A method of manufacturing the container seal is also provided.
TABBED CONTAINER SEAL AND METHOD OF MANUFACTURE

FIELD OF THE INVENTION

The invention relates to improved container sealing materials and methods of manufacture thereof. More particularly, the invention relates to improved container seals having a tab portion, and methods of manufacturing the tabbed container seals.

BACKGROUND OF THE INVENTION

It is common practice to seal a container with a sheet material, such as paper, a polymeric film, aluminum foil, or a laminate of paper, polymeric film and/or aluminum foil. The use of such seals, in many cases, has been imposed on the packaging industry by FDA regulations, as a protection against product tampering. Such seals can provide evidence of product tampering, since they are typically destroyed by the process of removing the seal. It is also common to line the inner surface of container closures with a moderately compressible material, such as a polymeric material, pulp board, or a multilayer laminated combination thereof. When a closure containing the liner material is secured to the finish of a container, such as by applying a torque force to a threaded closure that is engaged with a threaded container finish, the resulting pressure exerted by the closure onto the liner, which is interposed between the closure and the container finish, produces a substantially liquid and/or gas-tight seal. When the closure is removed from the container, the liner remains within the closure. Re-engaging the closure with the container finish reestablishes the seal. Liner materials can utilize a pulp or paper substrate, polymeric materials, such as polyolefin foams, laminated multilayer lining materials comprising a combination of pulp and/or a polymeric foam along with a polymeric film, metal foil, and the like.

In a typical application, closures for containers are lined with a laminated material having a layer of pulp mounted to a layer of aluminum foil by an intermediate wax layer. Such laminated materials also frequently contain a layer of polymer, such as a polyester film, fixed by an adhesive to the foil, and a layer of heat-sealable polymer fixed by an adhesive to the polyester film. The laminate is
produced and shipped in roll form, which is then cut to the required shape and size, and mounted in a closure with an adhesive or by friction.

In use, the resulting lined closure is torqued onto a container, such as a bottle or jar, which has been filled with a fluid or solid product. Next, the capped container is passed through a high frequency induction heating unit. During induction heating, radio frequency energy heats the aluminum foil to a temperature in excess of about 65 °C, generally about 150 °C or greater. The resulting heat melts the wax in the layer between the pulp and aluminum foil. The melted wax is absorbed by the pulp, causing the pulp to separate from the remainder of the material. The sealing material typically is a thermoplastic material selected to match the material of construction of the container, and is heat-welded (i.e., heat-sealed) to the finish of the container (i.e., the rim around the access opening of the container) utilizing the heat generated from the induction heating of the aluminum foil. Alternatively, the seal can be affixed over the access opening of a container by an adhesive, in which case the sealing material need not be a heat-sealable thermoplastic polymer, and the container is sealed without recourse to induction heating. When a consumer removes the closure from the container, the pulp layer remains in the closure as a liner, leaving the laminated combination of foil, polymer film, and sealing material over the access opening of the container as seal, to provide evidence of tampering and/or to prevent leakage and contamination of the container contents during storage and shipment. To access the contents of the container, the consumer must pierce the seal to remove it from the container.

Other conventional container seals have a die-cut tab extending beyond the limits of the container finish, so that a consumer can grasp the tab and pull the seal off of the container. When a closure is included over the seal, the tab typically is folded over the side of the container finish, between the threads of the closure and of the container finish. When such tabs are induction sealable, they include a metal foil layer and have a heat-sealable polymer layer on their underside. During the induction sealing process the tab can become sealed to the threaded side of the container finish, which is generally undesirable. Alternatively, such tabs can be folded up over the seal so that the tab is sandwiched between the closure and the
seal. In this arrangement, the tab can become sealed to the closure, which is also undesirable. In addition, the shape of the tab can adversely influence the induction sealing of the seal to a container finish. For example, William Zito, in the article entitled "Does Frequency Matter? Comparing Efficiency of Induction Sealers" in Food and Drug Packaging, 1986, reports that the bond between the container finish and the seal is generally weaker in the area where the tab is present relative to the seal along the remainder of the finish. The variability in bonding strength of the seal around the container finish can lead to leakage problems at the weaker point near the tab. An example of a die-cut tabbed container seal is described in U.S. Patent No. 4,778,698 to Ou-Yang.

Other container seals include a tab element constructed from one or more folds in one of the layers of the laminated seal. Such folded-tab or "z-tab" structures are produced by laminating a sheet material having pleats or folds onto a flat sheet of material, so that the folded portion can act as a tab when a container seal is cut from the material in register with the folds. The folded portion of the seal is considerably thicker than the remainder of the seal, leading to uneven pressure on the seal at the container finish (i.e., higher pressure at the folds and lower pressure at the unfolded portions). This can lead to uneven bonding and possible seal failure. More even seals can be obtained when the folded layer is kept as thin as possible, however thin folds have a tendency to tear away from the seal upon removal. An example of such a folded tab seal is described in U.S. Patent No. 4,934,544 to Han. Folded tab structures are complicated to manufacture and have not been readily accepted in the marketplace.

The tabbed container seals of the present invention overcome the deficiencies of the conventional tabbed seals by providing a container seal having a tab portion that does not include a metal foil. The seals of the present invention provide for a uniform bonding strength between the seal and a container finish during an induction sealing process.

**SUMMARY OF THE INVENTION**

The present invention provides an improved container seal including at least one metal-free tab member. The container seal comprises a flexible, metal-
free cover sheet and a flexible sealant sheet. The cover sheet comprises at least one layer of a flexible sheet material and includes a body portion that is sized and shaped to at least cover a container finish and has at least one metal-free tab portion extending from the periphery of the body portion. The flexible sealant sheet comprises a thermoplastic sealing surface layer and a layer of metal foil. The flexible sealant sheet is of the same shape and size as the body portion of the cover sheet. The inner surface of the sealant sheet and the inner surface of the body portion of the cover sheet are bonded together in opposed, congruent contact with each other.

In some preferred embodiments the inner surface of the sealant sheet comprises a polymeric barrier layer and the layer of metal foil is bonded between the thermoplastic sealing surface layer and the polymeric barrier layer. In other preferred embodiments the inner surface of the sealant sheet is the layer of metal foil. A polymeric barrier layer can be bonded between the metal foil and the thermoplastic sealing surface layer, if desired. The polymeric barrier layer can be, for example, an oxygen barrier film, a moisture barrier film, a solvent barrier film, or a combination thereof.

The cover sheet can comprise a single layer of material or can be a multilayer structure. The cover sheet can comprise a polymeric film or coating, a polymeric foam, a layer of paper, a layer of synthetic fabric, or a combination thereof. The polymeric film or coating can be a polymeric barrier such as an oxygen barrier, a moisture barrier, a solvent barrier, or a combination thereof.

The inner surface of the cover sheet can be directly bonded to the inner surface of the sealant sheet or can be bonded to the inner surface of the sealant sheet by a layer of adhesive.

In some embodiments, the cover sheet includes a single tab portion, while in other embodiments the cover sheet includes two opposed tab members extending from the periphery of the body portion.

In use, a tabbed container seal of the invention is sealed over the access opening of a container by thermally sealing (i.e., by conduction or induction) the sealing surface layer of the sealant sheet onto the container finish (i.e., onto the
rim surrounding the access opening) to seal the opening. The tab member, being metal-free, does not interfere with the thermal sealing process and does not adhere to any portion of the container finish or to the top of the seal after the container seal has been bonded to the container finish. The tab portion is freely accessible so that a consumer can readily grasp the tab and pull the seal off of the container opening to access the contents of the container. The container seals of the present invention provide a seal that is simple to manufacture, and which provides a more reliable and consistent seal than conventional tabbed induction seals.

The present invention also provides a method of manufacturing the tabbed container seals of the invention. The method comprises bonding a first moving web of at least one band of a metal-containing sealant sheet material to a second moving web of metal-free cover sheet material to form a moving composite web. The at least one band of metal-containing sealant sheet material is narrower than the second web of metal-free cover sheet material and is positioned relative to the second moving web so as to form a metal-containing band comprising the sealant sheet material bonded to the cover sheet material, with at least one metal-free strip of cover sheet material adjacent thereto. A tabbed container seal is then cut from the composite web in a manner such that a tab portion of the container seal is formed from the at least one metal-free strip of cover sheet material and the remainder of the container seal is formed from the metal-containing band.

BRIEF DESCRIPTION OF THE DRAWINGS

In the Drawings, Figure 1, Panel A shows the induction heating pattern of a conventional container seal 10a having extended tabs, while Panel B shows the induction heating pattern of conventional container seal 10b having tabs folded over the top of the seal.

Figure 2, Panel A shows the induction heating pattern of a container seal 12 of the invention having extended tabs, while Panel B shows the induction heating pattern of container seal 12 having its tabs folded over the top of the seal.

Figure 3 shows a cross-sectional view of a conventional multilayer container seal 14 bound to a container finish.
Figure 4 shows a cross-sectional view of a multilayer container seal 16 of the invention bound to a container finish.

Figure 5 is a plan view of container seal 20 of the invention.

Figure 6 is a plan view of container seal 22 of the invention.

Figure 7 is a plan view of container seal 24 of the invention.

Figure 8 is a plan view of container seal 26 of the invention.

Figure 9 is a plan view of container seal 28 of the invention.

Figure 10 is a plan view of container seal 30 of the invention.

Figure 11 is a plan view of container seal 32 of the invention.

Figure 12 is a plan view of container seal 34 of the invention.

Figure 13 is a plan view of container seal 36 of the invention.

Figure 14 is a plan view of container seal 38 of the invention.

Figure 15 is a cross-sectional view of container seal 40 of the invention.

Figure 16 is a cross-sectional view of container seal 42 of the invention.

Figure 17 is a cross-sectional view of container seal 44 of the invention.

Figure 18 is a cross-sectional view of container seal 46 of the invention.

Figure 19 is a cross-sectional view of container seal 48 of the invention.

Figure 20 is a cross-sectional view of container seal 50 of the invention.

Figure 21 is a plan view of a composite web for manufacturing a container seal of the invention.

Figure 22 is a plan view of a composite web for manufacturing a container seal of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

As used herein and in the appended claims, the term "closure" and grammatical variations thereof, refers to a lid or cap, such as a threaded cap, a lug-
type cap, a snap-cap, and the like, that is designed to be repeatedly secured to and removed from a container finish, such that when the cap or lid is secured to the container finish, a seal is formed that protects the contents of the container from contamination and leakage.

The terms "lining material" and "liner" refer to a sheet material that is compressible and preferably semirigid, and is suitable for use within a closure to provide a resealable seal between the closure and a container finish. The term "liner" also refers to a section of lining material that has been cut to fit snugly within a closure against the upper inside surface thereof.

The term "seal", when used as a noun, refers to a film or multilayer laminate material that is adhesively secured or heat-sealed over the finish of a container to provide an air and/or fluid tight seal. To access the contents of the container, the seal must be broken. A seal can provide evidence of product tampering, for example, when removal of the seal leaves a residue on the finish of the container. A container typically is fitted with a closure over a container seal. The closure protects the integrity of the seal during shipping and storage. Closures may include a liner, so that after the container seal is removed, the closure can be put back on the container to protect the contents that may remain in the container. When used as a verb, the term "seal" and grammatical variations thereof, refers to a process of covering the access opening of a container (e.g., ajar) with a sheet of flexible material bonded to the finish of the container.

The term "wax", as used herein, is not limited to natural waxes and paraffins, but also encompasses materials commonly referred to as waxes in the packaging and converting industries, such as microcrystalline wax, polyethylene wax, polyisobutylene resins, and so-called synthetic waxes (e.g., amide waxes), as well as mixtures thereof.

As used herein, the term "thermoplastic" refers to a flexible polymeric material that reversibly softens and flows upon application of heat and pressure to the material. Two thermoplastic materials in contact with one another can be directly bonded together without the use of an adhesive by application of heat and pressure to the two materials.
The term "directly bonded" and grammatical variations thereof, as used herein and in the appended claims refers to a physical or chemical bond between two sheet materials, which is achieved without the use of an adhesive. For example, a coating of one polymeric material onto a polymeric film web is a directly bonded laminate.

As used herein as a noun, the term "laminate" refers to a composite sheet material comprising at least two layers of individual sheets, films or coatings. The layers can be adhesively secured to one another, directly bonded to one another, or can be secured to one another by any combination of adhesive and direct bonding. When used as a verb, the term "laminate" and grammatical variations thereof, refers to the process of bonding sheet materials together in a stack (i.e., lamination).

For convenience, the term "sheet material" and grammatical variations thereof, is used herein to refer to any flexible material, which has a thickness that is substantially smaller in comparison to its length and breadth, and encompasses multilayer materials, as well as individual layers of sheets, films, coatings, foils, and the like, regardless of their thickness, and regardless of whether the layer was formed in situ by a coating process or was a preformed sheet or film.

A container seal of the invention includes at least one metal-free tab member. The container seal comprises a flexible, metal-free cover sheet and a flexible sealant sheet. The cover sheet comprises at least one layer of a flexible sheet material and includes a body portion that is sized and shaped to at least cover a container finish and has at least one metal-free tab portion extending from the periphery of the body portion. In some preferred embodiments, the cover sheet includes two opposed tab portions extending from the periphery of the body portion. The flexible sealant sheet comprises a thermoplastic sealing surface layer, an inner surface and a layer of metal foil. The inner surface can be a polymeric film, such as a barrier film, or can be the layer of metal foil. The flexible sealant sheet is of the same shape and size as the body portion of the cover sheet. The inner surface of the sealant sheet and the inner surface of the body portion of the cover
sheet are bonded together in opposed, congruent contact with each other, while the tab portion of the cover sheet remains free and unbonded.

Optionaliy, a compressible sheet of lining material of the same size and shape as the body portion of the cover sheet can be tacked to the outer surface of the cover sheet by a layer of releasable adhesive, such as a layer of wax or like expedient. The resulting integrated liner and container seal can be utilized to seal a container and line a closure for the container, as well.

In use, the sealing surface of the container seal is bound to the finish of a container over the access opening of the container. The tab portion is freely graspable and not bound to the container finish. A consumer can grasp the tab and pull the container seal off of the container to access the contents sealed therein.

In another aspect, the present invention provides a method of manufacturing a tabbed container seal. The method comprises bonding a first moving web of at least one band of metal-containing sealant sheet material to a surface of a second moving web of metal-free cover sheet material to form a moving web of composite material. The sealant sheet material comprises a thermoplastic surface layer, a layer of metal foil, and an inner surface. The inner surface of the sheet material is bound to a surface of the second web of cover sheet material directly or by means of an adhesive layer. The cover sheet material is metal-free and comprises at least one layer of a flexible material such as a polymeric film, a synthetic fabric, or similar material. The at least one band of metal-containing sealant sheet material is narrower than the second web and is positioned relative to the second moving web so as to form a band of metal-containing sealing material comprising the sealant sheet bonded to the cover sheet, leaving at least one exposed metal-free strip of cover sheet material adjacent to the metal-containing band. A tabbed container seal is then cut from the composite web in a manner such that a tab portion of the container seal is formed from the at least one metal-free strip and the remainder of the container seal is formed from the metal-containing band portion of the composite web.

The sealant sheet, the cover sheet, and the liner, if present, can each independently comprise one or more layers of material, such as cellulose pulp,
paper, a synthetic fabric, a polymer film, a polymer foam, and the like, or any
combination thereof, the layers being stacked and bound together to form a laminate
material. The sealant sheet includes a layer of metal foil, such as aluminum foil.
The sealing surface of the sealant sheet preferably comprises a thermoplastic
polymer film or coating (collectively referred to herein as a "thermoplastic polymer
layer") for heat-bonding to a container finish.

A sealed container of the present invention comprises a container
having an access opening surrounded by a container finish. The sealed container
includes a container seal of the invention bonded over its access opening. The
sealing surface of the container seal is bound to the finish over the access opening
of the container along the periphery of the sealing surface of the container seal. The
metal-free tab portion of the container seal is not bound to the finish of the
container and provides a mechanism for removing the seal from the container.

In one embodiment, the sealed container also comprises a closure
secured to the container finish over the cover sheet of the container seal.
Preferably, the closure includes a liner in contact with the cover sheet. The liner
can be adhesively secured within the closure, if desired. In some embodiments the
liner is tacked to the outer surface of the cover sheet by a layer of releasable
adhesive. When a consumer removes the closure from the container, the liner,
which is secured within the closure, shears away from the tab sheet, breaking the
adhesive bond between the liner and the cover sheet. The cover sheet remains
intact and bound to the sealant sheet. The consumer can then remove the seal from
the container by grasping the tab portion and pulling the seal away from the
container finish. In some embodiments, a visible residue or portion of the sealing
sheet remains bound to the rim of the container finish providing an indication that a
seal was once bound over the access opening, for example as evidence of tampering
(i.e., if the seal is removed prior to purchase of the container by the consumer). The
liner and container seal can be applied to the sealed container as a single integrated
unit by tacking the liner to the tab sheet of the container seal, if desired.

Typically, a container seal has peripheral dimensions slightly larger
than the peripheral dimensions of the container rim (finish). It is desirable for
induction-heated container seals to seal evenly around the entire finish. Induction heating of a metallic layer in a container seal tends to result in the highest temperature region being located around the periphery of the sealing surface of the container seal. When the seal includes metal-containing tabs, as in conventional container seals, the higher temperature periphery does not strictly follow the shape of the container finish. This can lead to sealing problems.

The following examples, depicted in the drawings, are provided to further illustrate preferred embodiments of the present invention. The embodiments shown in the drawings, and the descriptions thereof, and are not to be interpreted as limiting the scope of the present invention.

Referring now to the drawings, wherein similar reference-numbers refer to correspondingly similar components, Figure 1, Panel A schematically illustrates a conventional tabbed container seal 10a including a metal-containing tab 102a. Conventional container seal 10a is inductively heat-sealed over a container finish 104a (dotted lines). Shaded area 106a along the periphery of seal 10a indicates a high temperature zone where the induction heating is most concentrated. High temperature zone 106a corresponds to the area where the most effective bonding of seal 10a to finish 104a can occur. As can be seen in the drawing, high temperature zone 106a is located away from finish 104a in region 108a adjacent to tab 102a. This can lead to inefficient bonding and even seal failure.

Similarly, Panel B of figure 1 schematically illustrates a conventional tabbed container seal 10b including a metal-containing tab 102b, folded over top 103b of seal 10b. Conventional container seal 10b is inductively heat-sealed over a container finish 104b (dotted lines). Shaded area 106b along the periphery of seal 10b indicates a high temperature zone where the induction heating is most concentrated. High temperature zone 106b corresponds to the area where the most effective bonding of seal 10b to finish 104b can occur. As can be seen in the drawing, high temperature zone 106b is located away from finish 104b toward the interior of seal 10b in region 108b adjacent to tab 102b, which can also lead to potential seal failure.
Figure 2 shows an improved tabbed container seal of the invention, i.e., seal 12. Seal 12 includes metal-free tab members 122, and is inductively bound to container finish 124 (dotted lines). Panel A shows tabs 122 extended outwardly from container finish 124, while Panel B shows tabs 122 folded up over the top of seal 12. Shaded area 126 along the periphery of seal 12 indicates a high temperature zone where the induction heating is most concentrated. High temperature zone 126 corresponds to the area where the most effective bonding of seal 12 to finish 124 occurs. As can be seen in the drawing, high temperature zone 126 is evenly distributed in seal 12 over the area of finish 124, providing a uniform seal on the container finish. This is due to the absence of metal in tabs 122. In contrast, metal-containing tabs, as in conventional seals 10a and 10b in Figure 1, can lead to an uneven seal, as described above, since the high temperature zones 106a and 106b follow the periphery of the seal including the periphery of the tab portions 102a and 102b.

Figure 3 illustrates a cross-sectional view of a conventional tabbed container seal 14 bound over finish 141 of container 143. Tab portion 142 of seal 14 is indicated by the portion to the right of the imaginary dotted line 145 in the drawing, while body portion 144 is to the left of dotted line 145. Tab portion 142 and body portion 144 are made up of the same layers 146, 148, 150, 152 and 154. At least one of layers 146-152 is a layer metal foil, and layer 154 comprises a thermoplastic material to make seal 14 inductively sealable. Induction heating of seal 14 results in heating of the periphery of tab 142 as well as the periphery of body portion 146.

In contrast, Figure 4 shows container seal 16 of the invention bound over finish 161 of container 163. Tab portions 162 of seal 16 are located in opposed positions adjacent to body portion 164, which are delineated from one another by imaginary lines 165 and 167. Tab portions 162 comprise only two of layers of material (166 and 168, while body portion 164 comprises layers 166, 168, 170, 172 and 174. At least one of layers 170 and 172 is a layer metal foil, and layer 174 comprises a thermoplastic material. Layers 166 and 168 are metal-free, making tabs 162 metal-free, as well. Induction heating of seal 16 results in heating of the
peiphery of metal-containing body portion 164, but not of metal-free tab portions 162.

Figures 5-14 shows a number of tab configurations possible with container seals of the invention. In Figure 5, seal 20 includes two metal-free tab portions 202 having a substantially trapezoidal shape. In Figure 6, seal 22 includes two metal-free tab portions 222 having a substantially semicircular shape. In Figure 7, seal 24 includes two extended metal-free tab portions 242 having blunt, rounded ends. In Figure 8, seal 26 includes two metal-free tab portions 262 having a substantially rectangular shape. In Figure 9, seal 28 includes two metal-free tab portions 282 having a skewed tear shape. In Figure 10, seal 30 includes two metal-free tab portions 302 in the form of rings. In Figure 11, seal 32 includes two metal-free tab portions 322 in the form of semicircles tangent to the seal. In Figure 12, seal 34 includes a single metal-free tab portion 342 that is substantially semicircular in shape. In Figure 13, seal 36 includes a single metal-free tab portion 362 that is substantially rectangular in shape. In Figure 14, seal 38 includes a single metal-free tab portion 382 that is in the form of a ring.

Figures 15-20 provide schematic cross-sectional views of a number of illustrative container seals of the invention having two opposed tab members. The view in each of Figures 15-20 is a cross-section through a plane perpendicular to the cover sheet of the seal, passing through each tab member thereof.

In Figure 15, seal 40 comprises metal-free cover sheet 401 and metal-containing sealant sheet 403 bound to a central portion of cover sheet 401. Seal 40 includes two tab portions 405 formed from regions of cover sheet 401 that are not bound to sealant sheet 403. Cover sheet 401 comprises a single layer of sheet material 402, which preferably is a polymeric film, a sheet of polymeric foam, or a sheet of synthetic fabric material. Sealant sheet 403 comprises a laminate composed of three layers, i.e., backing layer 404, metallic layer 406, and sealant layer 408. Backing layer 404 can be a tie layer directly bound to sheet material 402 and metallic layer 406, or can be a layer of adhesive. Metallic layer 406 preferably comprises a layer of metallic foil, such as aluminum foil. Sealant layer 408 comprises a thermoplastic film or coating directly bound to metallic layer 406.
In Figure 16, seal 42 comprises metal-free cover sheet 421 and metal-containing sealant sheet 423 bound to a central portion of cover sheet 421. Seal 42 includes two tab portions 425 formed from regions of cover sheet 421 that are not bound to sealant sheet 423. Cover sheet 421 comprises a single layer of sheet material 422, which preferably is a polymeric film, a sheet of polymeric foam, or a sheet of synthetic fabric material. Sealant sheet 423 comprises a laminate composed of five layers, i.e., backing layer 424, which is directly bound to sheet material 422, metallic layer 426 directly bound to backing layer 424, barrier layer 430 bound to metallic layer 426 by layer of adhesive 428, and sealant layer 432 directly bound to barrier layer 430.

Backing layer 424 can be a polymeric tie layer directly bound to sheet material 402 or can be a layer of adhesive. Metallic layer 426 preferably comprises a layer of metallic foil, such as aluminum foil. Barrier layer 430 preferably comprises a polymeric barrier film, such as a moisture barrier film or an oxygen barrier film. Sealant layer 432 comprises a thermoplastic film or coating.

In Figure 17, seal 44 comprises metal-free cover sheet 441 and metal-containing sealant sheet 443 bound to a central portion of cover sheet 441. Seal 44 includes two tab portions 445 formed from regions of cover sheet 441 that are not bound to sealant sheet 443. Cover sheet 441 comprises a laminate composed of three layers of material, i.e., outer layer 442 bound to first backing layer 446 by adhesive layer 444. Sealant sheet 443 comprises a laminate composed of three layers, i.e., second backing layer 448, which is directly bound to sheet material first backing layer 446, metallic layer 450 directly bound to second backing layer 448, and sealant layer 452 directly bound metallic layer 450.

Outer layer 442 preferably is a layer of polymeric film, a layer of paper, a layer of polymeric foam, a layer of paper, or a layer of synthetic fabric. First backing layer 446 preferably is a polymeric film or layer of polymeric foam. Alternatively, layer 444 can be a polymeric film, a layer of paper, or a layer of synthetic fabric, which is directly bound to layers 442 and 446. For example cover sheet 441 can be a polymer coated paper in which layer 442 is a polymer coating, layer 444 is a paper, and layer 446 is a second polymeric coating.
Second backing layer 448 can be a polymeric tie layer directly bound to sheet material first backing layer 446 or can be a layer of adhesive. Metallic layer 450 preferably comprises a layer of metallic foil, such as aluminum foil. Sealant layer 452 comprises a thermoplastic film or coating.

In Figure 18, seal 46 comprises metal-free cover sheet 461 and metal-containing sealant sheet 463 bound to a central portion of cover sheet 461. Seal 46 includes two tab portions 465 formed from regions of cover sheet 461 that are not bound to sealant sheet 463. Cover sheet 461 comprises a laminate composed of three layers of material, i.e., outer layer 462 bound to first backing layer 466 by first adhesive layer 464. Sealant sheet 463 comprises a laminate composed of five layers, i.e., second backing layer 468, which is directly bound to first backing layer 466, metallic layer 470 directly bound to second backing layer 468, barrier layer 474 bound to metallic layer 470 by second layer of adhesive 472, and sealant layer 476 directly bound to barrier layer 474.

Outer layer 462 preferably is a layer of polymeric film, a layer of paper, a layer of polymeric foam or a layer of synthetic fabric. First backing layer 466 preferably is a polymeric film or layer of polymeric foam. Alternatively, layer 464 can be a polymeric film, a layer of paper, or a layer of synthetic fabric, which is directly bound to layers 462 and 466. For example cover sheet 461 can be a polymer coated paper in which layer 462 is a polymer coating, layer 464 is a paper, and layer 466 is a second polymeric coating.

Second backing layer 468 can be a polymeric tie layer directly bound to first backing layer 466, or can be a layer of adhesive. Metallic layer 470 preferably comprises a layer of metallic foil, such as aluminum foil. Barrier layer 472 preferably comprises a polymeric barrier film, such as a moisture barrier film or an oxygen barrier film. Sealant layer 476 comprises a thermoplastic film or coating.

In Figure 19, seal 48 comprises metal-free cover sheet 481 and metal-containing sealant sheet 483 bound to a central portion of cover sheet 481. Seal 48 includes two tab portions 485 formed from regions of cover sheet 481 that are not bound to sealant sheet 483. Cover sheet 481 comprises a laminate
composed of five layers of material, i.e., outer layer 482 bound to first backing layer 486 by first adhesive layer 484, and second backing layer 490 bound to first backing layer 486 by second layer of adhesive 488. Sealant sheet 483 comprises a laminate composed of three layers, i.e., third backing layer 492, which is bound to second backing layer 490, metallic layer 494 directly bound to third backing layer 492, and sealant layer 496 directly bound to metallic layer 494.

Outer layer 482 preferably is a layer of polymeric film, a layer of paper, a layer of polymeric foam or a layer of synthetic fabric. Each of first and second backing layers 486 and 490 preferably is a polymeric film or layer of polymeric foam. Third backing layer 492 can be a polymeric tie layer directly bound to second backing layer 490, or can be a layer of adhesive. Metallic layer 494 preferably comprises a layer of metallic foil, such as aluminum foil. Sealant layer 496 comprises a thermoplastic film or coating.

In Figure 20, seal 50 comprises metal-free cover sheet 501 and metal-containing sealant sheet 503 bound to a central portion of cover sheet 501. Seal 50 includes two tab portions 505 formed from regions of cover sheet 501 that are not bound to sealant sheet 503. Cover sheet 501 comprises a laminate composed of five layers of material, i.e., outer layer 502 bound to first backing layer 506 by first adhesive layer 504, and second backing layer 510 bound to first backing layer 506 by second layer of adhesive 508. Sealant sheet 503 comprises a laminate composed of five layers, i.e., third backing layer 512, which is bound to second backing layer 510, metallic layer 514 bound to third backing layer 512, barrier layer 518 bound to metallic layer 514 by second layer of adhesive 516, and sealant layer 520 directly bound to barrier layer 518.

Outer layer 502 preferably is a layer of polymeric film, a layer of paper, a layer of polymeric foam or a layer of synthetic fabric. Each of first and second backing layers 506 and 510 preferably is a polymeric film or layer of polymeric foam. Third backing layer 512 can be a polymeric tie layer directly bound to second backing layer 510, or can be a layer of adhesive. Metallic layer 514 preferably comprises a layer of metallic foil, such as aluminum foil. Barrier layer 518 preferably comprises a polymeric barrier film, such as a moisture barrier.
film or an oxygen barrier film. Sealant layer 520 comprises a thermoplastic film or coating.

Figure 21 illustrates a layout for manufacturing a tabbed container seal of the invention, such as container seals 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48 and 50, described above. Composite web 70 comprises metal-free cover sheet web 701 and two bands of metal containing sealant sheet material 702 and 704 bonded to cover sheet web 701. Metal-containing bands 702 and 704 are separated from each other by strip 706 comprising metal-free web 701. In addition, metal-free strips 708 and 710 flank bands 702 and 704, respectively.

Container seals 712 and 714 are die-cut from composite web 70. Seal 712 includes a body portion 716 cut from the section of composite web 70 that includes metal-containing band 702. Tab portions 718 and 720 of seal 712 are cut from metal-free strips 706 and 708, respectively. Similarly, seal 714 includes a body portion 722 cut from the section of composite web 70 that includes metal-containing band 704.

Tab portions 724 and 726 of seal 714 are cut from metal-free strips 706 and 710, respectively.

Figure 22 illustrates a wide composite web 74 which comprises a base web 741 of metal-free cover sheet material having spaced bands 742, 744, 746, 748, 750, and 752 of metal-containing sealant sheet material bound thereto. Bands 742, 744, 746, 748, 750, and 752 are separated from each other by metal-free strips 754, 756, 758, 760, and 762. The edges of web 74 include metal-free strips 764 and 766. Composite web 74 can be slit into three narrower portions, like the web shown in Figure 21, by cutting along imaginary dotted lines 767 and 769. Container seals of the invention can be die-cut from the narrower webs in the manner described for Figure 21, above.

The container seals of the present invention can include any combination of single-layer or multilayer sealant sheet, cover sheet, and liner, as described above. Multilayer sealant sheets, cover sheets, and liners preferably are two-layer, three-layer, four-layer or five-layer structures. Multilayer structures generally comprise sheets of cellulose pulp, paper, synthetic fabric, polymer film, polymer foam, metal foil, and the like, or any combination thereof, adhesively
bonded together, thermally fused, extruded or coated, to form a unitary structure, as is well known in the materials converting and laminating arts. In the container seals of the present invention, the cover sheet is metal-free.

In one illustrative use, a container seal of the invention can be die-cut to an appropriate size and shape and conveniently placed within a container closure (e.g., a cap) as a single unit. The container seal is sized and shaped to fit securely within the closure and is placed in the closure with its sealing surface facing outward. When the container seal includes a liner portion, the liner preferably is bound to the inside top of the closure by an adhesive, such as a hot-melt adhesive. The closure is then secured to the finish of a container (e.g., a bottle or ajar), for example, by torquing a threaded closure onto a threaded finish of a container after the container has been filled with a product. Heat is then applied to the container seal to bond the sealing surface to the container finish.

Heat can be applied to the container seal inductively or conductively.

In the inductive heating process, a filled container having a container seal of the invention secured over its access opening is passed through an induction-sealing device in which radio frequency (rf) energy inductively heats the metal foil layer, preferably to a temperature in the range of about 65 to about 150 °C. For a container seal having a heat-releasable liner, the heat from metal foil also liquefies a layer of wax that tacks the liner to the cover sheet. The wax is then absorbed by a wax-absorbent material in contact with the wax layer, causing the liner to release and separate from cover sheet. The wax layer that binds the liner to the cover sheet preferably is selected to have a melting point in the range of about 65 to about 150 °C.

Upon removal of the closure by a consumer, the liner, if present, remains in the closure, while the container seal, with its integral tab portion, remains bound to the finish of the container as a protective seal. The seal is peelably removable by a consumer by grasping the tab and pulling the seal off of the container finish after the closure is removed.

Liner components preferably include compressible materials, such as a cellulose pulp material, a polymeric foam, or a polymeric film. Preferred
polymeric foams include a polyolefin foam, a substituted polyolefin foam, or a polyurethane foam. Suitable polyolefin foams include foams of polyethylene, polypropylene, ethylene propylene copolymers, and blends thereof. Non-limiting examples of suitable substituted polyolefins include polystyrene foam, polyvinyl chloride foam, and foam rubber. Preferably, the polyolefin foam is a polyethylene foam, more preferably a low-density polyethylene foam.

The liner, when present, preferably has a thickness in the range of about 15 to about 60 mils (thousandths of an inch), and more preferably about 20 to about 40 mils.

Cellulose pulp-based substrates, which are commonly used in closure liners and container seals, can be laminated to other materials such as a metal foil, a polymer film, or to a foil/film laminate using conventional lamination techniques that are well known in the art.

Polymeric foams useful in the container seals of the present invention can be secured to other layers of material, such as a metal foil, paper, synthetic fabric, or polymer film, by lamination or by extruding the foam directly onto a web of the other material, or by extruding a polymeric resin onto a web of the polymeric foam, for example. Methods of extruding polymeric foams are well known in the polymer art. For example, methods of producing polymeric foams are described in A. Brent Strong, *Plastics Materials and Processing*, 2nd Ed., Prentice Hall Inc., Upper Saddle River, NJ, Chapter 17, pp. 589-614 (2000), the disclosure of which is incorporated herein by reference. The polymeric foams can be manufactured using any known foaming process, e.g. by mechanical foaming, chemical foaming, physical foaming, and the like. Preferably, the polymeric foam is formed by chemical foaming with a blowing agent, or gas injection foaming with a nucleating agent including passive nucleating agents (e.g., particulate materials such as talc) or active nucleating agents (e.g., foaming agents). Blowing agents are well known in the polymer arts.

Non-limiting examples of suitable blowing agents include the following chemicals designated by the U.S. Environmental Protection Agency as suitable replacements for chlorofluorocarbons (CFCs) and
hydrochlorofluorocarbons (HCFCs) for use as blowing agents in polyolefin foams:
methylene chloride (dichloromethane); 1,1,1,2-tetrafluoroethane (HFC-134a);
1,1,-difluoroethane (HFC-152a); 1,1,1-trifluoro 2,2-dichloroethane (HCFC-123);
1,1,1-trifluoroethane (HFC-143a); 1,1,1,3,3-pentafluoropropane (HFC-245fa);
saturated light hydrocarbons (C₃-C₅ hydrocarbons); water; and carbon dioxide.

Other suitable blowing agents include chemical blowing agents such as
carbonate and azo type compounds. Such compounds include, without being
limited thereto, ammonium carbonate, ammonium bicarbonate, potassium
bicarbonate, sodium bicarbonate, diazoaminobenzene, diazoaminotoluene,
azodicarbonamide, diazoisobutyronitrile, and the like.

Metal foils useful in the container seals of the present invention can
comprise any metal that is suitable for use in a closure liner or container seal, for
example, steel foil (including stainless steel foil), tin foil, aluminum foil (including
aluminum alloy foils), and the like. Choice of a particular metal will depend on the
nature of the material to be included in the container to be sealed by the container
seal of the invention, although aluminum foil is the most common conventional
metal foil used for induction sealing purposes, and is particularly preferred.
Preferably, the metal foil is aluminum foil having a thickness in the range of about
0.35 mil to about 2 mils.

Materials suitable for use as a polymer film in the container seals of
the invention include, for example, polyolefins such as polyethylene or
polypropylene, polyesters such as PET, functionalized polyolefins such as ethylene
vinyl alcohol (EVOH) or ethylene vinyl acetate (EVA) polymers, halogenated
polyolefins such as polyvinyl chloride (PVC) or polyvinylidene chloride (PVdC),
acrylonitrile methacrylate copolymer films (e.g., BAREX® film, BP Chemicals,
Inc., Cleveland, OH), and the like. The polymer film can be a single layer of
polymer, or a multilayer structure comprising two or more layers of polymer bound
together. A particularly preferred polymer film is PET film. Preferably, the
polymer film has a thickness in the range of about 0.5 to about 2 mils.

Adhesives suitable for permanently securing various layers of the
container seals of the invention to one another include epoxy adhesives, solvent-
based cements containing synthetic rubber or a phenolic resin, acrylic adhesives, urethane adhesives, waxes or any other suitable adhesive, or a tie-layer. Tie-layers are often used to provide adhesion between a nonpolar polymer, such as polyethylene, and a polar polymer such as ethylene vinyl alcohol (EVOH).

Typically, tie-layers are functionalized polyolefins such as ethylene acrylic acid copolymers, ethylene vinyl acetate copolymers (EVA), and the like, as is well known in the art.

One preferred form of adhesive is a solventless adhesive system, such as MOR-FREE® 403A/C117, available from Rohm & Haas Corp., Springhouse, PA. Another preferred adhesive is the two part adhesive available under the trade name ADCOTE® 503 adhesive, from Rohm & Haas Corp, which is a polyester resin used in combination with a curing agent such as Coreactant F, also available from Rohm & Haas Corp. Another suitable adhesive is Airflex 426, available from Air Products, Inc. Other preferred adhesives include, for example, solventless adhesive systems, which are available from Rohm & Haas, and H. B. Fuller (e.g., Fuller WD4120 and WD4122). Adhesives useful in a variety of applications are discussed in detail in Arthur H. Landrock, *Adhesives Technology Handbook*, Noyes Publications, Park Ridge, NJ, (1985), incorporated herein by reference (hereinafter "Landrock").

Releasable adhesives useful for tacking a liner to the cover sheet include weakly bonding adhesives, such as pressure-sensitive adhesives, wax and wax-based adhesives, and the like. Intermittent layers of permanent adhesives can also be utilized.

Pressure sensitive adhesives are discussed at pages 174-175 of Landrock. Such pressure sensitive adhesives include natural rubber adhesives, natural rubber/styrene-butadiene rubber adhesives, polyisobutylene adhesives, butyl rubber adhesives, as well as mixtures of natural rubber with tackifying resins such as rosins, petroleum, and terpenes. Other pressure sensitive adhesives include ethylene/vinyl acetate copolymers tackified with resins or softeners, vinyl ether polymers, silicone rubber and silicone resin adhesives, and the like.
When a pressure sensitive adhesive is used, one surface in contact with the adhesive can include a release coating, so that the adhesive will have a greater affinity for one surface that the other surface with which it is in contact. Release coatings include acrylic acid esters of long-chain fatty alcohols, polyurethanes incorporating long aliphatic chains, cellulose esters, polytetrafluoroethylene, and the like.

If an adhesive is utilized to bond a polymeric foam and/or a polymeric film to another layer of material, the bonding surfaces of the polymer foam or film can be surface-treated to improve adhesion. Non-limiting examples of suitable surface treatments include chromic acid etching, corona treatment, oxidizing flame treatment, gas plasma treatment, and the like.

Wax-absorbent materials useful in the present invention include paper, cellulose pulp (e.g., pulp board), or an absorbent synthetic fabric, such as a nonwoven fabric, an absorbent polymeric foam, a porous polymeric film, and the like. The wax-absorbent material can be a single layer of absorbent material, or a multilayer structure comprising two or more layers of absorbent material bound together (e.g. by an adhesive). In any event, the wax-absorbent material is selected to be capable of absorbing a sufficient quantity of the wax to cause the liner to release from the cover sheet.

The thickness of a wax-absorbent material is selected so that the material will absorb a sufficient amount of a wax layer to allow the liner to release from the cover sheet when the wax is melted. Preferably, the wax absorbent material has a thickness in the range of about 1 mil to about 12 mils, more preferably about 2 mils to about 10 mils, and most preferably about 2.5 mils to about 6 mils.

Paper, cellulose pulp, and synthetic fabric materials are useful components of the container seals of the invention even when a wax layer is not utilized. In particular, paper and synthetic fabric materials can be used as a facing for a liner or as a facing for the outer surface of the cover sheet. Printed matter can be present on the facing to provide product identification information, product
promotion information, instructions for use of the container contents, and the like, if
desired.

Suitable paper and cellulose pulp materials for use in the container
seals of the invention include bleached or unbleached Kraft paper, single-layer or
multilayer glassine paper, bleached or unbleached cellulose pulp, clay-coated
papers, or any other paper or cellulose sheet material commonly used in container
seals or liners in the packaging industry.

Synthetic fabrics that are useful in the container seals of the
invention include nonwoven polyolefin fabrics and nonwoven polyester fabrics.
Suitable nonwoven polyolefin fabrics include nonwoven polyethylene materials,
such as a microporous polyethylene film or spunbonded high density polyethylene,
as well as nonwoven polypropylene, nonwoven ethylene-propylene copolymer, and
nonwoven blends thereof. Suitable nonwoven polyester fabrics include nonwoven
polyethylene terephthalate fabrics and spunlaced DACRON® polyester-based
fabrics available from E.L DuPont de Nemours & Co., Inc. of Wilmington, DE
(Dupont), under the trade name SONTARA®. Preferably, the synthetic fabric is an
absorbent polyethylene non-woven fabric such as TYVEK® non-woven fabric,
available from DuPont, or a microporous polyethylene film sold under the trade
name TESLIN® by PPG Industries, Inc., Pittsburgh, PA.

A wax layer for tacking a liner to a cover sheet preferably comprises
paraffin, a microcrystalline wax, a polyethylene wax, a polyisobutylene resin, a
butyl rubber resin, a synthetic wax such as an amide wax (e.g., a stearamide, an
oleamide, or erucamide), or any combination thereof. More preferably the wax
layer comprises paraffin, a microcrystalline wax, or a combination thereof. Most
preferably the wax layer comprises a microcrystalline wax. A wax layer can be
deposited utilizing an emulsion of a wax material, as described above, suspended in
an aqueous medium. A wax layer, when present preferably has a melting point in
the range of about 65 to about 150 °C. Preferably, a wax layer has a thickness of
about 0.2 to about 2 mils, more preferably about 0.5 to about 0.75 mils.

A barrier film, when present, preferably comprises a polymeric
material having oxygen barrier, moisture barrier, solvent barrier, or toughness (i.e,
puncture resistance) properties, as desired, based on the type of contents that will be included within a container sealed by the container seal of the invention. The barrier film can be a single layer of polymer, or a multilayer structure comprising two or more layers of polymer either directly bound to one another or adhesively secured to each other. Non-limiting examples of materials that can be used as a moisture barrier film include vinyl chloride/vinylidene chloride copolymer (i.e., PVC-PVdC) films marketed by Dow Chemical Company under the trademark SARAN®, polyethylene, oriented polypropylene (OPP), OPP/polyvinyl chloride (PVC) laminates, and OPP/PVC-PVdC laminates. Non-limiting examples of materials that can be used as an oxygen barrier film include PVC-PVdC, PET, PVC-PVdC/PET laminates, acrylonitrile methacrylate copolymer films, PVdC, and OPP/PVC-PVdC laminates. Non-limiting examples of solvent resistant films include PET and polyethylene. Non-limiting examples of puncture resistant films include PET and PVC. Preferred barrier films are PET, PVdC, and acrylonitrile methacrylate copolymer films. Preferably the barrier film has a thickness in the range of about 0.5 to about 3 mils.

The thermoplastic heat-sealable film or coating at the sealing surface of the sealant sheet is a thermoplastic material that will soften and bond to a container finish with which it is in contact when heated at temperatures achieved during typical induction or conduction sealing operations, under the pressure exerted by the closure on the container seal between the closure and the container finish. Typically the pressure on the container seal is achieved by torquing a closure over the container seal onto a container finish with a torque in the range of about 15 inch-pounds to about 90 inch-pounds.

Non-limiting examples of materials that can be used as sealing surface layer include low-density polyethylene (LDPE), medium density polyethylene (MDPE), polypropylene (PP), ethylene vinyl acetate (EVA), ionomer films, and amorphous PET, including heat-sealable polymeric hot melt coatings, such as an EVA copolymer, a styrene-isoprene-styrene (SIS) copolymer, a styrene-butadiene-styrene (SBS) copolymer, an ethylene ethyl acrylate copolymer (EEA), a polyurethane reactive (PUR) copolymer, and the like. Typically the
sealing surface layer is selected to be of the same material as the container finish or of a material that is compatible with the container finish. Accordingly, a polyethylene film would be selected as a heat-sealable film to seal a high-density polyethylene container finish. Similarly, a PET film can be used as the heat-sealable film to seal a PET container finish. Preferably, the heat-sealable film is medium density polyethylene, polypropylene, EVA copolymer, or PET. When a relatively strong, puncture-resistant sealant sheet is desired, a tough barrier film can be included over the heat-sealable film.


The selection of appropriate shape and dimensions for a container seal to be used with a particular closure and container combination is routine for one of ordinary skill in the packaging art. Typically, the dimensions of the container seal are chosen to be substantially equal to the inside dimensions of the upper surface of the closure, so that the upper surface of the container seal will fit snugly within the closure. The thickness of the container seal is selected based on the clearance between the upper inside surface of the closure and the finish of a complementary container. Preferably, the thickness of the container seal is selected so that the container seal is slightly compressed when the material is sealed between the closure and a container finish. Such compression aids in forming a fluid and/or air-tight seal. Container closures are selected to match container finishes of complementary dimensions and design, as is well known in the packaging art.

Preferably, the container seal of the invention has an overall thickness in the range of about 8 to about 85 mils, more preferably about 20 to about 40 mils. It is preferred that a liner, when present, have a thickness in the range of about 5 to about 40 mils. Preferably, the sealant sheet portion has a total thickness in the range of about 0.5 to about 10 mils, more preferably about 0.5 to about 5 mils.
The container seals of the present invention can be manufactured using standard coating and lamination techniques that are well known in the art. For example, a web of substrate material (e.g., a polymeric film) and a thermoplastic film can be laminated to a sheet of metal foil using one or more conventional adhesives to form a sealant sheet. A surface of the sealant sheet material can be bonded, in zones (bands), to a metal-free cover sheet comprising, for example, a layer of paper laminated to a polymeric barrier film, to form a multilayer sheet material having strips of metal-free cover sheet material alternating with bands of metal-containing, multilayer material comprising both the cover sheet and the sealant sheet material. The resulting roll of composite material can then be die-cut in register with the metal-containing bands and metal-free strips to form container seals of the invention, such that the tab portion of the container seal is formed from a metal-free strip and the remainder of the seal is formed from a metal-containing band.

In preferred embodiments, the composite web comprises a strip of metal-free cover sheet material on each side of each band of metal-containing sealing material. Preferably, the composite web comprises a plurality (e.g., two or more) of metal-containing bands separated from one another by metal-free strips of cover sheet material.

The container seals of the present invention can be manufactured to full machine width in a master roll form, utilizing standard roll coating and laminating equipment, which are well known in the materials converting and processing arts. Typically, the master roll of sheet material is slit to a desired width and shipped to a closure manufacturer. The closure manufacturer, in turn, die-cuts the slit roll in register with the metal-containing bands and metal-free strips to the desired size and shape for use in particular container closures. The die-cut container seals are then inserted or pressed into the closure and sealed to a filled container as described above.

Any common closure design suitable for use with a liner or container seal can be used in conjunction with the container seals of the present invention. Preferred closures include standard, continuous threaded (CT) closures,

Numerous variations and modifications of the embodiments described above may be effected without departing from the spirit and scope of the novel features of the invention. No limitations with respect to the specific embodiments illustrated herein are intended or should be inferred.
I CLAIM:

1. A tabbed container seal comprising:
   (a) a flexible, metal-free cover sheet having an outer surface and an inner surface and comprising at least one layer of a flexible sheet material, the cover sheet including a body portion and at least one metal-free tab portion extending from the periphery of the body portion, the body portion being sized and shaped to at least cover a container finish; and
   (b) a flexible sealant sheet having an inner surface and a sealing surface and comprising a thermoplastic sealing surface layer and a layer of metal foil, the flexible sealant sheet being of the same size and shape as the body portion of the cover sheet;

   the inner surface of the sealant sheet and the inner surface of the body portion of the cover sheet being bonded together in opposed, congruent contact with each other.

2. The container seal of claim 1 wherein the sealant sheet includes a polymeric barrier layer at the inner surface thereof.

3. The container seal of claim 2 wherein the polymeric barrier layer is selected from the group consisting of an oxygen barrier film, a moisture barrier film, a solvent barrier film, and a combination thereof.

4. The container seal of claim 1 wherein the layer of metal foil is bonded between the thermoplastic sealing surface layer and a polymeric film.

5. The container seal of claim 1 wherein the inner surface of the sealant sheet is the layer of metal foil.

6. The container seal of claim 5 further comprising a polymeric barrier layer bonded between the layer of metal foil and the thermoplastic sealing surface layer.

7. The container seal of claim 6 wherein the polymeric barrier layer is selected from the group consisting of an oxygen barrier film, a moisture barrier film, a solvent barrier film, and a combination thereof.
8. The container seal of claim 1 wherein the cover sheet comprises a polymeric film, a polymeric foam, or a combination thereof.

9. The container seal of claim 1 wherein the cover sheet is a multilayer laminate and the inner surface thereof comprises a layer of polymeric material.

10. The container seal of claim 9 wherein the outer surface of the cover sheet comprises layer of paper or synthetic fabric.

11. The container seal of claim 1 wherein the outer surface of the cover sheet comprises a layer of paper or synthetic fabric.

12. The container seal of claim 1 wherein the inner surface of the cover sheet is directly bonded to the inner surface of the sealant sheet.

13. The container seal of claim 1 wherein the inner surface of the cover sheet is bonded to the inner surface of the sealant sheet by a layer of adhesive.

14. The container seal of claim 1 wherein the cover sheet includes two opposed tab members extending from the periphery of the body portion.

15. A method of manufacturing a tabbed container seal comprising:

(a) bonding a first moving web of at least one band of a metal-containing sealant sheet material to a second moving web of metal-free cover sheet material to form a moving composite web, the at least one band of metal-containing sealant material being narrower than the second web of metal-free cover sheet material, and positioned relative to the second moving web so as to form a band of metal-containing sealing material comprising the sealant sheet material bonded to the cover sheet material, and at least one metal-free strip of cover sheet material adjacent thereto; and

(b) cutting a tabbed container seal from the composite web in a manner such that a tab portion of the container seal is formed from the at least one metal-free strip of cover sheet material and the remainder of the container seal is formed from the band of metal-containing sealing material.
16. The method of claim 15 wherein the at least one band of sealant sheet material is positioned relative to the second moving web of cover sheet material so as to form a metal-free strip of cover sheet material on both sides of the band of metal-containing sealing material.

17. The method of claim 16 wherein the tabbed container seal comprises two opposed tabs, each tab being formed from a metal-free strip of cover sheet material on opposite sides of the band of metal-containing sealing material.

18. The method of claim 15 wherein the first moving web comprises at least two bands of metal containing sealing sheet material separated from one another a strip of uncovered cover sheet material.

19. A composite web of container sealing material formed by the process of claim 15.

20. A sealed container comprising:

(a) a container portion including an access opening and a rim surrounding the access opening; and

(b) a container seal of claim 1 sized and shaped to fit over the rim of the access opening, a peripheral portion of the sealing surface of the container seal being bound to the rim, and the metal-free tab portion of the container seal being freely graspable for removing the seal from the container.