comprising horizontally disposed parallel, horizontally spaced channels, means for advancing open mouth containers horizontally along said distributor with the upper open ends of the containers positioned between said channels, a cover plate bridging the space between said channels and extending lengthwise of the distributor through a portion of the length of the distributor and positioned over the path of the containers, means for supporting closure caps for the containers over, spaced above, and in register with the containers, means for advancing the caps and containers while in said relative position, means for supplying an inert gas to the distributor and causing it to circulate through said channels, means for directing blasts of said inert gas into the containers and closure caps as they advance, said cover plate being interposed between the caps and containers, said plate being formed with perforations in communication with said channels and distributed along the plate in position to supply inert gas from said channels into the space surrounding the closure caps and open ends of the containers and thereby maintaining them in an atmosphere of said inert gas as they advance along the distributor, and means for bringing the caps into sealing contact with the containers and thereby sealing the containers while within said atmosphere of inert gas.

10. An apparatus for sealing containers comprising means for conveying open filled containers and closures spaced thereabove along an arcuate path, a steam distributor positioned between the containers and closures in a part of the arcuate path of said containers and closures, said distributor including means for directing steam downwardly into the containers and upwardly into and about the closures, and means for sealing said caps to said containers.

11. The method of sealing containers which comprises continuously conveying open filled containers and closure caps spaced thereabove and in register therewith in an arcuate path through an atmosphere of superheated steam and successively sealing said caps to said containers while passing through said atmosphere of steam, said atmosphere of steam including, successively, sheets of steam directed outwardly and rearwardly, a series of fine streams of steam, horizontal sheets of steam directed in the direction of travel, and a series of fine transverse streams of steam.

12. An apparatus for sealing containers which comprises means for conveying open filled containers in an arcuate path, means for supporting closure caps for the containers over, spaced above, and in register with the containers during the movement through said arcuate path, means positioned along the arcuate path for providing an atmosphere of vapor through which said caps and containers successively travel in moving through said arcuate path, said atmosphere of vapor including, successively, sheets of vapor, directed outwardly and rearwardly, a series of fine streams of vapor, horizontal sheets of vapor directed in the direction of travel, and a series of fine transverse streams of vapor, and means for successively sealing said caps to said containers in said atmosphere of vapor.

13. In a sealing apparatus, the combination of means for moving containers and caps in register and spaced apart, means for successively subjecting each cap and each container as it is moved along in register to a scavenging action whereby the air in said cap and container is replaced by vapor, to an atmosphere of vapor, to a more concentrated atmosphere of vapor, and a final scavenging action and to an atmosphere of vapor, and means for sealing said cap and container in the latter atmosphere of vapor, the means for initially scavenging comprising a steam distributor placed between said cap and container provided with slots such that a stream of vapor is directed outwardly and rearwardly against said cap and container.

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