Clamps, systems, and methods for evacuating and hermetically sealing bags having an interior region and an open end. In one embodiment, a clamp includes a first clamp portion having a first chamber portion and a second clamp portion having a second chamber portion. The second clamp portion is movable between a released position and a clamped position. When the second clamp portion is in the clamped position, the first and second chamber portions define a vacuum chamber for removing gas from the bag. The clamp further includes a valve carried by the first or second clamp portion to control the flow of the gas out of the vacuum chamber.
FIG. 3
POSITION BAG IN CLAMP

CLAMP AND SEAL BAG

REMOVE GAS FROM BAG

STORE SEALED BAG WITH CLAMP

RELEASE AND UNSEAL BAG

FIG. 9
CLAMPS, SYSTEMS, AND METHODS FOR EVACUATING AND HERMETICALLY SEALING BAGS

CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of Brakes U.S. Provisional Patent Application No. 60/490,364, filed Jul. 24, 2003, which is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

The present invention generally relates to vacuum packaging. More particularly, the invention is directed to clamps, systems, and methods for evacuating and hermetically sealing bags.

BACKGROUND

Vacuum packaging involves removing air or other gases from a storage container and then sealing the container to prevent the contents from being exposed to the air. Vacuum packaging is particularly useful in protecting food and other perishables against oxidation. Oxygen is a main cause of food spoilage and contributes to the growth of bacteria, mold, and yeast. Accordingly, vacuum packaged food often lasts three to five times longer than food stored in ordinary containers. Moreover, vacuum packaging is useful for storing clothes, photographs, silver, and other items to prevent discoloration, corrosion, rust, and tarnishing. Furthermore, vacuum packaging produces tight, strong, and compact packages to reduce the bulk of articles and allow for more space to store other supplies.

FIGS. 1A and 1B are schematic isometric views of a conventional appliance 80 for vacuum packaging an object 79 in accordance with the prior art. The vacuum packaging appliance 80 includes a base 82, a lid 90 pivotedly coupled to the base 82, a lower trough 84, an upper trough (not shown) aligned with the lower trough 84, and a vacuum pump (not shown) operably coupled to the upper trough. The lid 90 pivots between an open position (shown in FIG. 1B) in which a bag 70 can be placed between the lid 90 and the base 82 and a closed position (shown in FIG. 1A) in which the bag 70 can be evacuated and thermally sealed. In the closed position, the upper trough and the lower trough 84 form a vacuum chamber to remove gas from the interior of the bag 70. The base 82 also includes a seal 85 surrounding the vacuum chamber to seal the chamber from ambient air while gas is removed from the interior of the bag 70. The vacuum packaging appliance 80 also includes a heating element 88 to thermally seal the bag 70 after the gas has been evacuated.

Conventional vacuum packaging bags include two panels attached together with an open end. Typically, the panels each include two or more layers. The inner layer can be a heat sealable material, and the outer layer can be a gas impermeable material to provide a barrier against the influx of air. The plasticity temperature of the inner layer is lower than the outer layer. Accordingly, the bag can be heated to thermally bond the inner layer of each panel together to seal the bag without melting or puncturing the outer layer during the heat sealing cycle.

A conventional vacuum packaging process includes depositing the object 79 into the bag 70 and positioning an open end 71 of the bag 70 proximate to the lower trough 84 of the vacuum packaging appliance 80. Next, the lid 90 pivots downward to form the vacuum chamber around the open end 71 of the bag 70. The vacuum pump then removes gas from the vacuum chamber and the interior of the bag 70, which is in fluid communication with the vacuum chamber. After the gas has been removed from the interior of the bag 70, the heating element 88 heats a strip of the bag 70 proximate to the open end 71 to melt the inner layer of each panel and thermally seal the bag 70.

One problem with conventional vacuum packaging methods is that thermally sealed bags cannot be resealed and reopened numerous times. More specifically, a thermally sealed bag is opened by cutting the bag below the seal. The bag can be subsequently resealed; however, each time the bag is reopened, another portion of the bag is cut off. Another problem with conventional vacuum packaging methods is that the bags must have at least two layers, each with a different plasticity temperature. The plasticity temperature of the layers is different so that the inner layer of the panels can be heated and bonded together without puncturing or melting the outer layer. Bags having panels with two different layers are expensive and complex to manufacture. Accordingly, there is a need to improve the process of vacuum packaging bags.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGS. 1A and 1B are schematic isometric views of a conventional appliance for vacuum packaging objects in accordance with the prior art.

FIG. 2 is a schematic isometric view of a system for evacuating and hermetically sealing a bag in accordance with one embodiment of the invention.

FIG. 3 is an enlarged schematic side view of a portion of the bag of FIG. 2.

FIG. 4 is a schematic side cross-sectional view of the clamp of FIG. 2 with the first and second clamp portions in the clamped position.

FIG. 5 is a schematic isometric view of a clamp in accordance with another embodiment of the invention.

FIG. 6 is a schematic side cross-sectional view of the clamp of FIG. 5 with the first and second clamp portions in the clamped position.

FIG. 7 is a schematic isometric view of a clamp in accordance with another embodiment of the invention.

FIG. 8 is a schematic side cross-sectional view of the clamp of FIG. 7 with the first and second clamp portions in the clamped position.

FIG. 9 is a flow diagram illustrating one method of operating the clamp of FIG. 7.

FIG. 10 is a schematic side cross-sectional view of a system for evacuating and hermetically sealing a bag in accordance with another embodiment of the invention.

DETAILED DESCRIPTION

A. Overview

The present invention is directed to clamps, systems, and methods for evacuating and hermetically sealing bags. In the following description, numerous specific details are provided of particular clamp configurations to provide a thorough understanding of and an enabling description for embodiments of the invention. Those of ordinary skill in the
art, however, will recognize that the invention can be practiced without one or more of the specific details explained in the following description. In other instances, well-known structures and operations are not shown or described in detail to avoid obscuring aspects of the invention.

[0020] One aspect of the invention is directed to clamps for substantially evacuating and hermetically sealing bags having an interior region and an open end. In one embodiment, a clamp includes a first clamp portion having a first chamber portion and a second clamp portion having a second chamber portion. The second clamp portion is movable relative to the first clamp portion between a released position and a clamped position. When the second clamp portion is in the clamped position, the first and second chamber portions define a vacuum chamber for removing gas from the bag. The clamp further includes a valve carried by the first or second clamp portion to control the flow of gas into and/or out of the vacuum chamber. In one aspect of this embodiment, the first clamp portion is pivotally coupled to the second clamp portion. Alternatively, the first clamp portion can further include a slot and the second clamp portion can be sized and configured to slide at least partially into the slot. In another aspect of this embodiment, the clamp further includes a seal coupled to the first or second clamp portion. The seal circumscribes the vacuum chamber.

[0021] In another embodiment, a clamp includes a first clamp portion having a recess to receive the open end of the bag and a second clamp portion having a surface. The second clamp portion is configured to selectively engage the first clamp portion so that the surface and the recess define a vacuum chamber. The vacuum chamber is configured to be in fluid communication with the interior region of the bag when the open end of the bag is received in the vacuum chamber. The clamp further includes a valve carried by the first or second clamp portion to control the flow of gas into and/or out of the vacuum chamber. In one aspect of this embodiment, the valve is a one-way valve to allow gas in the interior region of the bag to be exhausted from the vacuum chamber. The clamp can further include a release valve coupled to the first or second clamp portion to selectively allow gas from an ambient environment to flow into the vacuum chamber.

[0022] Another aspect of the invention is directed to systems for hermetically sealing bags having an interior region and an open end. In one embodiment, a system includes a clamp having a first chamber portion and a second chamber portion. The second chamber portion is movable relative to the first chamber portion between a released position and a clamped position. The first and second chamber portions define a vacuum chamber configured to be in fluid communication with the interior region of the bag when the second chamber portion is in the clamped position and the open end of the bag is received in the vacuum chamber. The system further includes a valve carried by the first or second chamber portion to control the flow of gas out of the vacuum chamber, an exhaust line coupleable to the valve, and a vacuum pump coupleable to the exhaust line to remove the gas from the vacuum chamber and the interior region of the bag.

[0023] Another aspect of the invention is directed to methods for hermetically sealing bags with clamps. The bags have an open end and an interior region, and the clamps have a first clamp portion and a second clamp portion. In one embodiment, a method includes clamping a portion of the bag with the first and second clamp portions to hermetically seal the bag with the open end received in a vacuum chamber defined by the first and second clamp portions. The vacuum chamber is in fluid communication with the interior region of the bag and hermetically sealed from an external environment. The method further includes removing gas from the vacuum chamber and the interior region of the bag and storing the clamped and sealed bag with the clamp.

[0024] B. Embodiments of Systems for Evacuating and Hermetically Sealing Bags

[0025] FIG. 2 is a schematic isometric view of a system 100 for evacuating and hermetically sealing a bag 170 containing an object 179 (shown in broken lines) in accordance with one embodiment of the invention. In the illustrated embodiment, the system 100 includes a clamp 110 for attachment to the bag 170, a vacuum pump 180 (shown schematically) for removing gas from the bag 170, and an exhaust line 198 coupling the clamp 110 to the vacuum pump 180. The vacuum pump 180 can be a stand-alone device or part of a larger apparatus. For example, a vacuum sealing appliance, such as the appliance described in U.S. Pat. No. 4,941,310, which is hereby incorporated by reference in its entirety, can include a vacuum pump which is coupled to the clamp 110.

[0026] The clamp 110 includes a first clamp portion 120 and a second clamp portion 140 movably coupled to the first clamp portion 120 to hermetically seal the bag 170. In the illustrated embodiment, the first clamp portion 120 is pivotally coupled to the second clamp portion 140 by a hinge 118. Accordingly, the first clamp portion 120 pivots relative to the second clamp portion 140 between a released position (shown in FIG. 2) in which the bag 170 can be placed between the first and second clamp portions 120 and 140 and a clamped position (shown in FIG. 4) in which the bag 170 can be clamped and sealed.

[0027] In the illustrated embodiment, the first clamp portion 120 includes an inner surface 130 and a recess 124 in the inner surface 130 to receive an open end 171 of the bag 170. The recess 124 includes a bottom surface 126 and a plurality of side walls 128. The recess 124 has a generally constant depth and a length L corresponding to a width W of the bag 170. More specifically, the length L of the recess 124 is greater than the width W of the bag 170 so that the open end 171 of the bag 170 can be received at least partially in the recess 124. In other embodiments, the depth can vary across the length L and/or the width of the recess 124. The first clamp portion 120 of the illustrated embodiment further includes a seal 132 attached to the inner surface 130. The seal 132 circumscribes the recess 124 to hermetically seal the vacuum chamber of the clamp 110. The seal 132 can be made of an elastomeric or other flexible material to form a seal around the bag 170 when the bag 170 is positioned between the first and second clamp portions 120 and 140. In one embodiment, the seal 132 and the first clamp portion 120 are made of food-safe and washable materials so that the clamp 110 can be used with bags containing foodstuffs.

[0028] In the illustrated embodiment, the second clamp portion 140 includes an inner surface 150 and a recess 144 in the inner surface 150. The recess 144 includes a bottom surface 146 and a plurality of side walls 148, and is generally
aligned with the recess 124 in the first clamp portion 120 when the first and second clamp portions 120 and 140 are in the clamped position. The second clamp portion 140 further includes a seal 152 attached to the inner surface 150 and circumferencing the recess 144. The recess 124 and the seal 132 of the first clamp portion 120 form a first chamber portion 122, and the recess 144 and the seal 152 of the second clamp portion 140 form a second chamber portion 142. When the first and second clamp portions 120 and 140 are in the clamped position, the first and second chamber portions 122 and 142 define a vacuum chamber 112 to remove gas from an interior region 172 of the bag 170.

In other embodiments, the first clamp portion 120 and/or the second clamp portion 140 may not include a recess. For example, in one embodiment, the inner surface 150 of the second clamp portion 140 does not include the recess 144, and consequently the seal 152 and the inner surface 150 form the second chamber portion 142. In additional embodiments, the first chamber portion 120 and/or the second chamber portion 140 may not include seals or may include seals with other configurations. In other embodiments, the clamp 110 can further include a removable trough disposed within one of the recesses 124 and 144 to collect liquids and other materials that are removed with the gas from the interior region 172 of the bag 170. In additional embodiments, the vacuum chamber can be independent of the first and second clamp portions 120 and 140. For example, the vacuum chamber can be formed by a separate member disposed within or located external to the first and second clamp portions 120 and 140.

The clamp 110 of the illustrated embodiment further includes a valve 160 (shown schematically) in fluid communication with the recess 144 and the exhaust line 198 to control the flow of gas into and/or out of the vacuum chamber 112. The valve 160 can be disposed between an outer edge 154 and the recess 144 of the second clamp portion 140 or carried by the first or second clamp portion 120 or 140 at another position. In additional embodiments, the valve 160 may be external to and spaced apart from the clamp 110, but still in fluid communication with the vacuum chamber 112. In any of these embodiments, the valve 160 can be a one-way valve to permit the vacuum pump 180 to draw gas out of the vacuum chamber 112, but not allow gas to flow from the ambient environment into the vacuum chamber 112. In other embodiments, the valve 160 can selectively permit gas to flow into the vacuum chamber 112 from the ambient environment to facilitate pivoting of the first and second clamp portions 120 and 140 from the clamped position to the released position, as described in detail below with reference to FIG. 5.

FIG. 3 is an enlarged schematic side view of a portion of the bag 170 of FIG. 2 with the side panels pressed together. Referring to FIGS. 2 and 3, the bag 170 includes a first panel 273 and a second panel 274 opposite the first panel 273. The first and second panels 273 and 274 define the interior region 172 into which objects may be placed. In the illustrated embodiment, the panels 273 and 274 each have a first layer 276, which is made of a gas impermeable material. The panels 273 and 274 can optionally further include a second layer 277 (shown in broken lines) to increase the strength and rigidity of the bag 170. The second panel 274 also includes a plurality of intersecting channels 275 to exhaust gas from the interior region 172 of the bag 170 when the panels 273 and 274 are pressed together as shown in FIG. 3. Accordingly, when the clamp 110 is in the clamped position and the bag 170 is sandwiched between the first and second clamp portions 120 and 140, gas can be evacuated from the interior region 172 of the bag 170 through the channels 275. The clamp 110, however, can be used with bags that do not include channels or that have other configurations. For example, the clamp 110 can be used with bags that include a plurality of layers, such as the bags disclosed in U.S. Pat. No. RE 34,929, which is hereby incorporated by reference in its entirety.

FIG. 4 is a schematic side cross-sectional view of the clamp 110 with the first and second clamp portions 120 and 140 in the clamped position. After the open end 171 of the bag 170 is placed proximate to the recess 124, the second clamp portion 140 is pivoted in a direction S1 to sandwich the bag 170 between the first and second clamp portions 120 and 140. The portion of the seals 132 and 152 adjacent to the bag 170 compresses and deforms around the bag 170 to hermetically seal the vacuum chamber 112 from the ambient environment. Because the interior region 172 of the bag 170 is in fluid communication with the vacuum chamber 112, the vacuum pump 180 (FIG. 2) can draw gas out of the vacuum chamber 112 and the interior region 172 of the bag 170. After the vacuum pump 180 (FIG. 2) evacuates the vacuum chamber 112 and the interior region 172, the exhaust line 198 (FIG. 2) is disconnected from the clamp 110, and the clamp 110 and bag 170 can be stored.

In one aspect of this embodiment, the clamp 110 tends to remain in the clamped position after the interior region 172 of the bag 170 and the vacuum chamber 112 have been evacuated because of the difference in pressure outside and inside the clamp 110. More specifically, because the ambient pressure outside the clamp 110 is greater than the pressure inside the vacuum chamber 112, an external force is required to pivot the first and second clamp portions 120 and 140 from the clamped position to the released position. In other embodiments, such as the embodiment described below with reference to FIG. 5, the clamp 110 can have a securing device to selectively lock the first and second clamp portions 120 and 140 in the clamped position.

One feature of the clamp of the illustrated embodiment is that the clamp can seal and release a bag repeatedly without consuming or damaging the bag. An advantage of this feature is that the life of the bag is significantly extended, and accordingly the cost associated with replacing the bag is reduced. Prior art devices thermally seal bags by bonding the inner layers of the panels together. To open thermally sealed bags, the bags must be cut, which damages and consumes a portion of the bags. Consequently, thermally sealed bags have a limited life and must be replaced frequently.

Another feature of the clamp of the illustrated embodiment is that the clamp seals bags with a single layer and bags with multiple layers. An advantage of this feature is that the clamp can be used with a wide variety of bags. Many prior art devices require that bags have at least two layers with different plasticity temperatures so that the inner layer of the bags can be thermally sealed without damaging the outer layer. These bags with multiple layers are more expensive and complex to produce.
FIG. 5 is a schematic isometric view of a clamp 310 in accordance with another embodiment of the invention. The clamp 310 is generally similar to the clamp 310 described above with reference to FIGS. 2 and 4. For example, the clamp 310 includes a first clamp portion 320 and a second clamp portion 340 pivotably coupled to the first clamp portion 320. In this embodiment, the first clamp portion 320 includes a recess 324, a seal 312, and a guide rail 334 to assist the user in properly positioning the open end 171 of the bag 170 (FIG. 2) between the first and second clamp portions 320 and 340. The guide rail 334 includes a first portion 336 attached to the bottom surface 126 of the recess 124 and a second portion 338 projecting from the first portion 336. The first portion 336 can be oriented generally perpendicular to the bottom surface 126, and the second portion 338 can be oriented generally perpendicular to the first portion 336. In operation, the user can position the open end 171 of the bag 170 against the first portion 336 of the guide rail 334 to ensure the open end 171 is disposed within a vacuum chamber 412 when the first and second clamp portions 320 and 340 are in the clamped position. Thus, the guide rail 334 prevents a user from positioning the bag 170 such that the open end 171 becomes sandwiched between the seals 132 and 152 and consequently the interior region 172 of the bag 170 is not in fluid communication with the vacuum chamber 412. In other embodiments, the clamp 310 may not include a guide rail or may include a guide rail with a different configuration.

The clamp 310 of the illustrated embodiment further includes a securing device 364 to selectively lock the first and second clamp portions 320 and 340 in the clamped position. The securing device 364 includes a support member 366 attached to the first clamp portion 320 and an engagement member 368 projecting from the support member 366. The support member 366 can be made of a flexible material to bend around the first and second clamp portions 320 and 340 and lock the clamp 310 in the clamped position (as shown in FIG. 6). The second clamp portion 340 includes a side wall 341 with a recess 369 to receive the engagement member 368. The recess 369 and the engagement member 368 can be sized and configured to form a frictional fit to selectively lock the clamp 310. In other embodiments, the clamp 310 may not have a securing device or the securing device may have another configuration. For example, the securing device may include straps with buttons, loops, or Velcro®.

The clamp 310 can further include a release valve 362 (shown schematically) carried by the second clamp portion 340 to allow ambient air to flow into the vacuum chamber 312 to facilitate moving the first and second clamp portions 320 and 340 from the clamped position to the released position. As described above, after the gas is evacuated from the vacuum chamber 312, the pressure outside the clamp 310 is greater than the pressure within the vacuum chamber 312. Because of the pressure differential, a significant force is required to move the first clamp portion 320 relative to the second clamp portion 340. The pressure differential can be reduced or eliminated by flowing ambient air into the vacuum chamber 312, thereby reducing the force required to move the first and second clamp portions 320 and 340 from the clamped position to the released position. In other embodiments, the clamp 310 may not include a release valve 362 or the valve 160 can also function as a release valve.

FIG. 6 is a schematic side cross-sectional view of the clamp 310 with the first and second clamp portions 320 and 340 in the clamped position. After the open end 171 of the bag 170 is positioned against the guide rail 334, the second clamp portion 340 is pivoted in a direction S3 to sandwich the bag 170 between the first and second clamp portions 320 and 340. The portion of the seals 132 and 152 adjacent to the bag 170 compresses and hermetically seals the vacuum chamber 312 from the ambient environment. Once the bag 170 has been clamped, gas is removed from the interior region 172 and the securing device 364 is moved to lock the clamp 310 in the clamped position. To lock the clamp 310, the support member 366 pivots in a direction D3 to insert the engagement member 368 into the recess 369 of the second clamp portion 340, and the bag 170 flexes as it is sandwiched between the engagement member 368 and the recess 369.

FIG. 7 is a schematic isometric view of a clamp 410 for use in evacuating and hermetically sealing bags in accordance with another embodiment of the invention. The clamp 410 includes a first clamp portion 420 and a second clamp portion 440 configured to slideably engage the first clamp portion 420. The first clamp portion 420 includes a first recess 424 extending into the first clamp portion 420 in a first direction and a second recess 425 extending into the first clamp portion 420 in a second direction generally perpendicular to the first direction. The first recess 424 is a slot that is sized and configured to receive a bag, and the second recess 425 is a slot sized and configured to receive the second clamp portion 440.

FIG. 8 is a schematic side cross-sectional view of the clamp 410 with the first and second clamp portions 420 and 440 in the clamped position. The first clamp portion 420 includes a surface 426 at the bottom of the second recess 425 that forms a first chamber portion 422. The second clamp portion 440 includes a bottom surface 450 and a seal 452 attached to the bottom surface 450. The bottom surface 450 and the seal 452 form a second chamber portion 442. The first and second chamber portions 422 and 442 accordingly define a vacuum chamber 412 for removing gas from the interior region 172 of the bag 170. The first clamp portion 420 further includes an aperture 427 at the bottom of the second recess 425 to remove gas from the vacuum chamber 412. A valve similar to the valve 160, described above with reference to FIG. 2, can be coupled to the aperture 427 to control the flow of gas into and/or out of the vacuum chamber 412.

FIG. 9 is a flow diagram illustrating one method of operating the clamp 410. Referring to FIGS. 8 and 9, at block 500, the open end 171 of the bag 170 is inserted through the first recess 424 and positioned within the second recess 425. At block 502, the second clamp portion 440 slides into the second slot 425 in a direction S3 to sandwich the bag 170 between the first and second clamp portions 420 and 440. The portion of the seal 452 that contacts the bag 170 deforms to hermetically seal the vacuum chamber 412 from the ambient environment. At block 504, gas from the vacuum chamber 412 and the interior region 172 of the bag 170 is removed through the aperture 427. At block 506, once
the gas is removed, the sealed and clamped bag 170 and the clamp 410 can be stored. At block 508, to subsequently access the contents of the bag 170, the second clamp portion 440 is moved from the clamped position to the released position to unseal and release the bag 170.

[0044] In additional embodiments, the clamp 410 can include a securing device to lock the second clamp portion 440 in the clamped position. For example, the second clamp portion 440 can have a taper so that an upper portion 441 has a greater width than a lower portion 443 to create a frictional fit in the second slot 425. In other embodiments, the second clamp portion 440 can include a handle to allow a user to easily remove the second clamp portion 440 from the second slot 425.

[0045] D. Embodiments of Vacuum Packaging Appliances for Use with Clamps

[0046] FIG. 10 is a schematic side cross-sectional view of a system 600 for evacuating and hermetically sealing the bag 170 in accordance with another embodiment of the invention. In the illustrated embodiment, the system 600 includes a clamp 610 and a vacuum packaging appliance 680 (shown schematically) configured to removably receive the clamp 610 and evacuate the bag 170. The vacuum packaging appliance 680 can be generally similar to the appliance 80 described above with reference to FIGS. 1A and 1B. For example, the vacuum packaging appliance 680 can include a base 662, a lid 690 pivotally coupled to the base 682, a lower trough 684 in the base 682, an upper trough 691 in the lid 690, and a vacuum pump 692 (shown schematically) in fluid communication with the lower and/or upper trough 684 or 691. The vacuum packaging appliance 680 can also include a lower seal 685 surrounding the lower trough 684 and an upper seal 693 surrounding the upper trough 691.

[0047] The lid 690 can be movable between an open position, in which the clamp 610 can be placed into the appliance 680, and a closed position (shown in FIG. 10). When the lid 690 is in the closed position, the lower and upper troughs 684 and 691 form a vacuum chamber, which can be evacuated by the vacuum pump 692. In the illustrated embodiment, the lower and upper troughs 684 and 691 are sized and configured to receive the clamp 610. The lower trough 684 can include a plurality of support members 689 (identified individually as 689a-b) to carry the clamp 610. In other embodiments, the vacuum packaging appliance 680 can have other configurations to removably receive the clamp 610 or other clamps.

[0048] In the illustrated embodiment, the clamp 610 is generally similar to the clamp 410 described above with reference to FIGS. 7 and 8. For example, the clamp 610 includes a first clamp portion 620, a second clamp portion 640 configured to slideably engage the first clamp portion 620, and a seal 652 attached to the second clamp portion 640. When the second clamp portion 640 engages the first clamp portion 620, the seal 652 and the first and second clamp portions 620 and 640 define a vacuum chamber 612 to remove gas from the interior of the bag 170. In this embodiment, the first and second clamp portions 620 and 640 are sized and configured to be received in the lower and/or upper trough 684 and 691 of the vacuum packaging appliance 680.

[0049] The clamp 610 further includes a one-way valve 660 (shown schematically) carried by the first clamp portion 620 and in fluid communication with the vacuum chamber 612. The one-way valve 660 allows gas to flow from the vacuum chamber 612 to the lower trough 684. Accordingly, when the clamp 610 is positioned in the vacuum chamber of the vacuum packaging appliance 680, the vacuum pump 692 can remove gas from the interior of the bag 170. In other embodiments, the clamp 610 can have other configurations, including configurations similar to the clamp 110 described above with reference to FIG. 2.

[0050] From the foregoing, it will be appreciated that specific embodiments of the invention have been described herein for purposes of illustration, but that various modifications may be made without deviating from the spirit and scope of the invention. Accordingly, the invention is not limited except as by the appended claims.

I/We claim:

1. A clamp to substantially evacuate and hermetically seal a bag having an interior region and an open end, the clamp comprising:

   a first clamp portion having a first chamber portion;
   a second clamp portion having a second chamber portion, the second clamp portion being movable relative to the first clamp portion between a released position and a clamped position, the first and second chamber portions at least partially defining a vacuum chamber for removing gas from the bag through the open end when the second clamp portion is in the clamped position; and
   a valve carried by the first or second clamp portion to control the flow of the gas out of the vacuum chamber.

2. The clamp of claim 1 wherein:

   the first clamp portion is pivotally coupled to the second clamp portion;
   the first chamber portion includes a first recess and the second chamber portion includes a second recess, the first and second recesses at least partially defining the vacuum chamber;
   the valve is a one-way valve to allow the gas to be exhausted from the vacuum chamber; and
   the clamp further comprises a first seal coupled to the first clamp portion and a second seal coupled to the second clamp portion, the first and second seals circumscribing the vacuum chamber.

3. The clamp of claim 1 wherein:

   the first clamp portion further includes a first slot extending into the first clamp portion in a first direction and a second slot extending into the first clamp portion in a second direction generally perpendicular to the first direction, the first slot intersecting the second slot and being configured to receive the open end of the bag, the second slot having a first surface defining part of the vacuum chamber;
   the second chamber portion being sized and configured to slide into the second slot and having a second surface defining part of the vacuum chamber, the second surface being juxtaposed to the first surface when the second clamp portion is in the clamped position; and
the clamp further comprises a seal coupled to the first or second surface, the seal circumscribing the vacuum chamber.

4. The clamp of claim 1 wherein the first clamp portion is pivotally coupled to the second clamp portion.

5. The clamp of claim 1 wherein:
the first clamp portion further includes a slot; and
the second clamp portion is sized and configured to slide at least partially into the slot.

6. The clamp of claim 1, further comprising a seal coupled to the first or second clamp portion, the seal circumscribing the vacuum chamber.

7. The clamp of claim 1 wherein the valve is a one-way valve to allow the gas to be exhausted from the vacuum chamber.

8. The clamp of claim 1 wherein:
the valve is a one-way valve to allow the gas in the bag to be exhausted from the vacuum chamber; and
the clamp further comprises a release valve coupled to the first or second clamp portion to selectively allow gas from an ambient environment to flow into the vacuum chamber to facilitate movement of the second clamp portion from the clamped position to the released position.

9. The clamp of claim 1 wherein the vacuum chamber is configured to be in fluid communication with the interior region of the bag and hermetically sealed from an ambient environment when the second clamp portion is in the clamped position.

10. The clamp of claim 1 wherein the first chamber portion includes a first recess and the second chamber portion includes a second recess.

11. The clamp of claim 1, further comprising a securing device coupled to the first and/or second clamp portion to selectively lock the second clamp portion in the clamped position.

12. The clamp of claim 1 wherein the first clamp portion further includes a guide rail to facilitate proper positioning of the open end of the bag in the first chamber portion.

13. The clamp of claim 1 wherein the clamp is reusable.

14. The clamp of claim 1 wherein the clamp is washable.

15. The clamp of claim 1 wherein the clamp is safe for use with foodstuffs.

16. The clamp of claim 1 wherein the clamp is sized and configured to be received in a vacuum packaging appliance.

17. A clamp to substantially evacuate and hermatically seal a bag having an interior region and an open end, the clamp comprising:
a first clamp portion;
a second clamp portion movable relative to the first clamp portion between a released position and a clamped position, the first and second clamp portions configured to clamp the bag when the second clamp portion is in the clamped position;
a vacuum chamber for removing gas from the bag through the open end when the second clamp portion is in the clamped position; and
a valve carried by the first or second clamp portion to control the flow of the gas out of the vacuum chamber.

18. The clamp of claim 17 wherein the vacuum chamber is configured to be hermetically sealed from an ambient environment when the second clamp portion is in the clamped position.

19. The clamp of claim 17 wherein the first clamp portion is pivotally coupled to the second clamp portion.

20. The clamp of claim 17 wherein the clamp is sized and configured to be received in a vacuum packaging appliance.

21. A clamp to substantially evacuate and hermatically seal a bag having an interior region and an open end, the clamp comprising:
a first clamp portion;
a second clamp portion movable relative to the first clamp portion between a released position and a clamped position, the first and second clamp portions configured to clamp the bag when the second clamp portion is in the clamped position;
a vacuum chamber for removing gas from the bag through the open end when the second clamp portion is in the clamped position; and
a valve operably coupled to the first or second clamp portion to control the flow of the gas out of the vacuum chamber.

22. The clamp of claim 21 wherein the vacuum chamber is configured to be hermetically sealed from an ambient environment when the second clamp portion is in the clamped position.

23. The clamp of claim 21 wherein the first clamp portion is pivotally coupled to the second clamp portion.

24. A clamp for hermatically sealing a bag having an interior region and an open end, the clamp comprising:
a first clamp portion having a recess to receive the open end of the bag;
a second clamp portion having a surface, the second clamp portion configured to selectively engage the first clamp portion so that the surface and the recess define at least in part a vacuum chamber, the vacuum chamber configured to be in fluid communication with the interior region of the bag when the open end of the bag is received in the vacuum chamber; and
a valve carried by the first or second clamp portion to control the flow of a gas out of the vacuum chamber.

25. The clamp of claim 24 wherein the first clamp portion is pivotally coupled to the second clamp portion.

26. The clamp of claim 24 wherein:
the first clamp portion further includes a slot; and
the second clamp portion is sized and configured to slide at least partially into the slot.

27. The clamp of claim 24, further comprising a seal coupled to the first or second clamp portion, the seal circumscribing the vacuum chamber.

28. The clamp of claim 24 wherein:
the valve is a one-way valve to allow gas in the interior region of the bag to be exhausted from the vacuum chamber; and
the clamp further comprises a release valve coupled to the first or second clamp portion to selectively allow gas from an ambient environment to flow into the vacuum chamber.
29. The clamp of claim 24 wherein the vacuum chamber is hermetically sealed from an ambient environment when the second clamp portion engages the first clamp portion.

30. A clamp to seal a bag having an open end and an interior region, the clamp comprising:
   a first clamp portion having a first surface;
   a second clamp portion having a second surface, the second clamp portion being movable relative to the first clamp portion between a released position and a clamped position;
   a seal coupled to the first or second surface, the seal, the first clamp portion, and the second clamp portion configured to hermetically seal the interior region of the bag when the second clamp portion is in the clamped position and the open end of the bag is disposed between the first and second clamp portions; and
   a valve carried by the first or second clamp portion to control the flow of gas out of the interior region of the bag.

31. The clamp of claim 30 wherein the first clamp portion is pivotally coupled to the second clamp portion.

32. The clamp of claim 30 wherein:
   the first clamp portion further includes a slot; and
   the second clamp portion is sized and configured to slide at least partially into the slot.

33. The clamp of claim 30 wherein the seal is a first seal coupled to the first surface, and wherein the clamp further comprises a second seal coupled to the second surface.

34. The clamp of claim 30 wherein:
   the valve is a one-way valve to allow the gas in the bag to be exhausted from the clamp; and
   the clamp further comprises a release valve coupled to the first or second clamp portion to selectively allow gas from an ambient environment to flow into the interior region of the bag to facilitate movement of the second clamp portion from the clamped position to the released position.

35. The clamp of claim 30 wherein the first clamp portion further includes a first recess in the first surface and the second clamp portion further includes a second recess in the second surface, the first and second recesses defining at least in part a vacuum chamber when the second clamp portion is in the clamped position, the vacuum chamber configured to be in fluid communication with the interior region of the bag and hermetically sealed from an ambient environment.

36. A system for hermetically sealing a bag having an interior region and an open end, the system comprising:
   a clamp including a first portion and a second portion movable relative to the first portion between a released position and a clamped position, the first and second portions defining a vacuum chamber configured to be in fluid communication with the interior region of the bag when the second portion is in the clamped position and the open end of the bag is received in the vacuum chamber;
   a valve operably coupled to the vacuum chamber to control the flow of gas out of the vacuum chamber;
   a vacuum pump coupleable to the exhaust line to remove the gas from the vacuum chamber and the interior region of the bag.

37. The system of claim 36 wherein the first chamber portion is pivotally coupled to the second chamber portion.

38. The system of claim 36 wherein the first chamber portion slideably engages the second chamber portion.

39. The system of claim 36 wherein the clamp further includes a seal coupled to the first or second chamber portion, the seal circumscribing the vacuum chamber.

40. The system of claim 36 wherein the vacuum chamber is hermetically sealed from an ambient environment when the second chamber portion is in the clamped position.

41. The system of claim 36 wherein the first chamber portion includes a first recess and the second chamber portion includes a second recess.

42. The system of claim 36 wherein the clamp further includes a securing device coupled to the first and/or second chamber portion to selectively lock the second chamber portion in the clamped position.

43. A system for selectively evacuating and sealing a bag having an interior region and an open end, the system comprising:
   a clamp including a first clamp portion and a second clamp portion, the first clamp portion having a recess, the second clamp portion having a surface and being configured to selectively engage the first clamp portion so that the surface and the recess define at least in part a vacuum chamber for removing gas from the interior region of the bag;
   a valve carried by the first or second chamber portion to control the flow of gas out of the vacuum chamber;
   an exhaust line coupleable to the valve; and
   a vacuum pump coupleable to the exhaust line to remove the gas from the vacuum chamber and the interior region of the bag.

44. The system of claim 43 wherein the first clamp portion is pivotally coupled to the second clamp portion.

45. The system of claim 43 wherein the first clamp portion slideably engages the second clamp portion.

46. The system of claim 43 wherein the clamp further includes a seal coupled to the first or second clamp portion, the seal circumscribing the vacuum chamber.

47. The system of claim 43 wherein the vacuum chamber is configured to be in fluid communication with the interior region of the bag and hermetically sealed from an ambient environment when the second clamp portion engages the first clamp portion.

48. A vacuum packaging appliance for use with a clamp in evacuating a bag, the appliance comprising:
   a base;
   a lid movably coupled to the base;
   a vacuum chamber at least partially within the base and/or lid, the vacuum chamber sized and configured to receive the clamp; and
   a vacuum pump operably coupled to the vacuum chamber to remove gas from the vacuum chamber.

49. The appliance of claim 48, further comprising the clamp removably disposed within the vacuum chamber,
wherein the clamp comprises a first clamp portion, a second clamp portion, and a valve carried by the first or second clamp portion, the second clamp portion being movable relative to the first clamp portion between a released position and a clamped position, the first and second clamp portions being configured to clamp the bag when the second clamp portion is in the clamped position.

50. The appliance of claim 48, further comprising a support member in the vacuum chamber to support the clamp.

51. A reusable vacuum packaging system, comprising:

- a reusable bag having an interior region and an open end; and
- a reusable clamp including a first region and a second region movable relative to the first portion between a released position and a clamped position, the first and second regions hermetically sealing the interior region of the bag when the second portion is in the clamped position and the open end of the bag is positioned between the first and second portions.

52. The system of claim 51 wherein the bag is configured to contain foodstuffs.

53. A vacuum packaging film for use with a clamp that does not require a heat-sealable layer, the vacuum packaging film comprising:

- a gas impermeable layer; and
- a structural layer coupled to the gas impermeable layer, wherein the structural and gas impermeable layers are not coupled to a heat-sealable layer.

54. The vacuum packaging film of claim 53 wherein the film is safe for use with foodstuffs.

55. A method for hermetically sealing a bag with a clamp, the bag including an open end and an interior region, the clamp including a first clamp portion and a second clamp portion, the method comprising:

- clamping a portion of the bag with the first and second clamp portions to hermetically seal the bag with the open end received in a vacuum chamber defined at least partially by the first and second clamp portions, the vacuum chamber being in fluid communication with the interior region of the bag and hermetically sealed from an external environment;
- removing gas from the vacuum chamber and the interior region of the bag; and
- storing the clamped and sealed bag with the clamp.

56. The method of claim 55 wherein the bag is a first bag, the method further comprising:

- releasing and unscrewing the first bag by moving the first clamp portion relative to the second clamp portion;
- clamping a portion of a second bag with the first and second clamp portions to hermetically seal the second bag with an open end of the second bag received in the vacuum chamber;
- removing gas from the vacuum chamber and an interior region of the second bag; and
- storing the clamped and sealed second bag with the clamp.

57. The method of claim 55 wherein removing gas from the vacuum chamber includes drawing gas with a vacuum pump through a one-way valve carried by the first or second clamp portion.

58. The method of claim 55 wherein clamping a portion of the bag includes pivoting the first clamp portion relative to the second clamp portion.

59. The method of claim 55 wherein clamping a portion of the bag includes slideably engaging the first and second clamp portions.