

Feb. 8, 1944.

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2,341,498

APPARATUS FOR FILLING AND SEALING CONTAINERS

Filed Nov. 14, 1940

3 Sheets-Sheet 1

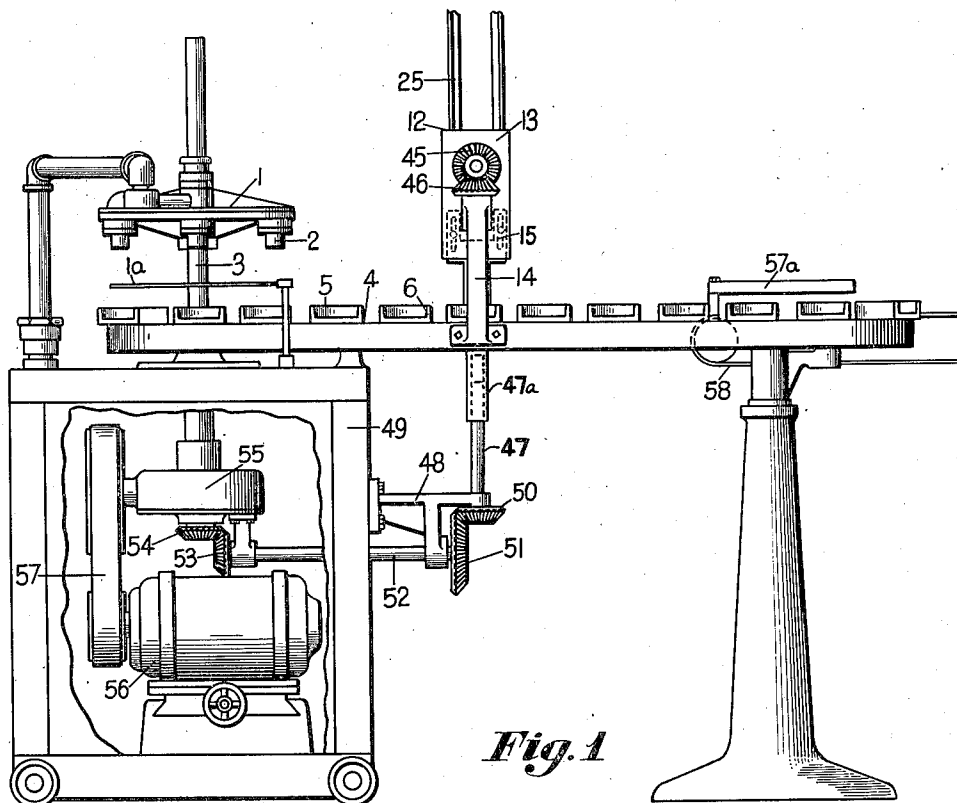


Fig. 1

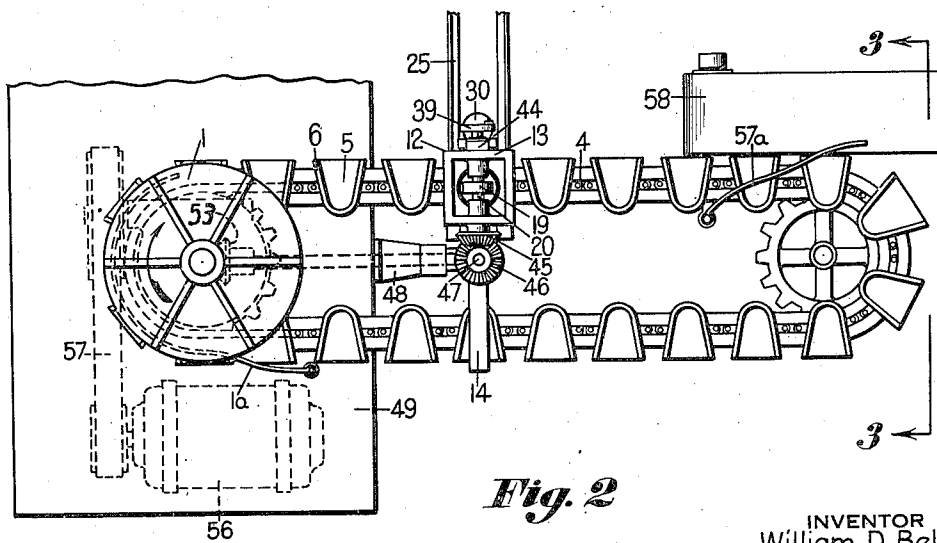


Fig. 2

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3 Sheets-Sheet 2

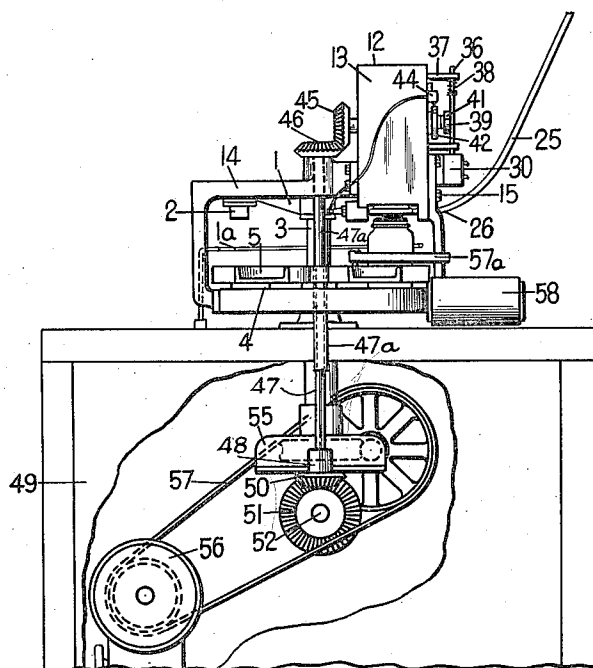


Fig. 3

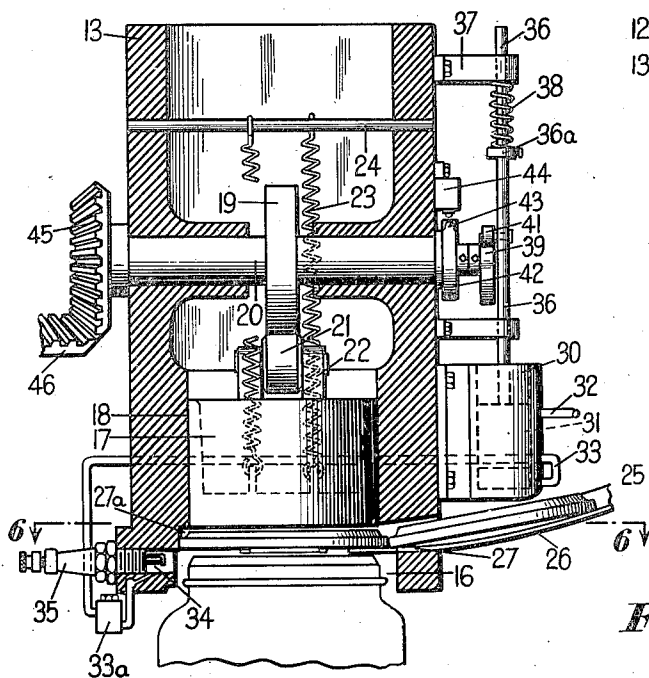


Fig. 4

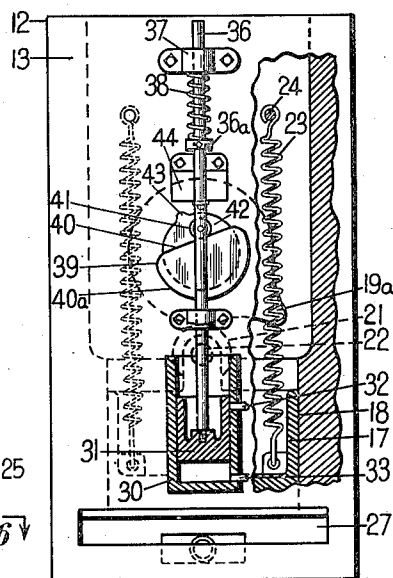


Fig. 5

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3 Sheets-Sheet 3

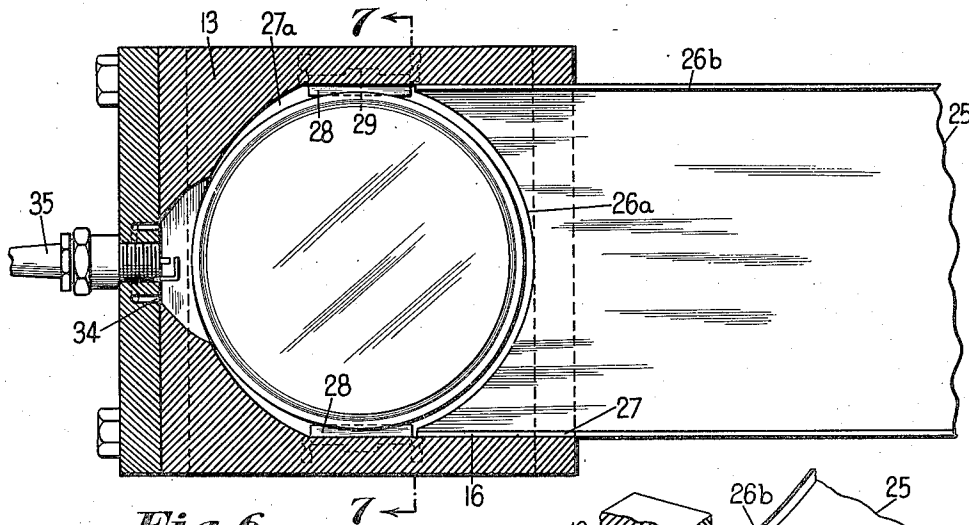


Fig. 6

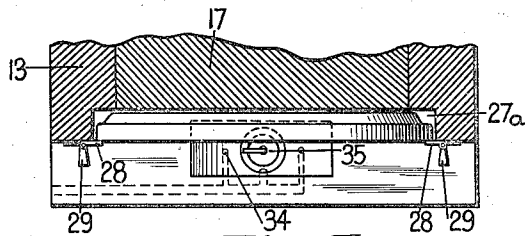


Fig. 7

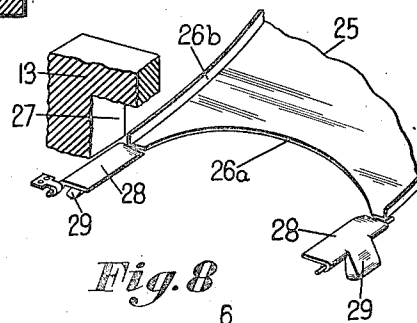


Fig. 8

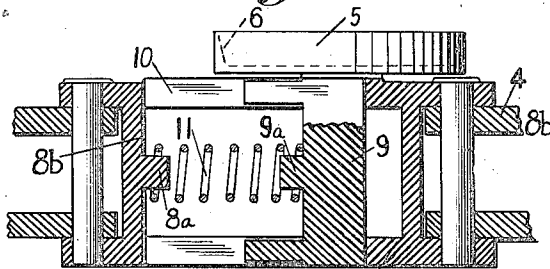


Fig. 9

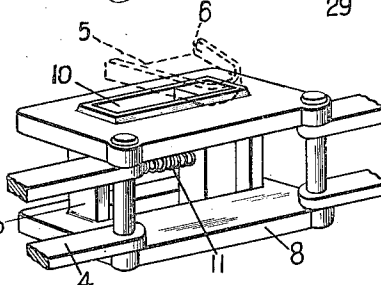


Fig. 10

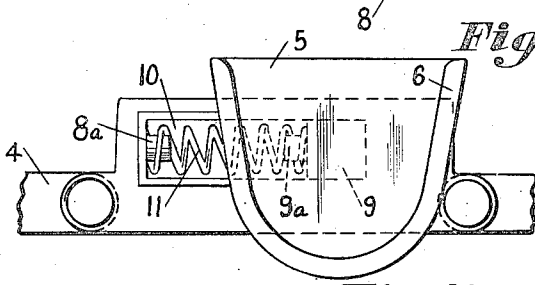


Fig. 11

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UNITED STATES PATENT OFFICE

2,341,498

APPARATUS FOR FILLING AND SEALING
CONTAINERS

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Application November 14, 1940, Serial No. 365,680

10 Claims. (Cl. 226—75)

My invention relates to apparatus for filling and sealing containers. It has to do, more particularly, with a filling machine in combination with a vacuum sealing machine, although some of the elements of my invention may be used independently of the filling machine or in combination with filling machines of different types from that disclosed herein. It relates to filling and sealing jars, cans, et cetera, of the type used for containing food and other products.

In the prior art, where vacuum sealing machines have been used, they have been used mainly in association with, rather than directly in combination with the filling unit. Thus, in one type of apparatus, which is in use in the prior art, it has been customary to provide a conveyor to receive the filled but open containers as they come from the filling machine. The receiving conveyor has associated therewith a cap-feeding unit which is designed to successively deliver caps to a position where the skirts thereof will be engaged by the upper ends of the containers, as they are moved along by such conveyor. Consequently, each moving container successively withdraws a cap from the closure feeding unit. Each container, with a cap thereon, then moves into association with a sealing means which seals the cap in position. In this type of machine, the caps are withdrawn in a steam chamber and the containers, with the caps thereon, pass through such steam chamber to the sealing means. During the withdrawal of the caps from the cap-feeding unit, and during the feeding of the containers with the caps thereon to the sealing unit, steam enters the head space of each container and is entrapped therein during the sealing operation. The sealed containers then pass into a cooler zone to insure condensation of the steam and consequent production of a partial vacuum in the head space of the sealed container, which partial vacuum assists in retaining the caps upon the container and has other advantages.

With this prior art machine, the containers are used to withdraw the caps from the cap-feeding unit. In many cases, the containers have bases of relatively small diameters. Therefore, it has been customary, in a machine of this prior art type, to provide endless gripping belts, which travel alongside the containers at the same speed as the conveyor which supports the containers, and which grip such containers, particularly at the time they withdraw the caps from the cap-feeding unit, so that they will remain upright and will positively withdraw the caps from such unit.

Another disadvantage of this type of prior art apparatus consists in the fact that the cap-applying and cap-sealing machine has a driving mechanism which operates independently of the apparatus for filling the containers. This makes it very difficult to synchronize the speed of movement of the conveyers of the two units which practically necessitates the withdrawal of the caps from the cap-feeding unit by the containers in the manner indicated above.

As indicated above, this prior art machine employs steam for the production of vacuum in the head space of each container. While this is satisfactory for some products, the condensation of the steam in the head space necessarily results in a certain amount of moisture, which is undesirable when sealing certain products which should be kept dry.

One of the objects of my invention is to provide simple, compact and efficient apparatus for both filling and sealing containers which embodies a filling machine and a vacuum sealing machine directly in combination with each other.

Another object of my invention is to provide apparatus of the type indicated wherein the filling unit is provided with a movable conveyor and the sealing unit is associated directly with such conveyor eliminating the necessity of having two separate conveyers, when the units are separate, and complicated apparatus for synchronizing the speed of movement of such conveyers.

Another object of my invention is to provide combined apparatus embodying a filling unit and a sealing unit which are both actuated by the same driving means.

Another object of my invention is to provide apparatus which avoids the necessity of utilizing the traveling containers to withdraw caps from a cap-feeding unit and thus which makes it possible to dispense with complicated mechanism that has previously been used for maintaining small diameter containers upright, under the stresses resulting from the withdrawal of the caps from the cap-feeding unit by such containers.

Another object of my invention is to provide apparatus of the type indicated wherein the sealing unit is operated each time a container moves into association therewith without having the container contact a control member or trigger for actuating the sealing head.

Another object of my invention is to provide apparatus of the type indicated wherein means is provided for feeding the cap directly to the sealing head of the sealing unit rather than feed-

ing them onto the containers before they reach the sealing head.

Another object of my invention is to provide apparatus of the type indicated which has a sealing unit of such a nature that all possibility of missing a container or jamming of the machine is entirely eliminated.

Another object of my invention is to provide apparatus of the type indicated which has a sealing unit of such a nature that a high degree of vacuum will be produced in the head space of the container by the use of a medium which will not produce moisture and which will substantially eliminate the oxygen in the head space and replace it by a medium which will be beneficial rather than detrimental to the contents.

This application is a continuation in part of my copending application, S. N. 325,393, filed March 22, 1940, and directed to Method and apparatus for sealing containers, which issued as Patent No. 2,284,631, June 2, 1942.

My invention contemplates the provision of a filling unit which includes a movable conveyer. I provide a sealing unit directly in combination with the filling unit which will apply and seal caps on the filled containers while they are still being carried by the conveyer of the filling unit. My invention further consists in the provision of a movable sealing head on said sealing unit, which is operated from the same source of power as the filling unit and which, therefore, will be synchronized therewith. The sealing head has means associated therewith for directly feeding the caps by gravity in succession beneath the sealing head. This sealing unit serves to seal the caps on the filled containers as they successively leave their filling stations upon the filling unit. My invention further consists in adding to the air within the head space of the container, beneath the cap which is about to be applied, and within the immediate vicinity of the top of the container, a sufficient amount of combustible gas to form an explosive mixture therewith. The combustible mixture, so formed, is ignited and, immediately, the cap is sealed upon the container in such a manner as to entrap the hot products of combustion, in order that subsequent cooling of the entrapped gases will result in a high degree of vacuum in the head space of the container. As indicated above, it is not necessary to rely on the movement of the container to withdraw the cap from the cap feed. Also, it is not necessary for the container to actuate a control for the sealing unit since the sealing unit is driven by the same source of power as the filling unit and is synchronized therewith.

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 elevation of a combined filling and sealing machine constructed according to my invention.

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

Figure 3 is an end elevational view of one end of the apparatus taken substantially along line 3-3 of Figure 2.

Figure 4 is a vertical sectional view taken through the sealing unit.

Figure 5 is a side view, partly broken away, of the sealing unit.

Figure 6 is a horizontal sectional view taken substantially along line 6-6 of Figure 4 showing

the means for supporting the cap in position beneath the sealing head.

Figure 7 is a transverse sectional view taken substantially along line 7-7 of Figure 6.

Figure 8 is a detail, mainly in perspective, of the cap-supporting means.

Figure 9 is a detail in vertical section of one of the container-receiving tray structures which are used upon the conveyer of the filling unit.

Figure 10 is a top plan view of the structure shown in Figure 9.

Figure 11 is a perspective view of the structure shown in Figures 9 and 10.

With reference to the drawings, I have illustrated in Figure 1, a filling unit which, in the main, is substantially in the form in which it is used in the prior art. It involves a continuously rotating filling head 1, carrying a series of filler nozzles 2. The filling head 1 is mounted upon a vertically disposed rotatable shaft 3 by means of which rotation of such filling head is effected. The filling head is disposed at one end of the conveyer. Travelling in timed relationship to this filling head and the nozzles thereof, is an endless conveyer 4. This conveyer 4 has container-receiving trays 5 disposed at regular intervals thereon. Each tray 5 is provided with an upstanding flange 6. The flange 6 is U-shaped so that a tray is formed for receiving the container, the tray being closed at its inner end and sides but being open at its outer end.

In the present instance, the container-receiving trays 5 are mounted on the endless chain of the conveyer in a different manner from the prior art. Each tray 5, as shown best in Figures 9 to 11, is carried by a link 8 of the conveyer. The tray is mounted on the upper end of a block 9, which is mounted for longitudinal sliding movement in guideway or slots 10 formed in the top and bottom portions of the link 8. A compression spring 11 has one end disposed around a boss 12 on block 9 and bears against such block. The other end of the spring is disposed around a boss 13 on the vertical portion 14, of the link 8, with which the spring contacts. This spring 11 tends to move the block 9 to the right-hand ends (Figure 9) of the slots 10 and keep the block in such position. Thus, the tray 5 is normally kept at its farthest position to the right on the link 8 which supports it. However, as will appear more fully hereinafter, when pressure is applied which tends to move the tray to the left on the link 8, the spring 11 will be compressed, permitting this movement.

The sealing unit which I preferably employ may be generally designated 12 and is located along one side of the endless conveyer 4 at a point where it will act on the containers which have been filled by the head 1 disposed at one end of the conveyer. This sealing unit comprises a vertically disposed housing 13 which is of substantially rectangular cross-section and is carried on the upper end of a support 14 which extends over the conveyer 4, as shown in Figure 3. The housing 13 is vertically adjustable on the support 14, by means of bolt and slot connections 15, so that the housing 13 may be adjusted to different heights, depending upon the height of the containers to be sealed. A channel 16 (Figure 4) is provided at the lower end of the housing 13, through which the upper ends of the containers are successively moved by the conveyer. This housing 13 has a sealing head 17 of cylindrical form mounted for vertical movement in a cylindrical bore 18, formed in the lower portion

of the housing. Above the sealing head 17, within the housing, is disposed a cam 19. This cam is keyed on a shaft 20 which is horizontally disposed within the housing and is mounted for rotation. The cam 19 engages a roller 21 which is carried by a pair of ears 22 formed on the upper end of the sealing head 17. Cam 19 has a projecting portion 19a (Figure 5). Springs 23 have their lower ends connected to the sealing head 17 and have their upper ends connected to a horizontally disposed pin 24 mounted within the housing 13. These springs normally tend to draw the head 17 upwardly so that the roller 21 will be in contact with the cam 19. However, upon rotation of the cam 19, the portion 19a will strike roller 21, and the head 17 will be forced downwardly. The shaft 20 is rotated to rotate the cam 19 in a manner to be explained.

Associated with the sealing unit 12 is an inclined cap chute 25 of channel form adapted to feed the caps downwardly in edge-to-edge relationship. This cap chute has a lower substantially horizontal portion 26 which leads through a slot 27 formed in the outer wall of the channel 16 as shown best in Figure 4. The chute 25 may be fed with caps at its upper end by any suitable type of cap-feeding hopper which will insure that the caps will be fed into the chute with their under sides lowermost. Obviously, the caps may be fed to the chute 25 by hand. The end of the cap chute 25 terminates in an end portion 26a which is of semicircular form, as shown best in Figures 6 and 8. This end portion 26a has flanges 26b which engage the edge of the cap.

Directly below the initial position of sealing head 17, as shown best in Figure 7, is a cap-receiving recess or socket 28. The socket 27a is of the proper depth to receive the cap. The socket or recess 27a extends transversely of the housing 13 at right angles to the channel 16, or at right angles to the direction of movement of the containers. The lower edges of the walls of this socket carry, at diametrically opposed points, a pair of pivoted cap-supporting flaps 28. These flaps are normally held in horizontal position by weights 29, formed as a part thereof. These flaps normally project beneath the cap-receiving recess 27a and will support a cap therein in the manner illustrated best in Figure 7. The flaps 28 serve as a continuation of the bottom wall of the chute 25, as shown best in Figure 8. Thus, it will be apparent that the caps will be fed in succession downwardly through the chute, through slot 27 to a point beneath the sealing head 17, where they will be supported by the flaps 28. However, when the sealing head 17 is moved downwardly, the flaps 28 will be forced downwardly and will be spread outwardly by the cap, but will swing back into horizontal position as soon as the cap has been moved downwardly to a sufficient extent and the sealing head returns to its initial position. Then another cap will be fed from the chute 25 by gravity into position beneath the sealing head 17. Thus, a gravity feed of the caps is provided and this feed is controlled by the position of the sealing head.

The sealing unit 12 is further provided with a pump 30, which is adapted to force a suitable fluid beneath the cap and into the upper end of the container which is in sealing position. This pump 30 is of the piston type being provided with a piston 31. A line 32 leads to the pump and serves as an inlet for the fluid. An outlet line 33 leads from the pump and to an outlet port 34, which is formed in one wall of the channel

16 adjacent the sealing head 17. A spark plug 35 is also mounted on this wall of the channel 16 and has its points in the port 34. The piston 31 of the pump has an upwardly extending piston rod 36 connected thereto. The rod 36 is mounted for vertical reciprocation in brackets 37 secured to the housing 13. A compression spring 38 is provided in surrounding relationship to the upper end of rod 36, beneath the upper bracket 37, and engages a collar 36a, carried by the rod 36, to normally force the rod 36 and the piston 31 downwardly. In this lower position of piston 31, the outlet line 33 will be closed and no gas will be supplied to the outlet port 34. However, when the piston 31 is raised to its uppermost position, the inlet 32 is open, allowing gas to enter the pump, and when the piston 31 returns to its lowermost position, due to the spring 38, the gas will be forced from the pump, through the line 33 and outlet port 34, into the upper end of the container. A check valve 33a is provided on line 33 and will open only upon downward movement of piston 31. Thus, a predetermined charge of gas will be supplied to the container.

For moving the piston rod 36 upwardly at the proper time to supply the charge of gas to the container, I provide a cam 39. This cam is keyed on an extension of the shaft 20. This cam has a flat portion 40, which is adapted to engage at regular intervals a roller 41 carried in a fixed position on the rod 36. When the portion 40 engages roller 41, it will permit the rod 36 to be forced downwardly by spring 38. Thus, the pump is actuated to supply the predetermined charge of gas to the container. When the curved portion 40a of cam 39 contacts roller 41, it will lift the rod 36 and keep it lifted for a short period. As the last portion of the charge of gas is being forced from the outlet 34, it is desired that it be ignited. For this purpose, I provide another cam 42, keyed on the extension of shaft 20, which has a projecting portion 43 that engages, at regular intervals, a micrometer switch 44, which energizes the spark plug 35 to which it is connected by a suitable circuit. Thus, the charge of gas is supplied to the container and is ignited substantially simultaneously. The cams 39 and 42 are so adjusted relative to the cam 19 on shaft 20 that the sealing head 17 moves downwardly substantially simultaneously with the ignition of the charge of gas, so as to entrap the products of combustion to produce the required vacuum.

The shaft 20 is rotated by means of a bevel gear 45 (Figures 1, 2 and 3) keyed on its end opposite to the end which carries cams 39 and 42. This bevel gear 45 meshes with a bevel gear 46 keyed on the upper end of a vertically disposed shaft 47. The upper portion of shaft 47 is rotatably carried by the support 14 and the support for the conveyer. The lower end of the shaft is rotatably mounted in a bracket 48, secured to a housing 49 which contains the driving mechanism of this machine. The shaft 47 has a telescoping section 47a and carries on its lower end a bevel gear 50 which meshes with a bevel gear 51. The bevel gear 51 is keyed on the outer end of a horizontally disposed rotatable shaft 52, which extends into the housing 49. The inner end of this housing 49 carries a bevel gear 53 which meshes with a bevel gear 54 of a speed reduction gear unit 55. The unit 55 also serves to drive the shaft 3 which operates the filling head 1. This shaft 3 extends through the upper wall of housing 49 and is rotatably carried by such wall. The gear unit 55 is driven by an elec-

tric motor 56, through a suitable belt drive 57. Thus, it will be apparent that the filler unit 1 and the sealing unit 12 are both driven by the same source of power.

In the operation of my apparatus, the containers are placed upon the trays 5 at the inner closed ends thereof while the conveyer is traveling in the direction indicated by the arrow in Figure 2. They are placed on the trays at the side of the conveyer opposite the side where the sealing unit 12 is disposed. When the containers reach the filling unit 1, they successively register with the nozzles thereof and, during a portion of the rotation of the filler head, each container is filled with the proper quantity of material. A wire guard 1a functions to keep the containers in proper position in the trays during filling (Figure 2). As each container passes from beneath the filler head unit 1, it moves toward the sealing unit 12 which has already been provided with a cap from the chute 25. When the filled receptacle reaches a position immediately below the sealing unit 12, the pump 30 is actuated by cam 39 to supply a charge of gas to the upper end of the container, and the switch 44 is actuated, by the cam 42 to ignite the gas. Practically simultaneously with this ignition of the gas, the sealing head 17 is forced downwardly by the cam 19 and seals the closure upon the container. At the time, the sealing head is pressing the cap on the container, the container will be forced downwardly against the tray 5 with a substantial pressure. However, movement of the tray with the continuously moving conveyer will be interrupted for an instant, due to the structure shown in Figures 9, 10 and 11, sufficient to permit the forcing of the cap into its final position by the sealing head. The ignition and burning of the combustible mixture localized about the head-space and top of the container brings about a large increase in the volume thereof because of the high temperature of the rapid combustion. If the cap is sealed onto the container before the flame subsides, the subsequent cooling of the gases trapped within the head-space, results in a final pressure therein very much below that of normal atmospheric pressure. After the sealing is effected, the sealed receptacle passes into contact with the guiding strip 57a, which removes it from tray 6 and delivers it to a conveyer 58, though it obviously may be removed by hand, directly from the conveyer of the filling unit.

Any combustible gas may be used for the purpose of obtaining the vacuum. For example, any hydrocarbon gas, such as hydrogen gas, ordinary illuminating gas, or any of the gases which are at present being sold in pressure tanks, may be used. When the gaseous mixture ignites, it envelops the entire head of the container in flame at a temperature of from 3000° to 4000° F. The oxygen of the air in the head-space of the container combines with the hydrogen and carbon of the fuel gas, and only the hot products of combustion and the residual nitrogen of the air remain to be trapped in the head-space. Nitrogen is not injurious to the contents of the container but, in fact, serves as a preservative. The expansion resulting from this ignition is sufficiently violent to drive out practically all of the gases previously in the head-space of the container and under the closure and in the immediate vicinity thereof. When the container cools, a high degree of vacuum will be present in the head space.

In addition to eliminating free oxygen from

the head-space of the container, the intense heat of the combustion effectively sterilizes the closure, the head-space of the container, and the exposed surface of the material in the container.

As a result, the conditions within the head-space of the sealed container are more favorable for the preservation of the contents than are at present commercially attainable by any other process. The head-space is effectively sterilized, free oxygen is eliminated, and only inert products of combustion at very low pressure remain in the head-space of the container. It is a well established fact that reduction in the amount of oxygen is one of the principal objects of vacuum packing, since most food spoilage can take place only when free oxygen is present.

It will be apparent that my novel apparatus has numerous important advantages. It presents a simple and effective way of combining the vacuum sealing unit with a filling unit, and of utilizing the mechanism of the filling unit to drive the sealing unit and to time the various operations thereof in synchronism with the operation of the sealing unit. It renders unnecessary the use of a container to trip mechanism to initiate the operation of the sealing unit.

Another important advantage of my apparatus arises from the fact that it is no longer necessary to apply the caps to the containers prior to the sealing of such caps on the receptacles. Consequently, it becomes unnecessary to use the containers to withdraw the closures from the cap feed and it there eliminates the necessity of providing belts or other means for holding the containers upright upon the conveyer.

Still another advantage of my invention is that the caps are fed directly to the sealing head and into a position that permits of their direct downward application to the containers and which eliminates all danger of the caps becoming improperly applied to the containers.

Still another advantage of my invention arises from the fact that the sealing head may be so adjusted as to regulate the position of the caps above the containers as desired. The skirts of the caps need not actually enclose the mouths of the containers until the final sealing operation. The lower edges of these skirts may be at an elevation above the uppermost edges of the containers while the combustible fluid is being introduced, which permits of the introduction of a larger volume of the combustible fluid initially and the attainment of a greater degree of vacuum finally.

Still another advantage arises from the fact that all oxygen is removed from the head-space of the container and from beneath the caps. Moreover, no moisture is deposited upon the product in the container. In addition, the head-space becomes filled with nitrogen which further protects the product as indicated above.

Other objects will be apparent.

Having thus described my invention, what I claim is:

1. A machine for sealing containers including a sealing unit and a conveyer for moving a succession of containers into cooperative relationship with said sealing unit, said conveyer being adapted for continuous movement relative to said unit, container-supporting means forming a part of said conveyer and normally movable therewith, and means located between each of said container-supporting means and the conveyer permitting the movement of said container-supporting means to be arrested while said support and con-

tainer are in sealing position with relation to said sealing unit.

2. A machine according to claim 1 wherein said last-named means returns the container-supporting means to its normal position with relation to the conveyer to move therewith after the sealing operation has been completed.

3. A machine according to claim 1 wherein said last-named means comprises a compression spring.

4. A machine for sealing containers comprising a sealing unit and an endless conveyer for moving a plurality of successive containers into cooperative relationship with said sealing unit, said endless conveyer being adapted for continuous travel relative to said sealing unit, a plurality of spaced container-supporting members carried by and forming a part of said endless conveyer and normally movable therewith, and a floating connection between each of said supporting members and said conveyer whereby to permit the movement of each of said container-supporting members to be arrested while said member and its supported container are in sealing position with relation to said sealing unit.

5. A machine according to claim 4 wherein said floating connection permits the supporting member to resume its normal position with relation to the conveyer and move therewith after the sealing operation of the container has been completed.

6. Means for moving a plurality of containers to the sealing unit of a container-sealing machine, comprising an endless conveyer for transporting a succession of said containers into cooperative relationship with said sealing unit, container-supporting members carried by and forming a part of said endless conveyer, said members being capable of limited movement relative to

said conveyer, and separate means associated with each of said members and said conveyer permitting the movement of a member to be arrested for a predetermined time while said member and its supported container are in sealing position with relation to the sealing unit.

7. Structure according to claim 6 wherein each of said separate means comprises a compression spring interposed between a portion of said supporting member and a portion of said conveyer.

8. Structure according to claim 6 wherein said separate means returns the container-supporting member to its normal position with relation to the conveyer to resume its travel therewith after the sealing operation has been completed.

9. In a machine for sealing closures onto filled containers in which the machine is provided with a substantially vertically movable sealing head and a continuously moving endless conveyer for conveying filled containers to the sealing head; supporting means for the individual filled containers forming a part of said endless conveyer, and means associated with said container-supporting means and conveyer permitting the supporting means and its supported container to remain stationary for a predetermined period of time during the continued movement of the conveyer and while the sealing operation is being performed by the sealing head.

10. A machine according to claim 9 wherein the means associated with the container-supporting means and the conveyer comprises an opening provided in the conveyer and a compression spring located in said opening and having its opposite ends in engagement with a portion of the container-supporting means and a portion of said conveyer.

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