METHOD AND APPARATUS FOR PACKAGING IN PROTECTIVE ATMOSPHERE

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7 Claims

ABSTRACT OF THE DISCLOSURE

In general, the disclosure sets forth a method and apparatus for forming a container having an outturned peripheral flange member, enclosing the container and a cover member in an evacuable chamber, evacuating the chamber, introducing a protective atmosphere into the container and chamber, and sealing the cover member to the flange member. The containers are formed in a continuous sheet and, in the embodiment illustrated, an opening is formed in the flange intermediate two containers. The evacuable chamber is formed of two parts which clamp the cover member and flange member at two opposite sides of the package and outwardly of the opening. At least one other side is left unclamped and the chamber evacuated outwardly of the container with the air in the container flowing between the members at the unclamped side and thereby being evacuated. The protective atmosphere is introduced through the opening, into the container, and therefrom between the members at the unclamped side into the chamber. The cover member is thereafter hermetically sealed to the flange member inwardly of the opening and removed from the chamber.

The present invention relates generally to packaging and more particularly to method and apparatus for packaging in a protective atmosphere.

Many products are presently marketed in packages formed by wrapping gas-imperious sheet material around the product and exhausting air from the package. This is known as vacuum packaging. Food products such as cheese and meats are typical of products benefited by this type of packaging since it reduces the tendency of product deterioration by oxidation. More recently, the air in packages has been replaced by an inert or protective gas, e.g. nitrogen, carbon dioxide, and the like. These protective atmospheres further contribute to the preservation of the product. Previous methods have involved the gas flush principle in which the package is partially sealed and the protective gas flowed into the package through a lance or the like extending into the package. The lance is withdrawn and the end of the package is subsequently sealed.

Another previous method has involved a type of vacuum packaging in which the package is exhausts from the package and partially replaced with a protective atmosphere. The package is then sealed. This causes the package to collapse around the product when exposed to atmosphere.

It is an object of the present invention to provide a new and useful packaging method and apparatus having advantages of both vacuum and gas flush packaging.

Another object of this invention is to provide packaging apparatus, and a method of packaging, for evacuating and gassing a container with a protective atmosphere.

Still another object is to provide a method and apparatus for packaging in a protective atmosphere in which a chamber surrounding the package is evacuated and the protective atmosphere is passed into the package and therefrom in the chamber.

Yet another object of the present invention is to provide a novel method and apparatus for packaging in a protective atmosphere in which the protective gas is passed into the package without the use of apparatus extending into the package.

Another object is to provide a method and apparatus for packaging in a protective atmosphere in which the sealing is accomplished in a single operation.

These and other objects and advantages of the present invention, will become apparent as the same becomes better understood from the following detailed description when taken in conjunction with the accompanying drawings wherein:

FIGURE 1 is a diagrammatic illustration of an embodiment of the present invention and for performing the steps of the method;

FIG. 2 is a partial perspective view of the apparatus of FIG. 1;

FIG. 3 is a partial perspective view illustrating an inner cover being placed on a container;

FIG. 4 is a partial sectional view of the evacuable chamber and sealing head taken generally along line 4—4 of FIG. 5;

FIG. 5 is a partial sectional view taken generally along line 5—5 of FIG. 4; and

FIG. 6 is a view similar to FIG. 5 but showing the sealing head in sealing position.

An apparatus for performing the steps of the method is diagrammatically illustrated in FIG. 1. The apparatus generally is an improvement on machines of the type disclosed in J. G. H. Ollier et al. Patent No. 3,196,590 and reference is made thereto for the disclosure of the old structure.

Reference is now made more particularly to the drawings which illustrate the best presently known mode of carrying out the invention and wherein similar reference characters indicate the same parts throughout the several views.

As shown, a roll 10 of thermoplastic material is supported adjacent one end of the machine. A web 11 is advanced longitudinally of the machine past successive stations. Heating heads 12 and 13 heat the web 11 so that it may be formed into any desired shape. At the next station, a cup-like member, generally designated C, is pressure formed in web 11 by a mandrel 14 adjacent one side of the web and pressure adjacent the other side. It is contemplated that vacuum forming may also be utilized, and the term "pressure-formed" should be taken as including pressure forming, vacuum forming, and other types of forming. Mandrel 14 moves in the direction of arrows 15 between a forming position generally contiguous to the web and a second position (shown in dashed lines) removed from the web so that the web may be intermittently advanced. Web advancement is accomplished by gripper 16 which is reciprocated by piston 17 in the direction of arrows 18.

While other shapes are contemplated, the cup-like container C is preferably rectangular as best shown in FIGS. 2 and 3. As shown, the container has a generally flat bottom 22 and side walls 23—26. The side walls advantageously slope uniformly upwardly from the bottom 22. The upper ends of the side walls are preferably co-planar and define the open end of the container. An out-
wardly projecting flange extends outwardly around the periphery of the side walls and at the upper end thereof. The outwardly projecting flange advantageously includes a flange portion 28 and an outer portion 29 stepped into the inner portion a preselected distance. The inner portion 28 is coplanar with the upper end of the side walls and extends a distance outwardly therefrom. The outer portion 29 has its upper face at a level above the upper face of inner portion 28 and defines a plane parallel thereto, as can be seen in the drawings. Sheet 61 is advantageously formed in web 11 in such a manner that adjacent outer portions 29 are interconnected.

After the container C is formed in web 11, it is advanced to a third station where an opening 30 is formed in the flange member. The opening is formed by means of a punch 32 and a die 34 (See FIG. 2) mounted at said third station. It is contemplated that the opening may also be formed at the aforesaid forming station, if desired. Preferably, opening 30 is formed in the outer flange portion 29 and in the interconnecting portion between adjacent containers. As shown, opening 30 is more closely adjacent side wall 26 than side wall 24 for a purpose which will hereinafter become apparent. At a fourth station, a preselected quantity of a product P is dispensed into the container C. While the product P may be of any nature, the type which may be handled and packaged, in accordance with the present invention it would be a product advantageously packaged in a protective atmosphere such as carbon dioxide, nitrogen, argon, active nitrogen, or the like.

Simultaneously with the above operation, a second roll of thermoplastic material 46 is unrolled from the machine and a web 41 withdrawn therefrom. In similar fashion, the web 41 is heated by heating members 42 and 43. An inner cover, generally designated I, is pressure-formed by mandrel 44. The web 41 is advanced to a cutting station where cutters 45 accurately cut the inner cover I to its required shape. Preferably, the inner cover I is shaped to lie contiguous to the inner flange portion 28 and span the open end of container C. The inner covers I are gripped by a reciprocating head 46 which deposits each inner cover on a respective container C which has been filled with product P. As the embodiment illustrated, inner cover I includes a spanning portion 52 extending adjacent the side walls 23–26 of container C and at a level below the upper ends thereof. Walls 53–56 extend upwardly from spanning portion 52 and are tapered outwardly generally parallel to side walls 23–26 of the container. The taper of these walls 53–56 advantageously provides a self-centering action when the inner cover is placed in position and allows the inner cover to nest in the position illustrated in the drawings with its walls 53–56 generally contiguous to side walls 23–26. A peripheral portion 58 extends outwardly from walls 53–56 and is engaged with inner flange portion 28 of the container C. As illustrated, a channel 59 is preferably formed in wall 56 and peripheral portion 58 in the area of opening 30 to provide communication with the interior of container C. While channel 59 is herein illustrated as being formed in inner cover I, it may be formed in the container C as, for example, in side wall 26 and the flange member. The advantages of channel 59 will hereinafter become more apparent.

In some packages, inner cover I may be omitted. In such a case, inner flange portion 28 may also be omitted and the entire flange member may be sealed to the inner portion of container C. As illustrated, a channel 59 is not required in such an arrangement; however, if desired, the channel is then advantageously formed in the flange member and extending from opening 30 to side wall 26.

A third roll 60 is supported on the apparatus, and thin, flexible sheet 61 is withdrawn therefrom. Sheet 61 is advantageously stretchable and adapted to be sealed to the flange member of container C along a preselected peripheral area. Preferably, compatible thermoplastic materials are selected for web 11 and sheet 61, and the sealing may be accomplished by heat sealing. It should be understood, that web 11 and sheet 61 are utilized and that other sealing methods may be used. It is preferable, however, that sheet 61 which provides the cover member of the finished package, be flexible for a purpose hereinafter to become apparent. Sheet or cover member 61 is placed in juxtaposition to the flange member, as shown, at the containers, and the cover member 61 is advantageously stretchable and adapted to be sealed to the outer flange portion 29 and inwardly to the opening 30. The exact apparatus and the steps of the method will hereinafter be described in detail.

At this point, a plurality of sealed packages is interconnected in a continuous web as illustrated in FIG. 1. The web of sealed packages is advanced to another station 64 where the packages are cut from the web by cutters 65 and 66. The completed packages are deposited on a conveyor 68, and the waste portion of the web is fed out of the machine. The waste sections of the web are cut at cutters 65 and 66. At cutting station 64, the continuously web is conveniently cut inside of the outer extremity of the seal area effectuated at chamber X to insure that the seal between cover member 61 and outer flange portion 29 extends entirely to the edge. This provides a very neat package with no loose outer cover. If desired, a peel portion of any desired length may be formed outwardly of the seal area in any convenient manner.

As explained above, vacuum packing has the disadvantage of collapsing the package when it is exposed to atmospheric pressure. Additionally, a certain residue of air is necessarily left in the package, and this can cause some deterioration of certain products such as meat. The gas flush principle allows a protective atmosphere to be flowed into the package; however, in the past this has necessitated partially sealing the package and introducing the protective atmosphere through a lance or the like extending into the container. In accordance with the present invention, it is desirable to reduce the residue of air in the container to a minimum, flow a protective atmosphere into the container, and thereafter hermetically seal the package in a single sealing operation. These steps are advantageously performed at the evacuable chamber X illustrated in FIGS. 4–6.

In the embodiment illustrated, the evacuable chamber includes a lower member 71, movable in a vertical direction by any convenient means. In its upper position, shown in FIGS. 4–6, the lower member 71 engages with an upper member 72 to form a substantially air-tight enclosure. A gasket 73 conveniently at the top of the lower member engages with peripheral part 74 of the upper member 72 to ensure that the enclosure thus formed is substantially gas-tight. As shown, the lower member 71 is formed with a lower cavity 79 shaped for receiving the containers C therein. The upper member 72 describes an upper cavity 79 which is in communication with the lower cavity 78 via passage 76 in lower member 71, as shown in FIG. 4.

Disposed planar, the upper cavity 79 is a heat sealing head 82 having projecting parts 83 of a shape generally corresponding to the flange member for sealing the cover member 61 thereto. Sealing head 82 is movable between a position removed from the cover member, as shown in FIGS. 4 and 5, and a sealing position engaged with the cover member, as shown in FIG. 6. The sealing head may be heated in any convenient manner; or may be adapted for pressure sealing if a pressure-sensitive adhe-
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cative is utilized. Ultrasonic or high frequency sealing and other sealing methods may also be used, if desired. Seal-

head 82 is conveniently provided for this purpose; as in Fig. 4, a valve 99 is utilized. Ultrasonic or high frequency

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if desired. Sealing head 82 may be kept stationary and lower member 71 moved upwardly for the sealing operation.

The cavities 78 and 79 can be placed in communication with the atmosphere or with a vacuum pump (not shown)

by means of a valve 86 connected to chamber outlet conduit 87, pump conduit 88, and atmosphere conduit 89.

In the operation of the device, the lower member 71 is lowered relative to the upper member 72 and the con-


tainer C, inner cover I, and cover member 61 are moved in the direction indicated by arrow g in FIGS. 1 and 2.

The container C is supported by a plate 92 (see FIG. 2) during the early part of this movement, from which it is
transferred to the chamber X. Lower member 71 is then moved upwardly by means not illustrated until the gasket
73 comes into contact with the upper member 72 or clamps the flange portion 29 and cover member 61 there-

between. It will be noted that the opening, offset toward side wall 26, is disposed inwardly of said clamping.

Valve 86 is now operated so that conduit 88, which is connected to a vacuum pump, is placed in communi-

cation with outlet conduit 87, and the pressure within the cavity 79 is reduced to a value below atmospheric. More-

over, since cavity 79 is communicated with cavity 78 by conduit 76, the pressure in this lower part is likewise

reduced. The interior of the container C and the space between inner cover I and a cover member 61 is likewise

reduced through flow of air through channel 59 and gaps as at 93 (see FIG. 4) caused by the air pushing out and

flexing the cover member 61 somewhat as a result of the pressure differential. Advantageously, a high vacuum

is drawn; for example, around 27-29 inches of mercury. When the desired amount of air has been evacuated,

valve 66 is moved to a closed position blocking any flow through conduit 87, as shown in FIG. 5.

As shown in FIGS. 5 and 6, lower member 71 is pro-

vided with a passage 95 communicating with opening 30. A supply of protective atmosphere 96 is connected to
gasway 95 by means of a conduit 97. A pressure regulator 98 is provided to control the pressure of the protective
atmosphere flowing into the chamber. A valve 99 is interposed in conduit 97, and a timer 100 is conven-

iently provided to control the valve between "on" and "off" positions. When valve 99 is turned on, the pro-

tective atmosphere is allowed to flow through conduit 97, gasway 95 and opening 30. The force of this flow-
ing gas is such to stretch cover member 61 slightly above the opening 30, and the gas flows into the container C

through the gap thereby provided and through channel 59. Since opening 30 is approximately at the center of

the container C, the protective atmosphere will flow first into the container and then, by differential pressure be-

tween the container and cover member, into the cavities 78 and 79. In this manner, an amount of the residue of

air is advantageously flushed into the cavities. Timer 100 is arranged to allow flow of gas over a sufficient period

of time to allow the pressure in the container and cavities to reach the pressure set on regulator 98. In accord-

ance with the present invention, it is preferable that this pressure be approximately atmospheric so that the con-

tainer will neither bulge nor be collapsed when exposed to atmosphere. After the pressure in the container and
cavities has reached the preselected amount, timer 100 turns off valve 99. In some cases to conserve gas, valve
86 is opened to atmosphere while the pressure in the cavities is subatmospheric, but after the pressure in the

container C has been returned approximately to atmosphere.

Sealing head 82 and lower member 71 are then moved relative to each other by any convenient means. In this

manner, projecting parts 83 of sealing head 82 press the cover member 61 into contact with the outer flange por-
tion 29, sealing the two together to provide a gas-tight package. In accordance with the present invention, it is

necessary that the sealing area be inwardly of opening 30. The projecting part 83 is also advantageously arranged
to engage the portion of channel 59 formed in peripheral portion 58 and depress the channel into engagement with

inner flange portion 28. As shown in FIG. 6, in this manner, at least a portion of the channel is ironed out during
the sealing operation. To accomplish this, inner cover I is advantageously formed of a material which will be
ironed out by the sealing head. In one embodiment, polyvinyl chloride is used, and heat is applied during the

sealing process. The application of heat to channel 59 causes it to resume its original, predeformed state. At the

end of the sealing process, the head 82 is returned to its upper position, valve 86 is operated to connect the

outlet conduit 87 to atmosphere conduit 89, and the lower member 71 is lowered to allow the sealed package to

be removed from the evacuable chamber X.

A method of packaging, as contemplated by the pres-

ent invention, includes forming the cup-like container C having an out-turned flange member at the upper end

thereof. A predetermined quantity of the product P is deposited into the container, and cover member 61 placed

in juxtaposition to the flange member for hermetically sealing the latter along a preselected area having an inner

seal line. As described above, opening 30 is formed, as by punching, in the flange member outwardly of the

inner seal line. The container C and the cover member 61 are placed in the evacuable chamber X, and the cover

member 61 is clamped to the outer flange member 29 outwardly of opening 30 and at two opposite sides of the

cover member. Preferably, at least one of the intermediate sides is left unclamped to aid in the evacuation and

refill of the chamber by the protective atmosphere. The chamber is evacuated through a conduit communicating

outwardly of the package, and the air in the package flows therefrom between the flange member and cover

member at the unclamped side of the package. A flow of protective atmosphere is introduced through opening

30, and said flow stretches the cover member 61 somewhat and the protective atmosphere passes into the con-

tainer. The pressure differential then allows the protective atmosphere to flush the residue from the container

as the protective atmosphere flows into the chamber cavities between the flange member and cover member at

the unclamped side. Thereafter, the cover member is her-

metically sealed to the flange member along the peripheral area to form a sealed package, and the package is

removed from the evacuable chamber.

It is important to note that by the present invention the protective atmosphere is introduced directly into the

package rather than merely into the evacuated chamber surrounding the package. This is particularly significant

when a lighter-than-air gas, such as hydrogen, is utilized.

While a heavier-than-air gas such as carbon dioxide,

would force the residue upwardly and outwardly of the package, the opposite results when a lighter-than-air
gas is used and the residue may tend to become trapped. By causing flow from the container into the cover

member, the protective atmosphere mixes with the residue air within the container and carries the same outwardly

into the chamber.

It is now deemed obvious that the present invention provides a useful packaging method and apparatus which

has advantages of both vacuum and gas flushing. The protective atmosphere is directed into the package and
therefrom into the chamber, and the present invention accomplishes this without the use of any apparatus

extending into the package. Additionally, it can be seen that the sealing is advantageously accomplished in a sin-

gle operation.

The invention in its broader aspects is not limited to the specific steps and apparatus shown and described,

but departures may be made therefrom without departing
from the principles of the invention and without sacrificing its chief advantages.

What is claimed is:

1. In a method of packaging including forming a cup-like container having an out-turned flange member at the upper end thereof, depositing a predetermined quantity of a material to be packaged into the container, and positioning a cover member in juxtaposition to the flange member for sealing thereto along a preselected peripheral area which defines an inner seal line, the improvement comprising the steps of: forming a first opening in one of said members outwardly of the inner seal line, placing said members in an evacuable chamber, holding the cover member in juxtaposition to the flange member while maintaining an unsealed relationship therebetween to provide communication between the container and chamber, reducing the air pressure in the chamber by drawing a vacuum through a second opening spaced from the first opening and causing the air in the container to flow between the unsealed members into the chamber, introducing a protective atmosphere through said first opening and against the opposite member and between said unsealed members into the container and therefrom into the chamber to flush residue of air from the container, thereafter hermetically sealing the cover member to the flange member along said preselected peripheral area to form a sealed package having the protective atmosphere therein, and removing the package from the chamber.

2. A method of making a sealed package having a protective atmosphere therein from two layers of packaging material, comprising the steps of: providing a first opening in one of said layers, placing said layers in an evacuable chamber, maintaining the layers in unsealed relationship while clamping the layers together outwardly of the first opening and at two opposite sides of the package and leaving at least one intermediate side unclamped, evacuating the chamber through a second opening outwardly of the package and causing the air in the package to flow therefrom between the layers at the unclamped side into the chamber thereby evacuating the package, introducing a flow of said protective atmosphere through the first opening and into the package and therefrom into the chamber between the layers at the unclamped side, thereafter hermetically sealing said layers together completely around the periphery thereof and inwardly of the first opening, and removing the sealed package from the chamber.

3. In a method of packaging including forming a cup-like container having an out-turned flange at the upper end thereof, depositing a material to be packaged into the container, and positioning an outer cover in juxtaposition to the flange for sealing thereto, the improvement comprising the steps of: forming the flange with inner and outer portions and with an opening in the outer portion, placing an inner cover contiguous to the inner portion of the flange, forming a channel in one of said inner cover and inner flange portion in the area of the opening to communicate the interior of the container with the opening, placing the container and covers in an evacuable chamber, reducing the pressure in the chamber, introducing a protective atmosphere through the opening and channel into the container, hermetically sealing the outer cover to the outer flange portion inwardly of the opening to provide a sealed package having the protective atmosphere therein, and removing the package from the chamber.

4. A method as set forth in claim 3 including ironing out at least a portion of the channel during the sealing step.

5. In a method of packaging including forming a cup-like container having an out-turned flange member at the open end thereof, depositing a material to be packaged into the container, and positioning an outer cover member in juxtaposition to the flange for sealing thereto, the improvement comprising the steps of: placing an inner cover in position overlapping the open end of the container and contiguous to an inner portion of the flange member, spacing at least a portion of the inner cover away from the inner portion of the flange member at one side of the container to provide a flow channel into the interior of the container, reducing the pressure in the container, introducing a protective atmosphere between said members and through the flow channel into the container, and thereafter hermetically sealing the outer cover member to the flange member outwardly of said inner portion thereof to provide a sealed package having the protective atmosphere therein.

6. In a packaging apparatus including first forming means for forming a container having an out-turned peripheral flange member with inner and outer portions at the open end thereof; means for depositing a quantity of a material to be packaged into the container; means for positioning a cover member overlying the container and in juxtaposition to the flange member; an evacuable chamber including upper and lower enclosing means movable relative to each other between one position to provide a substantially gas-tight chamber and a second position removed from the one position to provide an opening for entry of the container and cover member, said upper and lower enclosing means operative in the one position to support the container and cover member; and means communicating with the chamber outwardly of the container for reducing the pressure in the chamber and container to a value below atmospheric; the improvement comprising:

- means for forming an opening in the outer portion of the flange member prior to entry of the container into the chamber;
- second forming means for forming an inner cover for spanning the open end of the container and supported by the inner portion of the flange member;
- means for placing the inner cover in a position contiguous to the inner portion of the flange member prior to the cover member being juxtaposed to the flange member;
- one of the first and second forming means operative to form a channel for communicating the flange opening with the interior of the container;
- means communicating with the flange opening and terminating at the underside of the flange for introducing a protective atmosphere through the flange opening and channel into the container to return the pressure in the container and chamber generally to atmospheric;
- a sealing head disposed in the chamber above the cover member and having a lower portion shaped for hermetically sealing the cover member to the flange member and inwardly of the flange opening; and
- means for moving the sealing head and container relative to each other to engage the sealing head with the cover member after the container and chamber have been generally refilled with the protective atmosphere.

7. A packaging apparatus including:

- first forming means for forming a container having at the open end thereof an out-turned peripheral flange with inner and outer portions;
- second forming means for forming an inner cover for spanning the open end of the container;
- means for positioning the inner cover contiguous to the inner portion of the flange;
- one of the first and second forming means being operative to form a shape that dispenses at least a portion of the inner cover away from the inner portion of the flange when positioned by the last-mentioned means to provide communication with the interior of the container;
- means for positioning an outer cover overlying the container and inner cover and in juxtaposition to the outer portion of the flange;
- means for introducing a protective atmosphere between
the inner cover and flange member and into the container; and

a sealing head for hermetically sealing the outer cover to the outer portion of the flange to complete a sealed package having the protective atmosphere therein.

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