Aug. 8, 1944. H. E. STOVER 2,355,480

APPARATUS FOR SEALING CONTAINERS

Original Filed Aug. 2, 1940 3 Sheets-Sheet 1

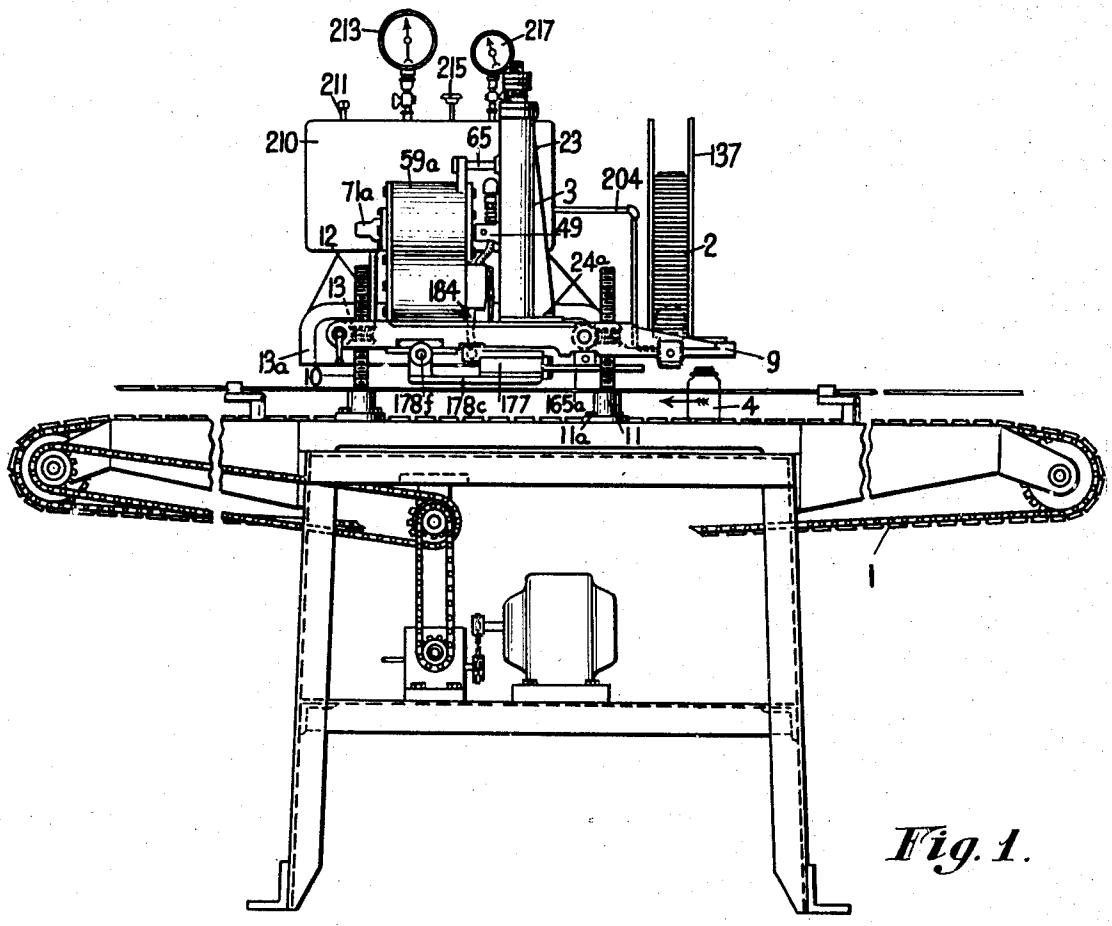


Fig. 1.

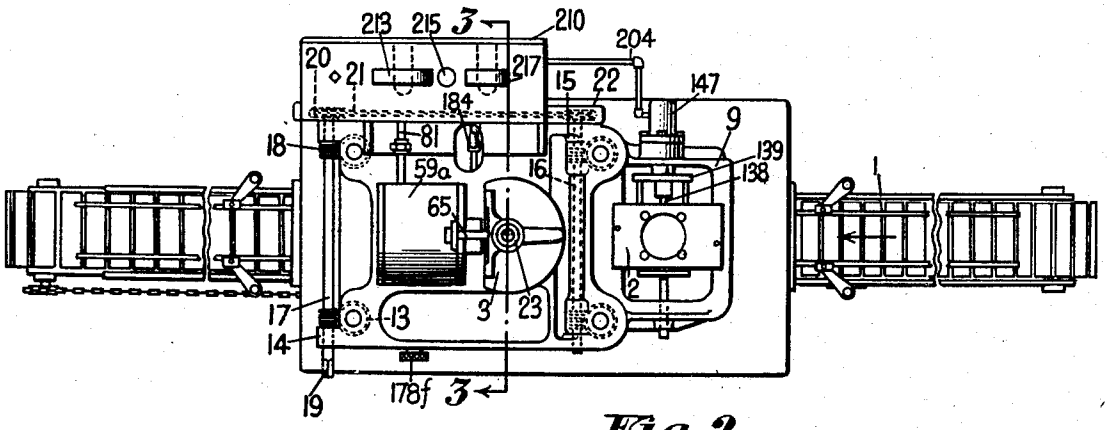


Fig. 2

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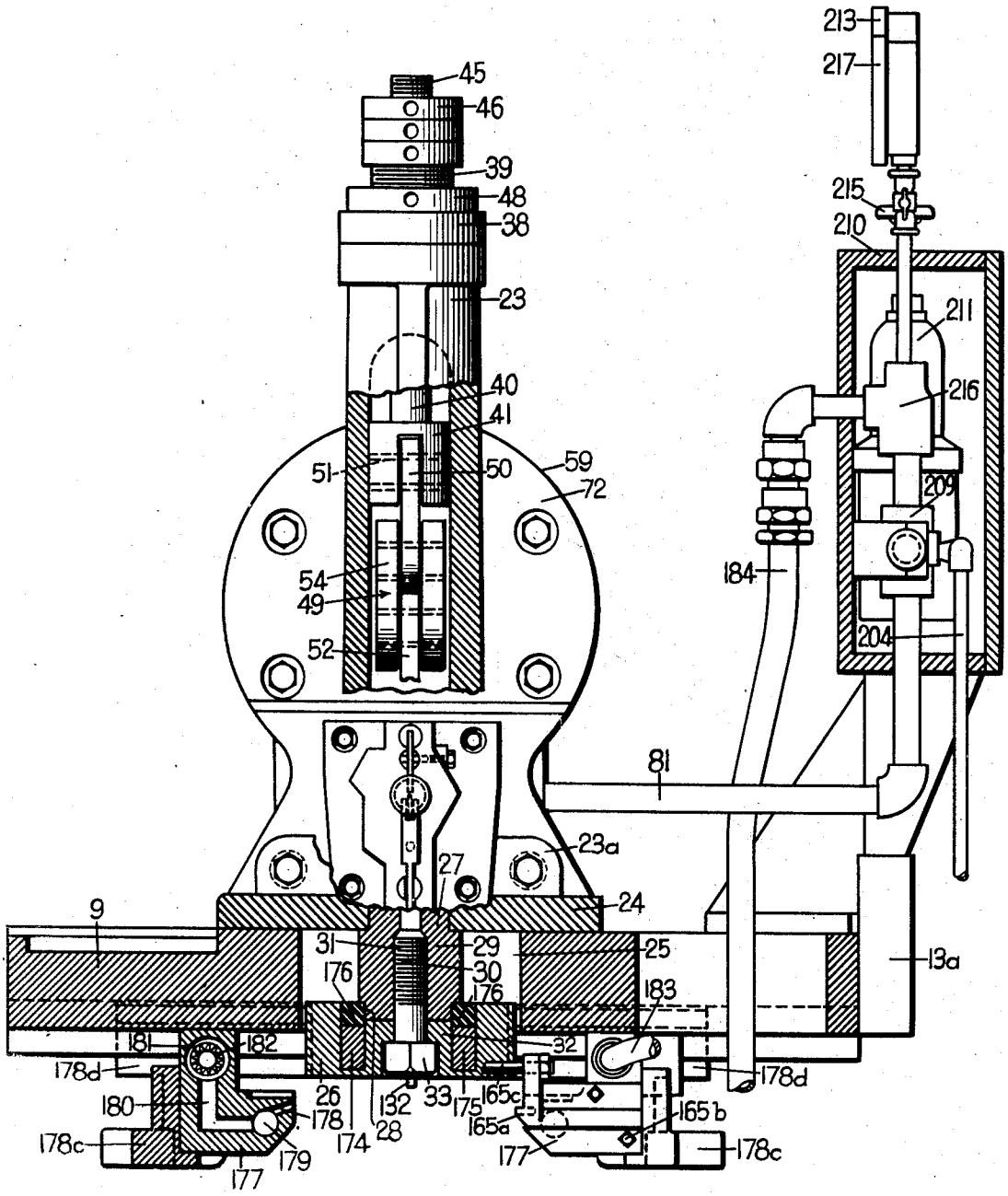


Fig. 3

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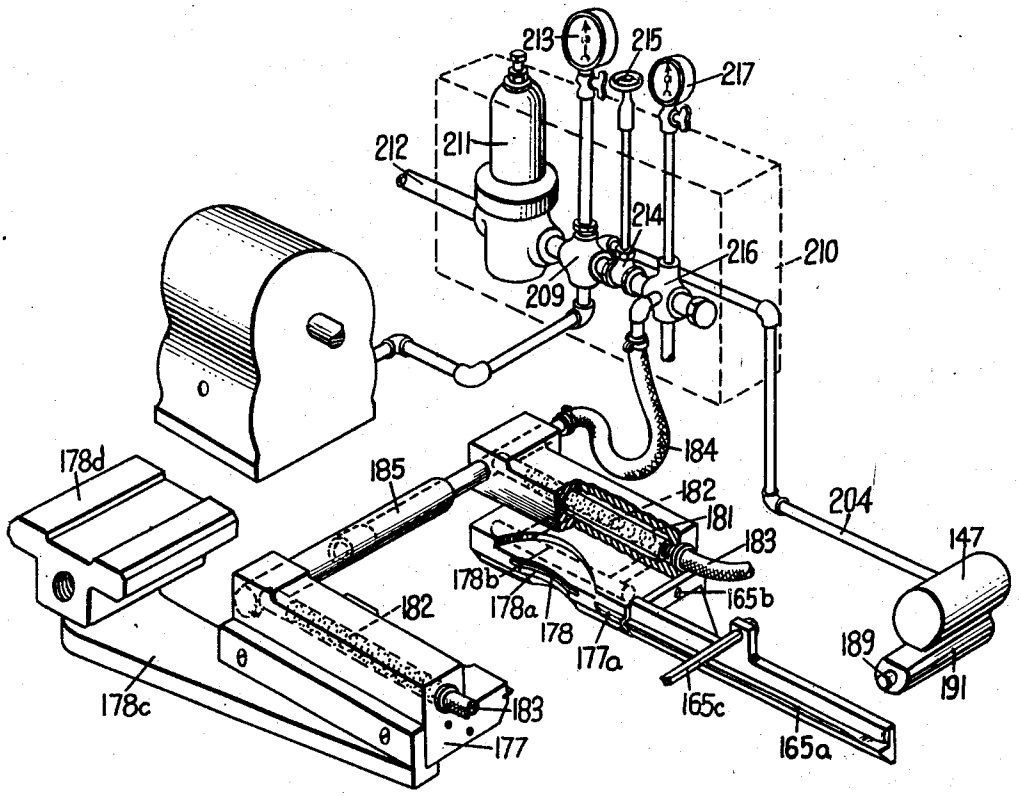


Fig. 4.

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UNITED STATES PATENT OFFICE

2,355,480

APPARATUS FOR SEALING CONTAINERS

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Original application August 2, 1940, Serial No. 349,655, now Patent No. 2,321,779, dated June 15, 1943. Divided and this application October 26, 1942, Serial No. 463,347

8 Claims. (Cl. 226—82)

My invention relates to an apparatus for sealing containers. It has to do, more particularly, with an apparatus for applying closures to containers, such as food containers and including jars, bottles, cans, et cetera, and sealing them on the containers and for producing a partial vacuum in the upper ends of the containers.

This application is a division of my co-pending application Serial No. 349,655, filed August 2, 1940, now Patent No. 2,321,779, issued June 15, 1943.

One of the objects of my invention is to provide improved and simplified means, apparatus, or a machine, capable of subjecting the upper end portions of containers or the like to the application of dry or superheated steam for sterilization and vacuumizing purposes whereby to permit the packing of products, such as dry products, in said containers or the like.

Another object of the invention is to provide an improved machine or apparatus capable of packaging, closing and sealing any products in containers wherein means is provided for creating a partial vacuum in the upper end portions of said containers.

A further object of the invention is to provide an improved apparatus or a machine of the foregoing character having means for supplying dry steam to the upper end portions of successive containers adapted for packing products in which the dry steam supplying or emitting means is adjustable relatively to the container; another object being to provide improved oppositely disposed nozzles for this purpose in which the nozzles are capable of adjustment relatively to each other and also with relation to the container.

A further object of my invention is to provide improved means, apparatus or a machine of the foregoing nature having improved means for providing dry steam to containers to be closed and sealed, in which the steam is heated prior to its discharge to the containers.

The above and other objects and advantages of the present invention will be apparent from the following description and appended claims when considered in connection with the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In its preferred form, my invention contemplates the provision of a simple apparatus for applying closures to and sealing them on various containers such as jars, bottles, cans, etc. My apparatus is in the form of a very compact structure which may be associated with any suitable type of conveyer unit, which is adapted to bring the containers into association therewith. My apparatus is preferably disposed in superimposed relationship to a continuously moving conveyer upon which the filled containers are placed indiscriminately. This conveyer preferably has means associated therewith for centering and maintaining the containers centered on the conveyer.

My apparatus includes a cap feeding and applying unit, where caps or other closures are loosely positioned on the upper ends of the containers moved into association therewith by the conveyer. Directly adjacent the cap feeding and applying unit, I provide a sealing head. The sealing head has means associated therewith for automatically lifting the cap from the upper end of each container and for injecting steam into the head space, at the upper end of each container, to displace the air therefrom, both of these operations being performed substantially simultaneously just prior to the sealing of the cap on the container. The steam-injecting means has means associated therewith for insuring that dry steam will be injected into the container. After the cap is sealed on the container, the steam previously injected into the head space of the container will condense, creating an effective vacuum within the container which will aid in holding the cap in position and will also aid in preventing spoilage of the contents of the container.

Various other objects and advantages will be apparent from the following description.

The preferred embodiment of my invention is illustrated in the accompanying drawings, wherein similar characters of reference designate corresponding parts and wherein:

Figure 1 is a side elevational view of a machine constructed in accordance with my invention.

Figure 2 is a plan view of the machine shown in Figure 1.

Figure 3 is a transverse vertical sectional view taken substantially along line 3—3 of Figure 2.

Figure 4 is a perspective view, partly broken away, of the main units of the fluid system.

With reference to the drawings, I have illustrated a machine having a base or supporting structure and which comprises generally a conveyer unit 1, a cap feeding and applying unit 2 and a sealing head unit 3.

The conveyer unit 1 may be of any suitable type. For example, it may be of the type disclosed in the co-pending application of William D. Bell on Apparatus for sealing containers, Serial No. 314,299, filed January 17, 1940. However, it is to be understood that my apparatus

may be associated with any suitable type of conveyer unit. The conveyer unit preferably embodies means for continuously moving the containers into proper association with the units 2 and 3, including means for centering the containers relative to said units.

My invention is not limited to use with any particular type of container and cooperating cap but for illustrative purposes I have shown in Figure 1 a container 4 adapted to receive a cap (not shown) on its upper end. This cap may be of the type which preferably embodies a substantially disk-like portion having a depending annular skirt which carries an annular gasket therewithin. When the cap is forced downwardly onto the upper end of the container, the frictional contact of the gasket with the upper end of the container will aid in maintaining the cap in position and will seal the cap on the container.

The containers 4 are placed indiscriminately on the conveyer and are moved in the direction of the arrows (Figures 1 and 2) by the conveyer. The containers are centered thereon in the manner described in said co-pending application Serial No. 314,299. They are first carried to the cap feeding and applying unit 2. This unit is of such a type that it will apply a cap loosely to the upper end of the container. After the container passes the unit 2, it passes to the sealing head unit 3. This sealing head unit 3 is adapted to displace the air from the head space and to sterilize such space and the cap before the sealing operation.

The units 2 and 3 are disposed directly adjacent each other. They are both supported by a horizontally disposed plate 9. The plate 9 is supported at a point spaced above the conveyer unit 1 by means of four vertically disposed non-rotatable posts 10 two of which are disposed at the left-hand corners of the plate (Figure 1) and the other two of which are spaced a substantial distance from the right-hand end of the plate. Each of these posts 10 is provided with a base portion 11 on its lower end which is suitably secured, as by screw bolts 11a, to a portion of the conveyer unit 1. The upper portion of each of these posts is threaded, as indicated at 12. Each of the posts has an internally threaded worm gear 13 mounted on the threaded portion 12 thereof. Each of these worm gears is disposed directly beneath and engages the plate 9. Formed integral with the left-hand end of plate 9 is a pair of lugs 14 (Figure 2). Formed integral with the plate 9 adjacent its opposite end is a pair of bearing portions 15. The pair of bearing portions 15 rotatably support a horizontally disposed worm shaft 16. The pair of lugs 14 at the other end of the plate 9 rotatably support a horizontally disposed worm shaft 17. Each of the worm shafts 16 and 17 carries a pair of worms 18 which engage the adjacent worm gears 13. The worm shaft 17 is provided with an angular end 19 for receiving a crank by means of which it may be rotated. In order to rotate the shaft 16 simultaneously with the shaft 17, the shaft 17 is provided on its opposite end with a sprocket 20 keyed thereon. This sprocket has a chain 21 passing therearound which also passes around a sprocket 22 keyed on the corresponding end of the shaft 16.

Thus, it will be apparent that when the shaft 17 is rotated, the shaft 16 will be rotated simultaneously and to the same extent. Consequently, by rotating shaft 17, all of the worm gears 13 will be caused to rotate. Since these gears are threaded on the posts 10, they will be moved vertically on the posts. Furthermore, since the gears are in engagement with lower surfaces of the plate 9, the plate 9 will be moved vertically in accordance with the vertical movement of the gears. Thus, the plate 9 may be adjusted vertically to position the units 2 and 3 at the proper height above the conveyer unit, depending upon the height of the containers to be sealed. It will be noted that all portions of my apparatus are carried by the plate 9. Consequently, it is in the form of a unitary structure which may be readily associated with any suitable type of conveyer unit. The worm and gear units are preferably enclosed in a suitable housing 13a as indicated in Figure 1.

The sealing head unit 3 is shown in Figures 1, 2 and 3. It comprises a vertically disposed cylindrical housing portion 23 which has a base portion 24 that is bolted by means of bolts 24a to the upper surface of the plate 9. Beneath the base portion 24 (Figure 3), the plate 9 is provided with a large opening 25, in order to permit vertical movement of the sealing head 26. This sealing head embodies a substantially cylindrical portion of non-magnetic metal which is carried on the lower end of a plunger 27.

The sealing head 26 is provided with a recess 28 in its upper surface which receives the lower end of the plunger 27. The plunger carries an enlarged portion 29 on its lower end which limits its upward movement by contacting with the lower end of housing 23. The plunger 27 is provided with a vertically disposed bore 30 which has an interiorly threaded lower end that receives the threaded upper portion of a bolt 31. This bolt passes upwardly through a centrally disposed opening 32 in member 26 which is enlarged at its lower end to receive the head 33 of the bolt. The bolt 31 will maintain the head 26 in position on the lower end of the plunger 27. A pin (not shown) is disposed in aligning openings (not shown) in the member 26 and lower end of the plunger 27 to prevent relative rotation of these members.

The plunger 27 is normally maintained in its uppermost position by means of a pin and compression spring arrangement similar to that shown in my Patent No. 2,321,779, referred to above wherein the spring 37 normally tends to force the plunger 27 upwardly until the enlarged portion 29 thereof contacts with the lower end of the housing portion 23.

Threaded into a collar 38 and bolted by a suitable bolt (not shown) to the upper end of the housing portion 23, is a sleeve 39. This sleeve 39 has a plunger 40 mounted therein for vertical movement. This plunger has an enlarged head 41 on its lower end which fits tightly within the housing portion 23. Between the lower end of the collar 39 and the upper surface of the head 41 and in surrounding relationship to the plunger 40, is a compression spring (not shown). The spring normally forces the plunger downwardly. The upper end of the plunger 40 is threaded, as indicated at 45, and receives threaded collars 46 which bear against the upper end of the threaded sleeve 39. The collars 46 will limit downward movement of plunger 40. By rotating the collars 46, the distance between the head 41 and the sleeve 39 may be varied and, consequently, the downward force exerted by the compression spring on the plunger may be varied. By rotating the sleeve 39 in the collar or member 38, the entire unit including plunger 40, the spring, sleeve 39 and collars 46 may be adjusted axially of the

housing. The two adjustments just described are provided for a purpose to be explained later. The sleeve 39 may be held in any adjusted position by means of a lock nut 48 threaded onto sleeve 39.

It will be apparent that the plungers 40 and 27 are disposed in axial alignment. It will also be apparent that the lower end of the plunger 40 is spaced above the upper end of plunger 27. Between these plungers and within the housing portion 23, a toggle joint 49 is disposed. One link 50 of the toggle joint extends upwardly and has its upper end pivotally connected, as at 51, to the bifurcated head or lower end 41 of the plunger 40. The other link 52 has its lower end pivotally connected to the bifurcated upper end (not shown) of the plunger 27. The adjacent ends of the links 50 and 52 are pivotally connected together by means of a bifurcated member or link 54. The member 54 is provided with a socket portion (not shown) which receives the round end portion of a horizontally disposed piston rod (not shown). A suitable pin holds the end portion in place in the socket portion. The member 54 extends through vertical slot (not shown) formed in the housing portion 23. The slot is large enough to permit the required movement of the toggle joint 49, and is of sufficient height to permit limited vertical movement of member 54.

The actuating mechanism for the sealing head 26 is normally in the condition illustrated in Figure 3. The plunger 40 will be held in its lowermost position by the compression spring above referred to. The plunger 27 will be held in its uppermost position by the other spring above referred to. The toggle joint 49 will be in the condition described, that is, with its links at an angle to each other. It will be apparent that if the piston rod (not shown) is moved in one direction, the toggle joint 49 will be straightened out. This will force the plunger 27 downwardly against the action of the spring associated therewith and, consequently, will force the sealing head 26 downwardly. As soon as the piston rod (not shown) moves in the opposite direction, the last named spring will return the head or member 26 to its uppermost position. The spring-pressed plunger 40 is provided to limit the downward force exerted on the plunger 27 to a predetermined maximum, so as to prevent injury to a container being sealed. This predetermined maximum is determined by the initial adjustment of the distance between the lower end of collar 39 and the flange 41, which varies the downward force exerted by the spring 42. When the downward force created by the toggle 49 on the plunger 27 reaches the predetermined maximum, the plunger 40 will be forced upwardly against the resistance of its associated compression spring. Consequently, the pressure exerted on plunger 27 will not be excessive. It will be apparent that during operation of the toggle joint, the horizontaly disposed piston rod will move vertically to a limited extent. Adjusting the plunger unit vertically by means of the sleeve member 39, as previously described, will vary the extent of the downward movement of the plunger 27 and, consequently, of the member 26. Thus, the extent of the downward movement of member 26 may be readily adjusted.

When the conveyer 1 moves a container beneath the cap feeding unit 2, the upper end of the container will engage the skirt of an inclined cap (not shown) and move the cap along suitable tracks (not shown) with the container, and onto tracks 165a which extend to a point adjacent the sealing head 26 (Figure 3). The tracks 165a are supported in a manner to be explained later. The cap and container will be moved along until they pass beneath the sealing head 26. The sealing head has means associated therewith for lifting the cap slightly from the container. This means comprises a plurality of small magnets 174 (Figure 3) which are arranged in circumferentially spaced relationship. An additional magnet 175 is disposed closely adjacent the edge of member 26 which will first be approached by the cap. The magnets are of cylindrical form and are mounted in sockets formed in the head 26 which is of non-magnetic material. These sockets do not extend quite completely through the head 26. The upper end of each socket receives a cylindrical portion 176 of rubber which fits tightly therewithin and tends to hold the magnet in position.

As the container with the cap thereon moves beneath the sealing head 26, the forward edge of the cap (not shown) will first be lifted by the magnet 175. Continued movement of the container will cause the magnets to act on the cap to hold it up against the lower surface of the member 26. Even with the cap in firm contact with the member 26, the skirt of the cap will still surround the upper end of the container so that it will be moved along with the container. However, the cap will be spaced sufficiently from the upper end of the container to permit steam to be injected therein.

The means for injecting the steam into the upper end of the container comprises a pair of steam jet members 177 which are provided with steam slots 178, see Figure 3. The members 177 are in spaced parallel relationship and extend along the member 26. The members 177 are carried by arms 178c which are, in turn, carried by guide members 178d (Figure 3). These guide members 178d are suitably mounted in guideways on the bottom of plate 9. A screw member (not shown) has oppositely threaded portions engaging the members 178d and is carried by the plate 9 in such a manner that it will not move axially. It will be understood that by rotating this screw the distance between the members 177 may be adjusted.

The tracks 165a are supported in the manner illustrated best in Figure 4. They are bolted, as as 165b, to the ends of the members 177. A bolt 165c extends transversely of the tracks and connects them together to prevent spreading thereof. The inner edges of the members 177 have short track sections 177a disposed thereon which are in alignment with the tracks 165a. The cap will be moved along by the conveyer over the track sections 165a and 177a until it comes beneath the sealing head 26. Since the track members 165a are carried by the members 177, the distance between them will be varied with adjustment of the distance between the members 177. During this adjustment the bolt 165c must be disconnected and after the adjustment, it may be replaced.

The inner edge of each of the members 177 is provided with an arcuate cutaway portion 178a adjacent the slot 178 which serves to direct the steam more effectively around the upper end of a container and also eliminates any chance of interference of the cap with the members 177 during the time the cap is being lifted. The upper surface of the member 177 is provided with an arcuate recess 178b which serves to form a pocket for the steam and direct it around the container.

Each of the members 177 has a longitudinally

extending passageway 179 (Figure 3) which communicates with the outlet slot 178. This passageway 179 is connected by means of a passageway 180 to a longitudinally extending tubular chamber 181 (Figure 3). This chamber 181 receives a hollow tubular electric heater 182. The heater 182 is of such a type that it will not be injured by moisture and is connected to a suitable source of power by means of an electrical conductor 183. A flexible conduit 184 (Figure 4) is connected to the chamber 181 of one of the members 177. The chamber 181 of this member 177 is connected to the chamber 181 of the other member 177 by means of a telescoping tube 185. Thus, steam will be supplied to both of the members 177 regardless of their position of adjustment. The steam entering the chambers 181 will pass around the heaters 182 and will be dried by such heaters. This eliminates the necessity of providing a steam super-heater of the type disclosed in said co-pending application S. N. 314,299.

As illustrated best in Figure 4, the line 204 for supplying steam to the cylinder 147 is connected to a fitting 209 disposed in a housing 210 mounted on the plate 9. The line 81 which supplies steam to the unit 59, for actuating the sealing head, is also connected to the fitting 209. A steam pressure regulating unit 211 of a suitable type is also disposed in housing 210 and is connected to the fitting 209. The main steam line 212 leads into the unit 211. The line 212 is connected to a suitable source of supply. The unit 211 will reduce the pressure of the steam coming from the line 212. A steam pressure gage 213 is also connected to the fitting 209 and will indicate the pressure of the steam flowing to the unit 59 and the cylinder 147. Beyond the fitting 209 in housing 210 a needle valve unit 214 is provided which is adjustable by means of a rotatable knob 215. The valve 214 is connected to a fitting 216, disposed in housing 210, to which the line 184 is connected. A pressure gage 217 is also connected to the fitting 216 and will indicate the pressure of the steam flowing through the line 184 into the members 177. The valve 214 is preferably so adjusted that the pressure of the steam flowing through the line 184 is considerably less than that flowing through the lines 81 and 204. The gages 217 and 213 and the knob 215 are disposed outside and above the housing 210.

From the preceding description, the operation of the machine will be well understood. The conveyer will be continuously driven and the plate 9 will be adjusted to the proper height above the conveyer depending upon the height of the containers to be sealed. The members 177 will be properly adjusted relative to each other depending upon the diameter of the upper ends of the containers. The cap feeding unit will be of a suitable type to handle caps of the correct size to be applied to the containers. The containers will be placed indiscriminately on the conveyer and will be moved beneath the units 2 and 3. As a container is moved beneath the unit 2, it will withdraw a cap from said unit. The container with a cap loosely thereon will then be moved beneath the sealing head 26. When the container moves beneath the head 26, the magnets serve to lift the cap against the head 26. However, the upper end of the container will still engage the skirt of the cap and will move it along therewith. As soon as the cap contacts the lower end of the trigger or finger (not shown) the control valves will be actuated to supply steam to move the piston previously described to the right. This will cause the horizontally disposed piston rod to actuate the toggle joint 49 which will, in turn, force the sealing head 26 downwardly. This will force the cap onto the container, as previously indicated. Thus, as the container moves into and reaches sealing position, it will automatically actuate the sealing head unit, provided a cap is disposed on the upper end of the container. Before the cap is forced on the container, the cap is sterilized and the air in the upper end of the container is displaced by steam. This is accomplished by means of the steam jets 177 from which steam continuously issues.

In sealing the cap on the container, forcing of the gasket over the upper end of the container, in itself, serves to hold the cap on the container. However, the condensation of the steam in the container beneath the cap, which occurs immediately, produces a partial vacuum which is the main force serving to hold the cap on the container and which also aids in preventing spoilage of the contents of the container. The sealing occurs substantially simultaneously with the injection of the steam into the container and, consequently, the steam will not have much chance of escaping from the container before it is sealed. During the sealing operation, movement of the container along with the conveyer is interrupted. Suitable mechanism for this purpose may be associated with the conveyer unit. For example, it may be of the type disclosed in Serial No. 314,299. However, immediately after the sealing operation occurs, the container will again be moved along with the continuously moving conveyer and will be moved away from sealing position. As previously stated, the container sealing mechanism will not function if a container which has no cap thereon, passes therebeneath.

When the sealing head 26 moves down sufficiently to force the cap downwardly into sealing position on a container, the cap will be out of engagement with the finger 132. Then the mechanism previously described may function to return the finger 132 to its original position. It is to be understood that each time a container passes the cap feeding unit, said unit is actuated to feed a single cap into position to be engaged by the next container. The extent of the downward movement of member 26 may be varied and the maximum pressure created by such member on the cap and container may be varied.

It will be apparent from the above description that I have provided a greatly simplified apparatus for applying and sealing closures on containers. The caps are positioned on the containers loosely, are lifted slightly and the upper portion of the containers vacuumized and sterilized and simultaneously the caps are sterilized, and then the caps are forced into sealed position on the containers. The containers will be vacuumized and sealed quickly and effectively. Due to the fact that dry steam is used for the sterilizing and vacuumizing operations it will be more effective. The machine can be adjusted readily to operate upon containers of various sizes and to use caps of various sizes.

Many other advantages have been mentioned in connection with the preceding description and will be apparent from the drawings and the following claims.

Having thus described my invention, what I claim is:

1. Apparatus of the type described for closing

and sealing open-mouth containers comprising means for applying a closure loosely on the open mouth of a container, means for lifting the closure from the container, nozzle members for supplying steam for the purpose of displacing air from the upper end of the container while the closure member is spaced therefrom, and heating means associated with said nozzle members for heating the steam passing therethrough.

2. Apparatus of the type described for sealing open-mouth containers having closure members loosely applied thereto comprising means for lifting the closures from the containers, nozzle members for supplying steam for the purpose of displacing the air from the upper end of each container while the closure member is spaced therefrom, and heating means associated with said nozzle members for heating the steam passing therethrough.

3. In apparatus of the type described, a source of steam, opposed nozzle members connected to said source of steam for subjecting the upper ends of containers to steam, and heaters associated with said nozzle members for heating the steam passing therethrough.

4. In apparatus for evacuating air from successive containers, a source of steam, nozzle members connected to said source of steam for subjecting the upper ends of containers to steam, said nozzle members having chambers formed therein through which the steam passes, and heating means disposed within said chambers for heating the steam passing therethrough.

5. In apparatus of the type described, a source of steam, nozzle members connected to said source of steam for subjecting the upper ends of containers to steam, said nozzle members adapted to be disposed on opposite sides of a container, said nozzle members being adjustable relative to each other, a conduit for supplying steam to one of said nozzle members, and a telescoping conduit for connecting the two nozzle members together.

6. In apparatus of the type described, means for subjecting the upper ends of containers to steam, said means including nozzle members adapted to be disposed on opposite sides of a container, said nozzle members having chambers formed therein through which the steam passes, said nozzle members being adjustable relative to each other, a telescoping tube connecting said chambers, and an electric heating element disposed in each of said chambers for heating the steam passing therethrough.

7. Apparatus according to claim 4 wherein said nozzle members are provided with arcuate discharge slots conforming generally to the outer contour of the containers.

8. Apparatus according to claim 3 wherein said heaters provide means for superheating and thus drying the steam emitted by said nozzle members.

HARRY E. STOVER.