as temperature changes that cause the liquid to expand during transport of the package to a location where the package will be placed in dispensing operation.

A liner-based pressure dispense container is typically filled at a chemical fill facility. The container is typically formed of stainless steel and has a unitary chime extending around the upper circumference of the container. After such a container is filled, such container is typically sealed with a membrane, cap, and/or other closure, and shipped to a point of use, typically a processing facility. At the point of use, an end user couples the container with a dispense head preconnected to process equipment and arranged to permit addition of pressurizing gas to an interstitial space between the liner and the container, and to permit a liquid-containing composition to be extracted from the liner. The dispense head extends upwardly from the top and the uppermost portion of the fitting of the container and above the chimes of the container.

Certain liquids (e.g., for display panel and microelectronic device manufacturing) are highly sensitive to oxygen and/or moisture, and may be subject to spoilage or reduced shelf life due to exposure to oxygen or moisture and the processes that utilize such materials are compromised. Conventional use of liner-based pressure dispense containers subject to ingress of air (e.g., including water vapor) at multiple intervals – i.e., during filling or sealing, during shipment, and/or at the time of coupling to a dispense head. It would be desirable to minimize such exposure with procedures and apparatus. Improvements are always sought in reducing complexity of componentry, reduction of manufacturing costs, and increasing the robustness, durability, and cleanliness of containers and dispense heads.

In other instances, liquids used in processing can be very odorous, often very unpleasant to smell, in some cases harmful. In such instances it would be desirable to eliminate or minimize the exposure of such liquids with the ambient environment so that fumes and spillages do not happen or are minimized.

SUMMARY

According to a first aspect of the present invention, there is provided a shippable liquid storage and dispensing apparatus comprising: a substantially rigid container containing a collapsible liner, wherein the liner comprises an interior, and an interstitial space is arranged between the liner and the container; a dispense head arranged for coupling to a mouth portion of the container, the dispense head comprising a liquid passage in fluid communication with the interior of the liner, a liner gas passage in fluid communication with the interior of the liner, and a pressurization gas passage in fluid communication with the interstitial space; a

liquid valve contained by or coupled to the dispense head and in fluid communication with the liquid passage, wherein the liquid valve comprises or has associated therewith a liquid valve quick connect fitting, with the liquid valve arranged between the dispense head and the liquid valve quick connect fitting; a liner gas valve contained by or coupled to the dispense head and in fluid communication with the liner gas passage; and a pressurization gas valve contained by or coupled to the dispense head and in fluid communication with the pressurization gas passage, wherein the pressurization gas valve comprises or has associated therewith a pressurization gas valve quick connect fitting, with the pressurization gas valve arranged between the dispense head and the liquid valve quick connect fitting.

According to a second aspect of the present invention, there is provided a shippable dispense head arranged for mating with a substantially rigid container containing a collapsible liner with an interstitial space between the liner and the container, and with a fitment of the liner registered with a mouth portion of the container, the dispense head comprising: a dispense head body defining (i) a liquid passage and a liner gas passage arranged to permit fluid communication with an interior of the liner, and (ii) a pressurization gas passage in fluid communication with the interstitial space, wherein an insertion portion of the dispense head includes at least one sealing element is insertable into the fitment to sealingly engage a portion of the fitment, with a terminus of the liner gas passage arranged below the at least one sealing element to permit fluid communication with an upper portion of the liner; and a dip tube extending past the fitment into the interior of the liner, wherein the liquid passage extends to or through the dip tube to permit extraction of fluid material from a lower portion of the liner; a liner gas valve in fluid communication with the liner gas passage; a liquid valve in fluid communication with the liquid passage; and a pressurization gas valve in fluid communication with the pressurization gas passage.

According to a third aspect of the present invention, there is provided a fluid handling method utilizing a substantially rigid container containing a collapsible liner and a dispense head coupled to a mouth of the container and comprising a liquid passage in fluid communication with an interior of the liner, a liner gas passage in fluid communication with the interior of the liner, a pressurization gas passage in fluid communication with an interstitial space between the liner and the container, a liquid valve in fluid communication with the liquid passage, a liner gas valve in fluid communication with the liner gas passage, and a pressurization gas valve in fluid communication with the pressurization gas passage, the method comprising: supplying inert gas through the dispense head to an interior of the liner and inflating the liner; following the inert gas supplying step, removing inert gas from the

interior of the liner through the dispense head to at least partially deflate the liner; following removing inert gas from the interior step, supplying a liquid-containing material through the dispense head to at least partially fill the interior of the liner with the liquid-containing material while allowing at least a portion of the inert gas within the liner to escape through the dispense head; and following the liquid-containing material supplying step, closing the liquid supply valve.

According to a fourth aspect of the present invention, there is provided a fluid handling method at a point of use, the method comprising: receiving from a chemical supply facility a substantially rigid container containing a collapsible liner with a liquid containing material therein and a dispense head coupled to a mouth of the container and comprising a liquid passage in fluid communication with an interior of the liner, a liner gas passage in fluid communication with the liquid in the interior of the liner, a pressurization gas passage in fluid communication with an interstitial space between the liner and the container, a liquid valve in fluid communication with the liquid passage, a liner gas valve in fluid communication with the liner gas passage, and a pressurization gas valve in fluid communication with the pressurization gas passage; connecting a pressurized gas supply line and a liquid dispensing line to the dispense head at a point of use; removing inert gas from the liner from the liner through the dispense head; supplying pressurized gas from the pressurized gas supply line through the dispense head to an interstitial space between the liner and the dispense head; and dispensing liquid-containing material through the dispense head and the liquid dispensing line to a fluid-utilizing apparatus arranged to utilize the liquid-containing composition.

According to a fifth aspect of the present invention, there is provided a dispense head for coupling with the mouth of a rigid container and with a bag in the container for holding a liquid to be dispensed, the dispense head comprising: a central probe portion axially extending a vertical length of the dispense head and having a first fluid passageway and a second fluid passageway, each with respective upper outlets extending horizontally and lower outlets, the probe having a central flange extending radially outward; an upper body portion with a central aperture radially capturing the central probe portion; a lower body portion that cooperates with the upper body portion to sandwich the central flange of the central probe portion therebetween; a nut that extends around the lower body portion and having a inwardly extending flange that is rotatable received in a circular recess between the upper body portion and the lower body portion, the nut having threads to connect with the rigid container.

According to a sixth aspect of the present invention, there is provided a dispense system comprising a container, a liner, and a dispense head connected to the container and

liner; the container comprising a stainless steel container portion with an outer cylindrical wall, an upper endwall and a lower endwall, each integral with the cylindrical wall, the upper endwall having a mouth for accessing an interior of the container portion, the mouth having threads thereon, and an upper chime extending from the container portion upwardly, the chime including a lip and an uppermost lip portion, a liner placeable in the interior of the container conforming to said interior, the liner having a fitment for positioning in the mouth of the container; the dispense head comprising a nut sized for engaging with the threaded mouth, and having a dispense fluid passageway and a gas passageway, a dip tube attachable to the dispense head for extending into the liner when the liner is in position in the container, the dispense head and upper chime cooperatively sized such that when the dispense head is attached to the mouth of the container the dispense head is entirely below the uppermost lip portion.

According to a seventh aspect of the present invention, there is provided a fluid handling method at a process facility, the method comprising: receiving from a chemical supply facility a rigid container containing a collapsible liner with a process liquid therein and a dispense head coupled to a mouth of the container and comprising a liquid passage in fluid communication with an interior of the liner, a liner gas passage in fluid communication with the liquid in the interior of the liner, a pressurization gas passage in fluid communication with an interstitial space between the liner and the container, a liquid valve in fluid communication with the liquid passage, a liner gas valve in fluid communication with the liner gas passage, and a pressurization gas valve in fluid communication with the pressurization gas passage; at the process facility, connecting a pressurized gas supply line to the pressurized gas passage with the liner gas valve closed, and connecting a liquid dispensing line to the dispense head with the liquid valve closed; dispensing liquid by opening the liquid valve and opening the liner gas valve.

A process and apparatus for use in semiconductor processing minimizes air and moisture contamination associated with dispensing of processing liquids.

A shippable container with an internal liner has a dispense head installed at a chemical facility with steps taken to eliminate or minimize any containment surfaces from contact with ambient air. The process liquid is put into a bag purged with a clean dry gas in a rigid container through the dispense head at the chemical supply facility. The container with the process liquids and with the dispense head is then shipped to a process facility for use of the