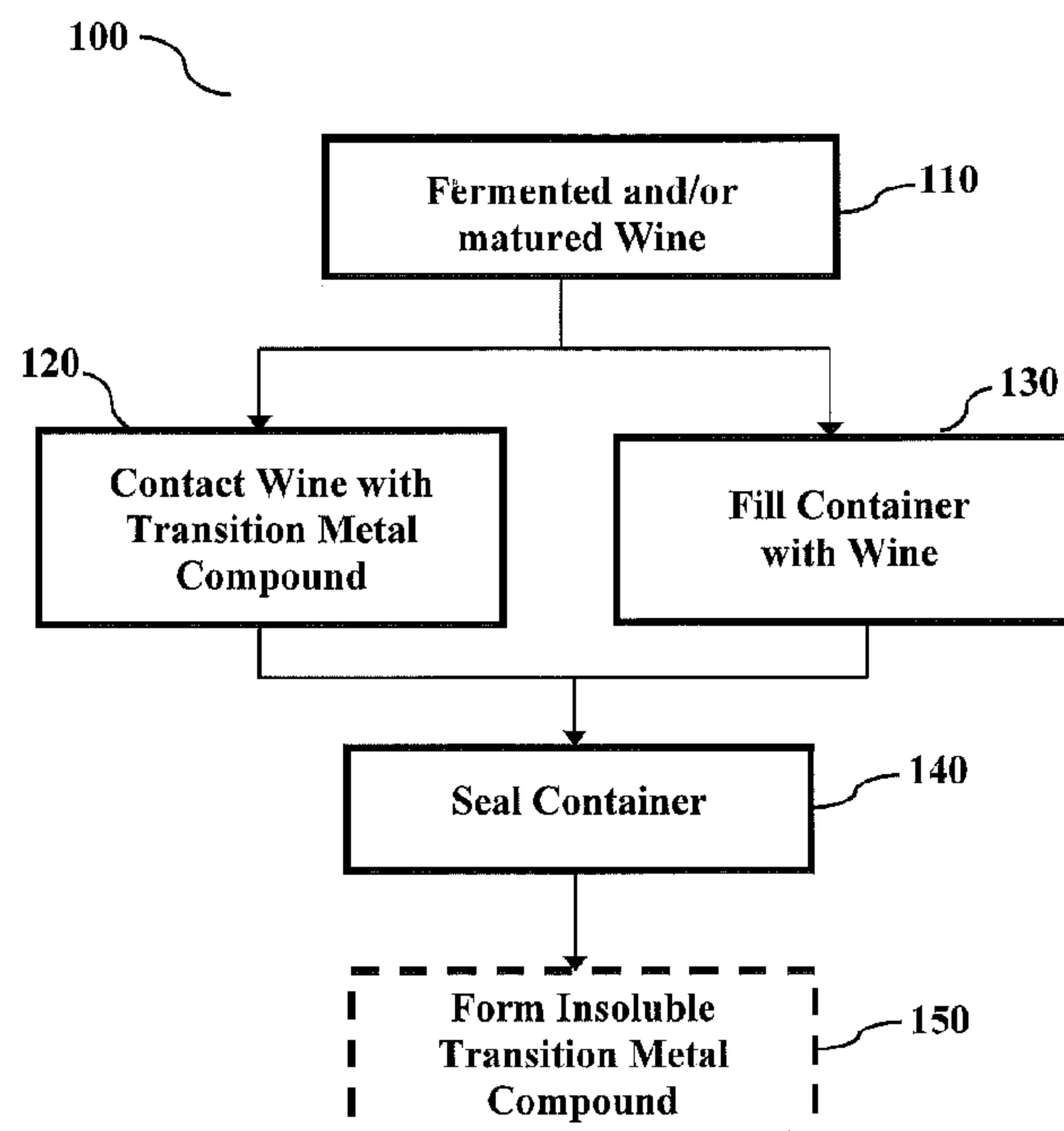




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(54) Titre : ADDITION DE METAL DE TRANSITION A DES VINS ET A DES BOISSONS DE TYPE VIN DANS DES RECIPIENTS METALLIQUES DE BOISSON POUR EMPECHER DES AROMES INDESIRABLES
(54) Title: ADDITION OF TRANSITION METAL TO WINES AND WINE TYPE BEVERAGES IN METALLIC BEVERAGE CONTAINERS TO PREVENT UNWANTED AROMAS



(57) **Abrégé/Abstract:**

The disclosure relates to a method for removing of unwanted odors and/or flavors from a wine and/or wine-type beverage using a transition metal, more particularly to the removal of sulfur and/or sulfur-containing compounds having an unwanted odor and/or off-flavor from a wine product by one or both of: (a) adding copper and/or a copper-containing compound during bottling of the wine product and (b) having a copper-containing container and/or closure system.

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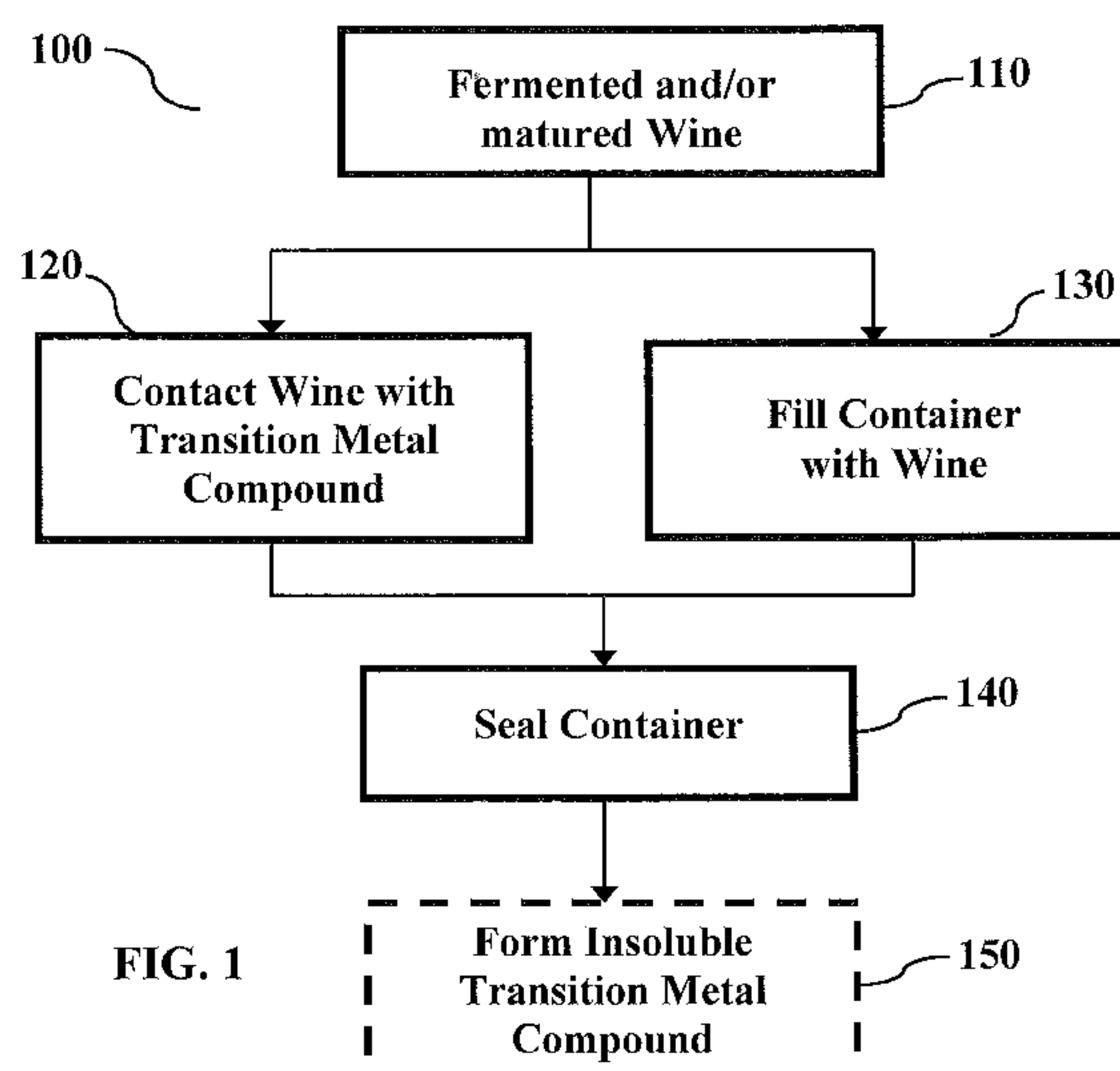


FIG. 1

(57) Abstract: The disclosure relates to a method for removing of unwanted odors and/or flavors from a wine and/or wine-type beverage using a transition metal, more particularly to the removal of sulfur and/or sulfur-containing compounds having an unwanted odor and/or off-flavor from a wine product by one or both of: (a) adding copper and/or a copper-containing compound during bottling of the wine product and (b) having a copper-containing container and/or closure system.

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**ADDITION OF TRANSITION METAL TO WINES AND WINE
TYPE BEVERAGES IN METALLIC BEVERAGE CONTAINERS
TO PREVENT UNWANTED AROMAS**

FIELD OF INVENTION

This invention relates to a method for removing malodors and/or unwanted-flavors from a wine and/or wine-type beverage using a transition metal, and more particularly to the removal of unwanted or malodorous sulfur and/or sulfur-containing compounds from wine and/or wine-type beverages by adding copper and/or a copper-containing compound during bottling of the wine and/or wine type beverage.

BACKGROUND OF THE INVENTION

Wine making typically includes pressing fruit (typically, grapes) to obtain a fruit juice, fermenting the fruit juice, maturing the fruit juice to form wine and, after maturation, bottling the wine. Typically, the fermentation and maturation processes are carefully controlled to develop preferred organoleptic characteristics. However, due to the characteristics of the fruit (such as, growing, harvesting and/or storage conditions), maturation process (such as, temperature, oxidation, and such), and/or bottling (such as, oxygen, wine composition, container and closure system) unwanted odors and/or flavors can develop during one or both of the fermentation and maturation processes. The unwanted odors and/or flavors are typically removed by treating the wine with a fining agent. The fining agent is usually separated from the wine prior to bottling the wine. Examples of fining agents include isinglasse, bentonite, galatin, casein, carrageenan, alginate, diatomaceous earth, pectinase, pectolase, polycar, colloidal silica, copper sulfate, albumen, hydrated yeast, activated carbon, and potassium caseinate. The unwanted odor and/or flavor are typically associated with sulfur and/or sulfur-containing compounds. The sulfur and/or sulfur-containing compounds may be present in the fruit juice that wine is prepared from, may develop during fermentation and/or maturation, and/or may develop as the wine and/or wine-type ages during storage. In some instances, the generation of sulfur and/or sulfur-containing compounds can be minimized, or substantially eliminated, by storing and/or aging the wine in a container having a cork, which typically permits the ingress of oxygen. Oxygen can prevent, or at less minimize, the formation of sulfur and/or sulfur-containing compounds.

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However, unwanted odors and/or flavors can develop in bottled wine (such as, wines bottled in containers having a non-cork closure system). Unwanted odor and flavor development is particularly problematic in wines bottled in metallic containers, even more particularly to wines bottled in metallic containers having metallic lids and/or closure systems. Since it is more cost effective to manufacture, fill and transport containers made from metallic materials as opposed to traditional glass, there is a significant need in the beverage and container industries to manufacture and utilize metallic containers for wine and other alcoholic beverages, yet reduce the unwanted odor and flavor caused by sulfur and/or other sulfur-containing compounds.

Thus, a significant need exists for a bottling process that reduces unwanted odor and/or flavor formation in wines bottled in metallic containers, particularly for wines bottled in metallic containers having metallic lids and/or closure systems.

SUMMARY OF THE INVENTION

These and other needs are addressed by the various embodiments and configurations of the present invention. This disclosure relates to a container system for reducing and/or eliminating unwanted odor and flavor in bottled wine and to a method for forming the container system for reducing and/or eliminating unwanted odor and/or flavor in bottled wine. More specifically, this disclosure relates to a metallic container system and to a system for reducing and/or eliminating unwanted odor and/or flavor in bottled wine and wine-like beverages.

In accordance with a first aspect, a method is provided for reducing unwanted odor and/or flavor in a wine by contacting a transition metal-containing compound with the wine to form a treated wine. The treated wine contains the transition metal-containing compound. The method includes filling a metal container with one of the wine, the treated wine or a combination of both and sealing the container containing the treated wine with a metallic closure system. The contacting of the wine with the transition metal-containing compound generally occurs after one or both of the fermentation and maturation processes. The wine may further include one or both of a non-fermented fruit juice and soda water.

In accordance with another aspect, a method is provided for reducing unwanted odor and/or flavor in a bottled wine by contacting the wine with a copper-containing compound to form a treated wine and sealing the treated wine in a metallic container having a metallic closure system to form a bottled wine. Preferably, the contacting of the wine with the transition metal-containing compound is conducted after one or both of fermentation and maturation of the wine.

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Preferably, the transition metal-containing compound comprises an insoluble transition metal-containing compound. The treated wine is preferably a copper-containing wine.

In accordance with yet another aspect, a metallic container comprising aluminum is provided. The metallic container has a predetermined volume. The predetermined volume being defined by a container wall interconnected to a container bottom and a metallic closure system. The metallic closure system is preferably a lid or screw cap. The container bottom and metallic closure system are in an opposing relationship. In some embodiments, the method further includes substantially filling the predetermined volume with the treated wine. In some embodiments, the treated wine substantially fills the predetermined volume.

In another embodiment, the metallic container and/or metallic closure system comprise a transition metal. In some configurations, the metallic container and/or metallic closure system comprise aluminum. Preferably, the transition metal is copper.

In such embodiments, contacting the wine with the transition metal-containing metallic container and/or closure system forms the treated wine. Furthermore, in some embodiments, contacting the wine with the transition metal-containing metallic container and/or closure system releases at least some transition metal in the wine to form the treated wine. Moreover, in some embodiments, contacting the wine with the transition metal-containing metallic container and/or closure system removes one or both of unwanted odor and flavor from the wine to form the treated wine.

Preferably, the container is an aluminum container having a predetermined volume for receiving the wine. A container bottom, wall and end closure define the predetermined volume. The container wall and bottom may be formed simultaneously by a draw/redraw process or may be formed from two distinct components. Furthermore, the container wall defines an aperture adapted to receive the metallic closure system. More preferably, the metallic container and the metallic closure system are substantially impervious to one or both of oxygen permeation and transmission.

The transition metal-containing compound contains a transition metal selected from the group of metals consisting of scandium, titanium, manganese, iron, cobalt, nickel, copper, zinc, yttrium, zirconium, niobium, molybdenum, ruthenium, rhodium, palladium, silver, hafnium, tantalum, tungsten, rhenium, iridium, platinum, and gold. Preferably, the transition metal-containing compound comprises copper.

While not wanting to be bound by theory, the contacting of the transition metal-containing compound with one or both of sulfur and a sulfur-containing compound forms an insoluble compound. The insoluble compound is believed to contain the transition metal and the one or both of the sulfur and sulfur-containing compound.

Typically, the sulfur and/or sulfur-containing compound is preferably are one of sulfide (S^{2-}), hydrogen sulfide (HS^-), dihydrogen sulfide (H_2S), mercaptan ($R-SH$), 3-mercaptohexanol ($CH_3CH_2CH(SH)CH_2CH_2OH$), methyl mercaptan, and/or a mixture thereof. Commonly, the insoluble compound contains the transition metal and at least one of sulfide (S^{2-}), hydrogen sulfide (HS^-), dihydrogen sulfide (H_2S), mercaptan ($R-SH$), 3-mercaptohexanol ($CH_3CH_2CH(SH)CH_2CH_2OH$), methyl mercaptan (CH_3SH), ethyl mercaptan (CH_3CH_2SH), 2-mercatoethanol ($HOCH_2CH_2SH$) or a combination thereof.

Preferably, the transition metal is copper. The copper preferably forms an insoluble compound with the sulfur and/or sulfur-containing compound. Commonly, the insoluble compound contains copper (II) and at least one of sulfide (S^{2-}), hydrogen sulfide (HS^-), dihydrogen sulfide (H_2S), mercaptan ($R-SH$), 3-mercaptohexanol ($CH_3CH_2CH(SH)CH_2CH_2OH$), methyl mercaptan (CH_3SH), ethyl mercaptan (CH_3CH_2SH), 2-mercatoethanol ($HOCH_2CH_2SH$) or a combination thereof.

In a preferred embodiment, the treated and/or transition metal-containing wine contains no more than about 0.2 ppm copper. In a more preferred embodiment, the treated wine contains copper in the form of copper (II). In an even more preferred embodiment, the treated wine contains copper in the form of copper sulfate.

In accordance with another aspect, a method is provided for reducing unwanted odor in a wine-type beverage by contacting the wine-type beverage with a copper-containing material to form a treated wine-type beverage. The contacting of the wine-type beverage with the copper-containing material forms a treated wine-type beverage, and sealing the treated wine-type beverage in a container to form a bottled beverage. The container is sealed with an end closure. Preferably, the container comprises one of an aluminum container or glass container. The container has a predetermined volume, the predetermine volume defined by a container wall and a container bottom. The container wall defines a neck on an upper end to receive the end closure.

In accordance with another aspect, a method is provided for reducing unwanted odor and flavor in a wine bottled in a metallic container system. The method comprises contacting the

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wine with a water soluble transition metal-containing compound to form a treated wine containing the water soluble transition metal-containing compound, wherein the contacting of the wine with the transition metal-containing compound occurs after a fermentation process. The method also comprises sealing the treated wine in a metallic container with a metallic closure system, wherein the metallic container and the metallic closure system are substantially impervious to one or both of oxygen permeation and transmission, and wherein one of the following are true:

- (a) the water transition metal-containing compound is contacted with the wine prior to filling the metallic container;
- (b) the metallic container is charged with the one of the wine and the water soluble transition metal-containing compound prior to charging the metallic container with the other of the wine and the water soluble transition metal-containing compound; and
- (c) the wine and the water soluble transition metal-containing compound are charged to the metallic container at about the same time by a separate or a combined wine charging and water soluble transition metal-containing compound charging process.

In accordance with another aspect, a method is provided for reducing at least one of an unwanted odor or flavor in a wine-type beverage bottled in a metallic container. The method comprises contacting, after at least one of a fermentation process and a maturation process, the wine-type beverage with a water soluble copper-containing compound to form a treated wine-type beverage containing the water soluble copper-containing compound. The method also comprises sealing the treated wine-type beverage in a metallic container having a metallic end closure, wherein the metallic container and the metallic end closure are substantially impervious to one or both of oxygen permeation and transmission, and wherein one or more of the following are true:

- (a) the water soluble copper-containing compound is contacted with the wine-type beverage prior to filling the metallic container;
- (b) the metallic container is charged with one of the wine-type beverage and water soluble copper-containing compound prior to charging the metallic container with the other of the wine-type beverage and the water soluble copper-containing compound; and

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- (c) the wine-type beverage and the water soluble water-containing compound are charged to the metallic container at apparently the same time by a separate or a combined wine-type beverage charging and water soluble copper-containing compound charging process.

In accordance with another aspect, a metallic container adapted to store a wine product is provided. The metallic container comprises a metallic side wall having a metallic bottom on a lower end and a neck on an upper end. The neck is adapted to receive a closure system. The metallic container also comprises a transition metal provided as a compound in the metallic container or introduced into the container with the wine product, wherein the transition metal reacts with the wine in the container to inhibit the formation of unwanted odors, flavors, or both.

In accordance with another aspect, a method is provided for reducing an unwanted odor or flavor in a wine bottled in a metallic container system. The method comprises contacting the wine with a copper (II) sulfate compound to form a treated wine, wherein the contacting of the wine with the copper (II) sulfate compound is after at least one of a fermentation process and a maturation process. The method also comprises sealing the treated wine in metallic container having a metallic end closure, wherein the metallic container and the metallic end closure are substantially impervious to one or both of oxygen permeation and transmission, and wherein one of the following are true:

- (a) the copper (II) sulfate is contacted with the wine prior to filling the metallic container;
- (b) the metallic container is charged with one of the wine and copper (II) sulfate prior to charging the metallic container with the other of the wine and the copper (II) sulfate; and
- (c) the wine and the copper (II) sulfate are charged to the metallic container at about the same time by a separate or a combined wine charging and copper (II) sulfate charging processes.

In accordance with another aspect, a method is provided for reducing unwanted odor, unwanted flavor, or both in a wine. The method comprises adding a water soluble transition metal-containing compound to the wine to form a treated wine containing the transition metal-containing compound, wherein the contacting of the wine with the transition metal-containing compound is after at least one of a fermentation process and a maturation process. The method also comprises filling a metal container with the treated wine. The method further comprises

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sealing with an end closure the metal container with the treated wine containing the transition metal-containing compound.

In accordance with another aspect, a wine product bottled in a metallic container system is provided. The metallic container comprises a metallic side wall having a metallic bottom on a lower end and an open neck on an upper end, wherein the neck is closed and sealed with a metallic end closure system, and wherein the metallic container and the metallic closure system are substantially impervious to one or both of oxygen permeation and transmission. The wine product comprises a water soluble transition metal compound that reacts with the wine in the metallic container to inhibit the formation of an unwanted odor or flavor, or both.

Some embodiments include filling the predetermined volume substantially with the treated wine-type beverage, and sealing the end closure to neck of the container to form the bottled beverage. Preferably, the container is substantially impervious to one or both of oxygen permeation and transmission. The end closure is at least one of a screw cap, a cork and a pull tab.

Preferably, the copper-containing material forms an insoluble copper-containing compound with sulfur or a sulfur-containing compound. The sulfur and/or sulfur-containing compound comprise one or more of sulfide (S^{2-}), hydrogen sulfide (HS^-), dihydrogen sulfide (H_2S), mercaptan ($R-SH$), 3-mercaptophexanol ($CH_3CH_2CH(SH)CH_2CH_2OH$), methyl mercaptan (CH_3SH), ethyl mercaptan (CH_3CH_2SH), 2-mercatoethanol ($HOCH_2CH_2SH$) or a combination thereof. The copper-containing material is one of added to wine-type beverage or contained within the container.

As used herein, the following terms and meanings are provided:

"Wine" refers to wine and wine -type alcoholic and non-alcoholic beverages, including wine coolers, beers, mixed drinks and other combinations currently sold in grocery, package, or liquor stores.

"Wine-type beverages" refer to beverages containing fermented and/or matured wine and one or both of a non- fermented fruit juice and soda water.

Wine and wine-type beverages will be used interchangeably. That is, wine can refer to a wine-type beverage and wine-type beverage can refer to a wine.

"Bottled wine" refers to wine, after fermentation and/or maturation, stored in a sealed container. The sealed container can include one or more metallic components, such as the container body, end closure, breathable metallic cap and/or metallic bottle adapted to receive a

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cork closure. A breathable metallic cap refers to a metallic cap that can allow for at least some oxygen transmission in the sealed container. Preferably, the breathable metallic cap has oxygen transmission properties similar to a cork closure system. The breathable metallic cap transmits sufficient oxygen to the bottled wine to substantially mitigate aerobic conditions and formation of sulfur and/or sulfur-containing compounds.

"Transition metal" generally refers to a metal bellowing to groups 4-12 of the periodic table. A transition metal generally has an atomic number selected from the group of atomic numbers of 21-30, 39—48, and 72-80.

As used herein, the term "a" or "an" entity refers to one or more of that entity. As such, the terms "a" (or "an"), "one or more" and "at least one" can be used interchangeably herein. It is also to be noted that the terms "comprising", "including", and "having" can be used interchangeably.

As used herein, "at least one", "one or more", and "and/or" are open-ended expressions that are both conjunctive and disjunctive in operation. For example, each of the expressions "at least one of A, B and C", "at least one of A, B, or C", "one or more of A, B, and C", "one or more of A, B, or C" and "A, B, and/or C" means A alone, B alone, C alone, A and B together, A and C together, B and C together, or A, B and C together.

The preceding is a simplified summary of the invention to provide an understanding of some aspects of the invention. This summary is neither an extensive nor exhaustive overview of the invention and its various embodiments. It is intended neither to identify key or critical elements of the invention nor to delineate the scope of the invention but to present selected concepts of the invention in a simplified form as an introduction to the more detailed description presented below. As will be appreciated, other embodiments of the invention are possible utilizing, alone or in combination, one or more of the features set forth above or described in detail below.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings are incorporated into and form a part of the specification to illustrate several examples of the present invention(s). These drawings, together with the description, explain the principles of the invention(s). The drawings simply illustrate preferred and alternative examples of how the invention(s) can be made and used and are not to be construed as limiting the invention(s) to only the illustrated and described examples.

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Further features and advantages will become apparent from the following, more detailed, description of the various embodiments of the invention(s), as illustrated by the drawings referenced below.

Fig. 1 depicts a process according to an embodiment;

Fig. 2A depicts a plan view of a container according to some embodiments;

Fig. 2B depicts a cross-sectional view of the container depicted in Fig. 2A;

Fig. 3A depicts a plan view of a container according some embodiments; and

Fig. 3B depicts a cross-section view of the container depicted in Fig. 3A.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 depicts a process 100 for treating wine according to one aspect of the present invention. In step 110, wine in the form of a fermented and/or matured wine is provided for bottling. The wine may or may not contain unwanted malodorous sulfur-containing compounds. Commonly, the wine is treated with one or both of a fining agent and a sulfur removal agent prior to step 110 to remove the unwanted malodorous sulfur-containing compounds. One or both of the fining and sulfur removal agents typically remove at least most, if not all, of the unwanted malodorous sulfur-containing compounds present in the wine. Furthermore, the fining and/or sulfur removal agents commonly remove the unwanted malodorous sulfur-containing compounds by one or more of absorption, adsorption, complexation, precipitation, and chemical reaction of the fining and/or sulfur removal agents with the unwanted malodorous sulfur-containing compounds. Ordinarily, one or more of the absorbed, adsorbed, complexed, precipitated and/or reacted unwanted malodorous sulfur-containing compounds, the fining agent and sulfur removal agent are removed from the wine prior to step 110.

Preferably, the wine in the form of a fermented and/or matured wine provided in step 110 is substantially free of the one or more of the unwanted malodorous sulfur-containing compounds, fining agent and sulfur removal agent. In some embodiments, the wine provided in step 110 is in the form of a wine-type beverage, such as, but not limited to wine blended with one or both of a non-fermented fruit juice and carbonated water (that is, soda water).

Steps 120 and 130 can be performed in any order. In some embodiments, step 120 is performed before step 130. In other embodiments, step 120 is performed after step 130. In yet other embodiments, steps 120 and 130 are performed substantially at about the same time.

In step 120, a transition metal compound is contacted with the wine. Preferably, the transition metal compound is a water-soluble transition metal compound. The transition metal compound comprises a compound containing one or more metals selected from Groups 3-12 of the periodic table. Preferably, the transition metal compound contains at least one metal having an atomic number selected from the group of atomic numbers consisting of 21, 22, 25-30, 39-42, 44-47, 72-75 and 77-79. The transition metal is typically selected from the group of metals consisting of scandium, titanium, manganese, iron, cobalt, nickel, copper, zinc, yttrium, zirconium, niobium, molybdenum, ruthenium, rhodium, palladium, silver, hafnium, tantalum, tungsten, rhenium, iridium,

platinum and gold. More preferably, the transition metal compound contains a metal having atomic number 29. In some embodiments, the transition metal compound is a copper-containing compound. According to some embodiments, the transition metal compound has substantially little, if any, transition metal other than copper. In accordance
5 with some embodiments, the transition metal compound consists essentially of a copper-containing compound.

In some embodiments, the transition metal compound is contacted with the wine by adding the transition metal compound to the wine. Preferably, the contacting of the wine with the transition metal compound dissolves at least some of the transition metal to
10 form the treated wine.

In some embodiments, the metallic container comprises an aluminum alloy. The aluminum alloy may or may not include one or more transition metals. In such instances, the treated wine is formed by contacting the wine with the metallic container. More specifically, the contacting of the wine with the transition metal contained in one or more
15 of the container wall, container bottom, metallic lid and metallic closure system forms the treated wine. The transition metal content of the aluminum alloy is typically from about 0.01 to about 5 wt%, more typically from about 0.05 to about 4.5 wt%. In some configurations the transition metal content of aluminum alloy is from about 2 to about 4.5 wt%, preferably from about 2 to about 3 wt%. In some configurations, the transition metal
20 content of the aluminum alloy is as low as from about 0.05 to about 1.5 wt%.

In some configurations, the copper content of the aluminum alloy is from about 0.01 to about 0.2 wt% copper. In some configurations, the copper content of the aluminum alloy is from 0.05 to about 0.03 wt% copper.

In some embodiments, the container wall and container bottom may comprise a first metallic alloy. In some embodiments, the metallic lid and/or metallic closure system
25 comprise a second metallic alloy.

In some configurations, the first and second alloys are the same. In some configurations, the first and second alloys differ.

While not wanting to be limited by example, the aluminum alloy typically
30 comprises one of 1000 or 3000 aluminum alloy. Non-limiting examples of 1000 series aluminum alloys are 1050, 1060, 1100 and 1199. The 1000 series aluminum alloys typically contain from about 99 to about 99.99 wt% aluminum. Moreover, the 1000 series aluminum alloys typically contain one or more of Si, Fe, Cu, Mn, Mg, Cr, Zn, V, Ti, Bi, Ga, Pb and Zr. Non-limiting examples of 3000 series aluminum alloys are 3003, 3004, and

3102. The 3000 series aluminum alloys typically contain from about 95 to about 98 wt% aluminum. Moreover, the 3000 series aluminum alloys typically contain one or more of Si, Fe, Cu, Mn, Zn and Ti.

The copper-containing compound may comprise any copper containing compound.

5 Preferably, the copper-containing compound comprises a water-soluble copper compound. More preferably, the copper-containing compound comprises a water-soluble copper (II) compound. Non-limiting examples of water-soluble copper containing compounds comprise copper sulfate, copper nitrate, copper chloride, copper bromide, copper iodide, copper acetate, copper butanoate, copper citrate, copper ethylacetate, copper formate, 10 copper gluconate, copper iodate, copper 2, 4-pentadioate, copper tartate, copper tetrafluoroborate, copper benzoate and mixtures thereof. According to some embodiments, the copper-containing compound comprises one of copper sulfate, copper benzoate, or a mixture thereof.

Preferably, the copper-containing compound is hydrated copper sulfate. The 15 hydrated copper sulfate may have any degree of hydration. Commonly, the hydrated form of copper sulfate may contain for each mole of copper no more than one mole of water, more commonly no more than two moles of water, even more commonly no more than three moles of water, yet even more commonly no more than four moles of water, still yet even more commonly no more than five moles of water, still yet even more commonly no 20 more than six moles of water, still yet even more commonly no more than seven moles of water, still yet even more commonly no more than eight moles of water, still yet even more commonly no more than nine moles of water, still yet even more commonly no more than ten moles of water, still yet even more commonly no more than eleven moles of water, or still yet even more commonly no more than twelve moles of water.

25 In some embodiments, the copper sulfate commonly contains for each mole of copper from about 1 to about 12 moles of water, more commonly from about 3 to about 10 moles of water, even more commonly from about 4 to about 6 moles of water, or yet even more commonly about 5 moles of water.

In some embodiments, the copper-containing compound is provided in an 30 anhydrous form. In some configurations, the copper sulfate is provided in an anhydrous form.

The contacting of the copper-containing compound with the wine forms a treated wine. The treated wine may comprise the copper-containing compound in a substantially dissolved, dissociated state in the treated wine. Commonly, the treated wine contains no

more than about 0.5 ppm of the copper-containing compound, more commonly no more than about 0.4 ppm of the copper-containing compound, even more commonly no more than about 0.35 ppm of the copper-containing compound, yet even more commonly no more than about 0.3 ppm of the copper-containing compound, still yet even more
5 commonly no more than about 0.25 ppm of the copper-containing compound, still yet even more commonly no more than about 0.2 ppm of the copper-containing compound, still yet even more commonly no more than about 0.15 ppm of the copper-containing compound, still yet even more commonly no more than about 0.1 ppm of the copper-containing compound, still yet even more commonly no more than about 0.05 ppm of the
10 copper-containing compound, still yet even more commonly no more than about 0.025 ppm of the copper-containing compound, still yet even more commonly no more than about 0.01 ppm of the copper-containing compound, or still yet even more commonly no more than about 0.005 ppm of the copper-containing compound.

Preferably, the treated wine contains no more than about 0.2 ppm of copper. More
15 preferably, the treated wine contains about 0.2 ppm of copper. Typically, treated wines having no more than about 0.2 ppm copper are less corrosive to aluminum containers than treated wines having more than about 0.2 ppm copper. More typically, treated wines having about 0.2 ppm are less corrosive to the aluminum container than treated wines having more than 0.2 ppm copper.

20 The transition metal compound may be in a powder form or in the form of a solution. Preferably, the transition metal compound is provided in a powder form. More preferably, the transition metal powder is provided in the form of a flowable powder. The flowable powder may comprise the transition metal compound in the form of fine particulate. The flowable powder is in a form a fine particulate powder that can be dosed
25 by a solids handling and/or dosing equipment.

In some embodiments, the transition metal solution is provided as an aqueous or wine solution containing the transition metal compound. The aqueous or wine solution is in a form that can be dosed by solution dosing and/or metering equipment.

30 In step 130, a container 200 (see Figs. 2A, 2B, 3A and 3B) is charged with the wine. The container 200 can be any container suitable for storing the wine. The container may comprise a polymeric material, a ceramic material, a glass, a metallic material or a combination thereof. The container 200 is substantially impervious to one or both of oxygen permeation and transmission. The container 200 has a predetermined volume 240, defined by a container wall 250 interconnected to a container bottom 270.

Furthermore, the wall defines an aperture 300. The predetermined volume 240 is configured to receive the wine. Moreover, the aperture 300 is adapted to receive a metallic closure system 210. Typically, the wine is charged to the container 200 through the aperture 300. Moreover, the charging of the wine to the container 200 substantially,
5 but not completely, fills the predetermined volume 240 with the wine.

In some embodiments, the container 200 is a metallic container. The container 200 preferably comprises an aluminum container. The container wall 250 and bottom 270 respectively have interior wall 260 and bottom 280 surfaces and exterior wall 250 and bottom 290 surfaces. The wine contained in the predetermined volume 240 is in contact
10 with the interior wall 260 and bottom 280 surfaces.

In some embodiments, the one or both of the interior wall 260 and bottom 280 surfaces comprise aluminum. In such embodiments, the wine contained within the predetermined volume 240 is in contact with the interior 260 and bottom 280 surfaces comprising aluminum.

15 In some embodiments, one or both of the wall interior 260 and exterior 250 surfaces have a polymeric coating. Moreover, in some embodiments, one or both of the bottom interior 280 and exterior 290 surfaces have a polymeric coating. In such instances, the wine contained within the predetermined volume 240 is contact with the polymeric coating on one or more of the wall interior 260 and bottom interior 280 surfaces.

20 Returning to steps 120 and 130, in some configurations, the transition metal compound is contacted with the wine prior to filling the container 200. In other configurations, the container 200 is charged with one of the wine and transition metal compound prior to charging the container 200 with the other of the wine and transition metal compound. In yet other configurations, the wine and the transition metal compound
25 are charged to the container 200 at about the same time by separate and/or combined wine charging and transition metal charging processes.

In step 140, the container 200 is sealed. Typically, the sealing of the container includes interconnecting and mechanically joining a metallic closure system 300 about the aperture 300. Wines sealed in containers for storage (such as, wines sealed in corked
30 containers) are typically sealed in containers that permit some degree of oxygen permeation and transmission, allowing at least some oxygen to enter the predetermined volume 240 during storage. In some configurations, the sealed container 200 is substantially imperious to one or both of oxygen permeation and transmission.

Those of ordinary skill in the art are aware that storing wine in a sealed container that substantially impervious to oxygen permeation and transmission can lead to the formation of unwanted odors and/or flavors in the stored wine. Typically, the unwanted odor and/or flavor are due to the formation of one or more sulfur compounds. Non-limiting examples of the unwanted odor and/or flavor sulfur compounds are sulfide (S^{2-}), hydrogen sulfide (HS^-), dihydrogen sulfide (H_2S), mercaptan ($R-SH$), 3-mercaptopropanol ($CH_3CH_2CH(SH)CH_2CH_2OH$), methyl mercaptan (CH_3SH), ethyl mercaptan (CH_3CH_2SH), 2-mercatoethanol ($HOCH_2CH_2SH$) or a combination thereof.

Transition metal compounds, particularly copper-containing compounds, can substantially remove the malodor and/or off-flavor from wine associated with one or more of sulfide (S^{2-}), hydrogen sulfide (HS^-), dihydrogen sulfide (H_2S), mercaptan ($R-SH$), 3-mercaptopropanol ($CH_3CH_2CH(SH)CH_2CH_2OH$), methyl mercaptan (CH_3SH), ethyl mercaptan (CH_3CH_2SH), 2-mercatoethanol ($HOCH_2CH_2SH$) or a combination thereof. Generally, transition metals form insoluble compounds with sulfides and mercaptans.

While not wanting to be limited by theory, it is believed that the copper forms substantially insoluble sulfur-containing copper compounds with one or more of sulfide (S^{2-}), hydrogen sulfide (HS^-), dihydrogen sulfide (H_2S), mercaptan ($R-SH$), 3-mercaptopropanol ($CH_3CH_2CH(SH)CH_2CH_2OH$), methyl mercaptan (CH_3SH), ethyl mercaptan (CH_3CH_2SH), 2-mercatoethanol ($HOCH_2CH_2SH$) or a combination thereof.

The formation of the substantially insoluble sulfur-containing copper compound (depicted as optional step 150) substantially removes the unwanted odor and/or flavor from the wine.

Generally, wines are substantially less likely to develop unwanted odor and/or flavor when stored in sealed containers having some degree of oxygen permeation and transmission. However, the method of process 100 could benefit wines that are susceptible to the development of unwanted odor and/or flavor development when stored in containers having insufficient oxygen permeation and transmission. Moreover, the method of process 100 could benefit wines stored in containers substantially lacking oxygen permeation and transmission, such as wines stored in metallic containers.

Preferably, the closure system 300 comprises a metallic lid and/or metallic closure system, more preferably an aluminum closure system. In some configurations, the metallic lid and/or metallic closure system is substantially impervious to one or both of oxygen permeation and transmission. The metallic lid and/or closure system may or may not comprise a polymeric coating.

Preferably, the metallic lid and/or closure system lacks a polymer coating positioned between the predetermined volume 240 and closure system 300. More preferably, the metallic lid and/or closure system comprises a copper alloy, even more preferably one of 1000 or 3000 aluminum alloy.

5 In some configurations, the closure system comprises a breathable metallic lid and/or closure system. The breathable metallic lid and/or closure system allows for at least some oxygen transmission. Preferably, the breathable metallic lid and/or closure system has oxygen transmission properties similar to cork closure system. The breathable metallic lid and/or closure system transmits sufficient oxygen to the bottled wine to
10 substantially mitigate the aerobic conditions. Preferably, the breathable metallic lid and/or closure system transmits sufficient oxygen to the bottled wine to substantially mitigate the formation of sulfur and/or sulfur-containing compounds. In such instances, the wine is treated with little, if any, transition metal.

In some embodiments, the end closure of the metallic container is configured to
15 accept a cork sealing system. The metallic container having a cork sealing system can have sufficient oxygen transmission to substantially mitigate of the bottled wine. In such instances, the wine is treated with little, if any, transition metal.

A number of variations and modifications of the invention can be used. It would be possible to provide for some features of the invention without providing others.

20 The present invention, in various embodiments, configurations, or aspects, includes components, methods, processes, systems and/or apparatus substantially as depicted and described herein, including various embodiments, configurations, aspects, sub-combinations, and subsets thereof. Those of ordinary skill in the art will understand how to make and use the present invention after understanding the present disclosure. The
25 present invention, in various embodiments, configurations, and aspects, includes providing devices and processes in the absence of items not depicted and/or described herein or in various embodiments, configurations, or aspects hereof, including in the absence of such items as may have been used in previous devices or processes, e.g., for improving performance, achieving ease and/or reducing cost of implementation.

30 The foregoing discussion of the invention has been presented for purposes of illustration and description. The foregoing is not intended to limit the invention to the form or forms disclosed herein. In the foregoing Detailed Description for example, various features of the invention are grouped together in one or more embodiments, configurations, or aspects for the purpose of streamlining the disclosure. The features of

the embodiments, configurations, or aspects of the invention may be combined in alternate embodiments, configurations, or aspects other than those discussed above. This method of disclosure is not to be interpreted as reflecting an intention that the claimed invention requires more features than are expressly recited in each claim. Rather, as the following

5 claims reflect, inventive aspects lie in less than all features of a single foregoing disclosed embodiment, configuration, or aspect. Thus, the following claims are hereby incorporated into this Detailed Description, with each claim standing on its own as a separate preferred embodiment of the invention.

Moreover, though the description of the invention has included description of one

10 or more embodiments, configurations, or aspects and certain variations and modifications, other variations, combinations, and modifications are within the scope of the invention, e.g., as may be within the skill and knowledge of those in the art, after understanding the present disclosure. It is intended to obtain rights which include alternative embodiments, configurations, or aspects to the extent permitted, including alternate, interchangeable

15 and/or equivalent structures, functions, ranges or steps to those claimed, whether or not such alternate, interchangeable and/or equivalent structures, functions, ranges or steps are disclosed herein, and without intending to publicly dedicate any patentable subject matter.

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What is claimed is:

1. A method for reducing unwanted odor and flavor in a wine bottled in a metallic container system, comprising:

contacting the wine with a water soluble transition metal-containing compound to form a treated wine containing the water soluble transition metal-containing compound, wherein the contacting of the wine with the transition metal-containing compound occurs after a fermentation process; and

sealing the treated wine in a metallic container with a metallic closure system, wherein the metallic container and the metallic closure system are substantially impervious to one or both of oxygen permeation and transmission, and wherein one of the following are true:

- (a) the water transition metal-containing compound is contacted with the wine prior to filling the metallic container;
- (b) the metallic container is charged with the one of the wine and the water soluble transition metal-containing compound prior to charging the metallic container with the other of the wine and the water soluble transition metal-containing compound; and
- (c) the wine and the water soluble transition metal-containing compound are charged to the metallic container at about the same time by a separate or a combined wine charging and water soluble transition metal-containing compound charging process.

2. The method of claim 1, wherein the water soluble transition metal-containing compound comprises a transition metal selected from the group of metals consisting of scandium, titanium, manganese, iron, cobalt, nickel, copper, zinc, yttrium, zirconium, niobium, molybdenum, ruthenium, rhodium, palladium, silver, hafnium, tantalum, tungsten, rhenium, iridium, platinum and gold.

3. The method of claim 1, wherein the water soluble transition metal-containing compound comprises copper.

4. The method of claim 1, wherein the metallic container comprises an aluminum container having a predetermined volume for receiving the wine, the predetermined volume being defined by a container bottom portion, a container side wall having an upper end and a lower end, the upper end defining a neck and an aperture for filling.

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5. The method of claim 4, wherein the neck of the metallic container is adapted to receive said metallic closure system.

6. The method of claim 1, wherein the transition metal contained in the treated wine beverage forms an insoluble compound with one or both sulfur or a sulfur-containing compounds.

7. The method of claim 6, wherein the one or both of the sulfur and sulfur-containing compound comprise one or more of a sulfide (S^{2-}), a hydrogen sulfide (HS^-), a dihydrogen sulfide (H_2S), a mercaptan ($R-SH$), a 3-mercaptohexanol ($CH_3CH_2CH(SH)CH_2CH_2OH$), a methyl mercaptan (CH_3SH), an ethyl mercaptan (CH_3CH_2SH), and a 2-mercaptoethanol ($HOCH_2CH_2SH$) or a combination thereof.

8. The method of claim 6, wherein the insoluble compound comprises copper (II) and one or more of a sulfide (S^{2-}), a hydrogen sulfide (HS^-), a dihydrogen sulfide (H_2S), a mercaptan ($R-SH$), a 3-mercaptohexanol ($CH_3CH_2CH(SH)CH_2CH_2OH$), a methyl mercaptan (CH_3SH), an ethyl mercaptan (CH_3CH_2SH), a 2-mercaptoethanol ($HOCH_2CH_2SH$) or a combination thereof.

9. The method of claim 1, wherein the treated wine contains no more than 0.2 ppm copper (II) and wherein the copper is in the form of copper sulfate.

10. A method for reducing at least one of an unwanted odor or flavor, in a wine-type beverage bottled in a metallic container, comprising:

contacting, after at least one of a fermentation process and a maturation process, the wine-type beverage with a water soluble copper-containing compound to form a treated wine-type beverage containing the water soluble copper -containing compound; and

sealing the treated wine-type beverage in a metallic container having a metallic end closure, wherein the metallic container and the metallic end closure are substantially imperious to one or both of oxygen permeation and transmission, and wherein one or more of the following are true:

- (a) the water soluble copper-containing compound is contacted with the wine-type beverage prior to filing the metallic container;
- (b) the metallic container is charged with one of the wine-type beverage and water soluble copper-containing compound prior to charging the metallic container with the

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other of the wine-type beverage and the water soluble copper-containing compound;
and

- (c) the wine-type beverage and the water soluble water-containing compound are charged to the metallic container at apparently the same time by a separate or a combined wine-type beverage charging and water soluble copper-containing compound charging process.

11. The method of claim 10, wherein the metallic container comprises an aluminum alloy container, and wherein the metallic container has a predetermined volume, the predetermine volume defined by a container side wall and a container bottom, and wherein the container wall defines an open neck on an upper end to receive the metallic end closure.

12. The method of claim 10, wherein the end closure is at least one of a screw cap and a pull tab.

13. The method of claim 10, wherein the water soluble copper-containing compound material forms an insoluble copper-containing compound with sulfur or a sulfur-containing compound, and wherein the sulfur or sulfur-containing compound comprise one or more of a sulfide (S^{2-}), a hydrogen sulfide (HS^-), a dihydrogen sulfide (H_2S), a mercaptan ($R-SH$), a 3-mercaptophexanol ($CH_3CH_2CH(SH)CH_2CH_2OH$), a methyl mercaptan (CH_3SH), an ethyl mercaptan (CH_3CH_2SH), a 2-mercптоethanol ($HOCH_2CH_2SH$) or a combination thereof.

14. A wine product bottled in a metallic container system,
wherein the metallic container comprises a metallic side wall having a metallic bottom on a lower end and an open neck on an upper end, and wherein the neck is closed and sealed with a metallic end closure system, wherein the metallic container and the metallic closure system are substantially impervious to one or both of oxygen permeation and transmission, and wherein the wine product comprises a water soluble transition metal compound that reacts with the wine in the metallic container to inhibit the formation of an unwanted odor or flavor, or both.

15. The wine product of claim 14, wherein the wine product comprises a transition metal selected from the group of metals consisting of scandium, titanium, manganese, iron, cobalt, nickel, copper, zinc, yttrium, zirconium, niobium, molybdenum, ruthenium, rhodium, palladium, silver, hafnium, tantalum, tungsten, rhenium, iridium, platinum and gold.

16. The wine product of claim 14, wherein the metallic closure system is at least one of a screw cap, a pull tab and a full panel opening lid.

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17. The wine product of claim 14, wherein the water soluble transition metal compound forms a water insoluble transition metal-containing compound with one or more of a sulfide (S^{2-}), a hydrogen sulfide (HS^-), a dihydrogen sulfide (H_2S), a mercaptan ($R-SH$), a 3-mercaptophexanol ($CH_3CH_2CH(SH)CH_2CH_2OH$), a methyl mercaptan (CH_3SH), an ethyl mercaptan (CH_3CH_2SH), a 2-mercaptoethanol ($HOCH_2CH_2SH$) or a combination thereof.

18. The wine product of claim 17, wherein the insoluble transition metal-containing compound comprises copper (II) and one or both of sulfur and sulfur-containing compounds.

19. The wine product of claim 14, wherein the wine product contains no more than 0.2 ppm copper (II).

20. A method for reducing an unwanted odor or flavor in a wine bottled in a metallic container system, comprising:

contacting the wine with a copper (II) sulfate compound to form a treated wine, wherein the contacting of the wine with the copper (II) sulfate compound is after at least one of a fermentation process and a maturation process and

sealing the treated wine in metallic container having a metallic end closure, wherein the metallic container and the metallic end closure are substantially impervious to one or both of oxygen permeation and transmission, and wherein one of the following are true:

- (a) the copper (II) sulfate is contacted with the wine prior to filling the metallic container;
- (b) the metallic container is charged with one of the wine and copper (II) sulfate prior to charging the metallic container with the other of the wine and the copper (II) sulfate; and
- (c) the wine and the copper (II) sulfate are charged to the metallic container at about the same time by a separate or a combined wine charging and copper (II) sulfate charging processes.

21. The method of claim 20, wherein the metallic container comprises an aluminum container having a predetermined volume for receiving the treated wine, the predetermined volume being defined by a container bottom portion, a container side wall having an upper end and a lower end, the upper end defining a neck and an aperture for filling.

22. The method of claim 20, wherein the wine contains at least one of sulfur and a sulfur-containing compound, wherein the copper (II) contained in the copper (II) sulfate forms

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an insoluble copper (II) compound with the at least one of the sulfur and the sulfur-containing compound.

23. The method of claim 22, wherein the at least one of the sulfur and the sulfur-containing compound comprise at least one of a sulfide (S^{2-}), a hydrogen sulfide (HS^-), a dihydrogen sulfide (H_2S), a mercaptan ($R-SH$), a 3-mercaptophexanol ($CH_3CH_2CH(SH)CH_2CH_2OH$), a methyl mercaptan (CH_3SH), an ethyl mercaptan (CH_3CH_2SH), a 2-mercптоethanol ($HOCH_2CH_2SH$) and combinations thereof.

24. The method of claim 1, wherein the treated wine contains no more than 0.2 ppm copper (II).

25. The method of claim 1, wherein the metallic container comprises an aluminum alloy containing a transition metal.

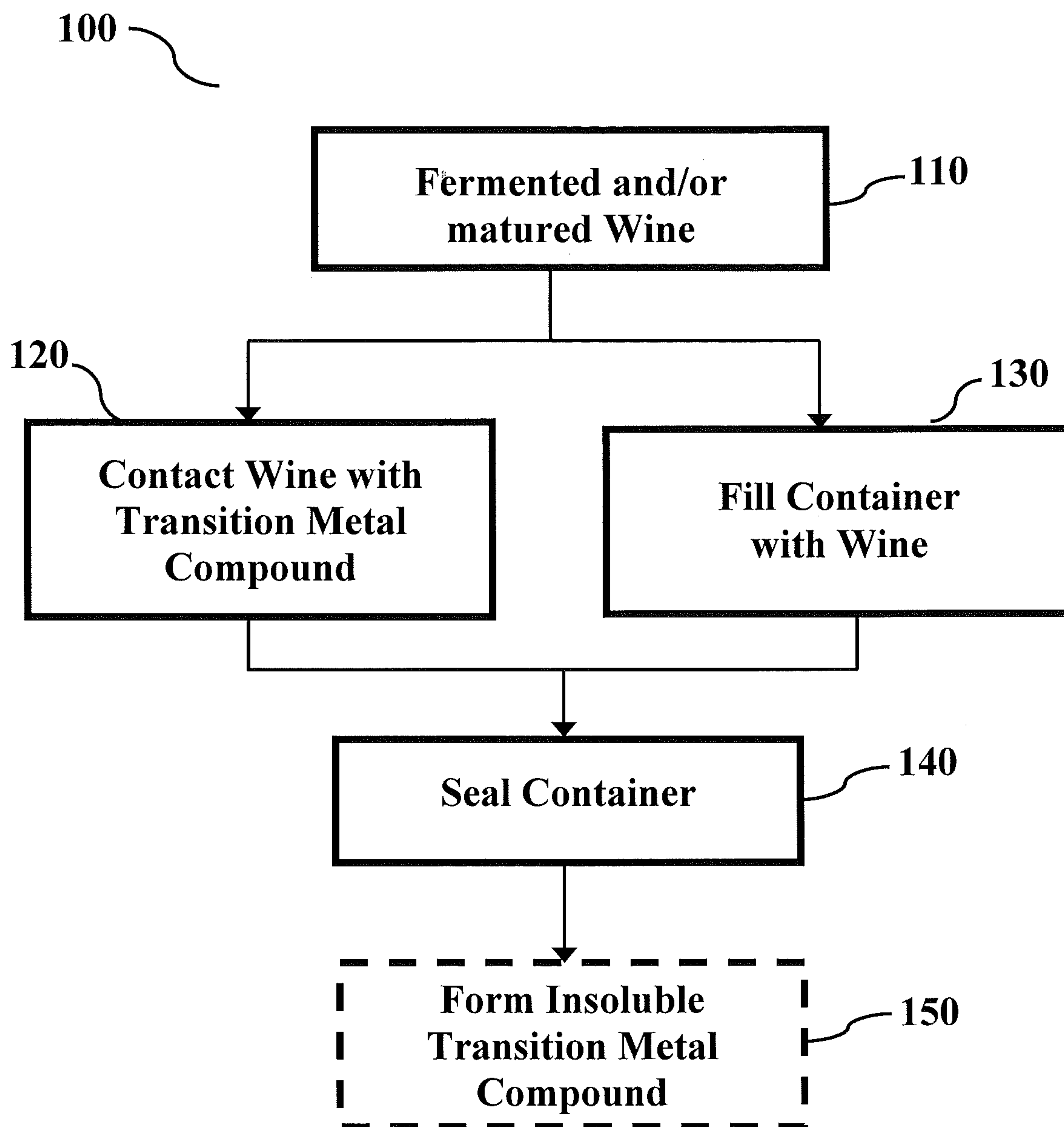


FIG. 1

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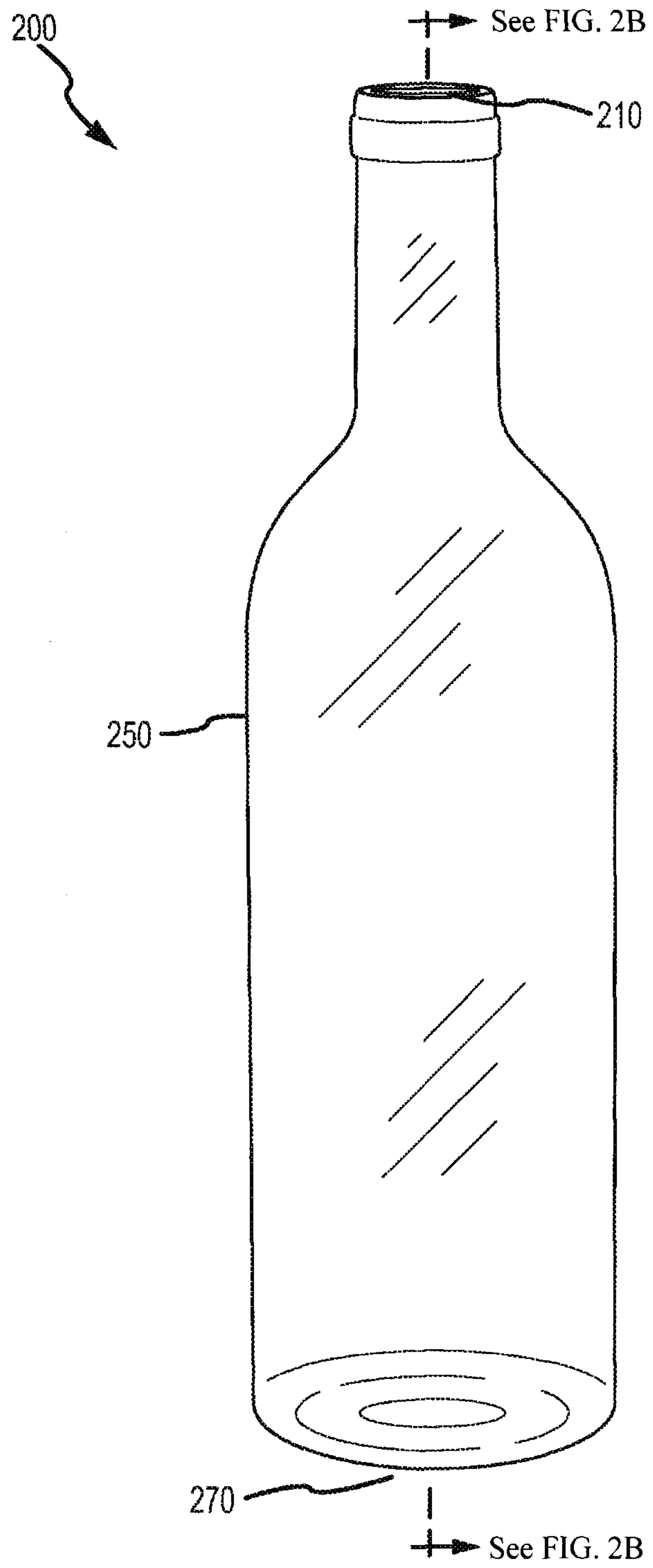


FIG.2A

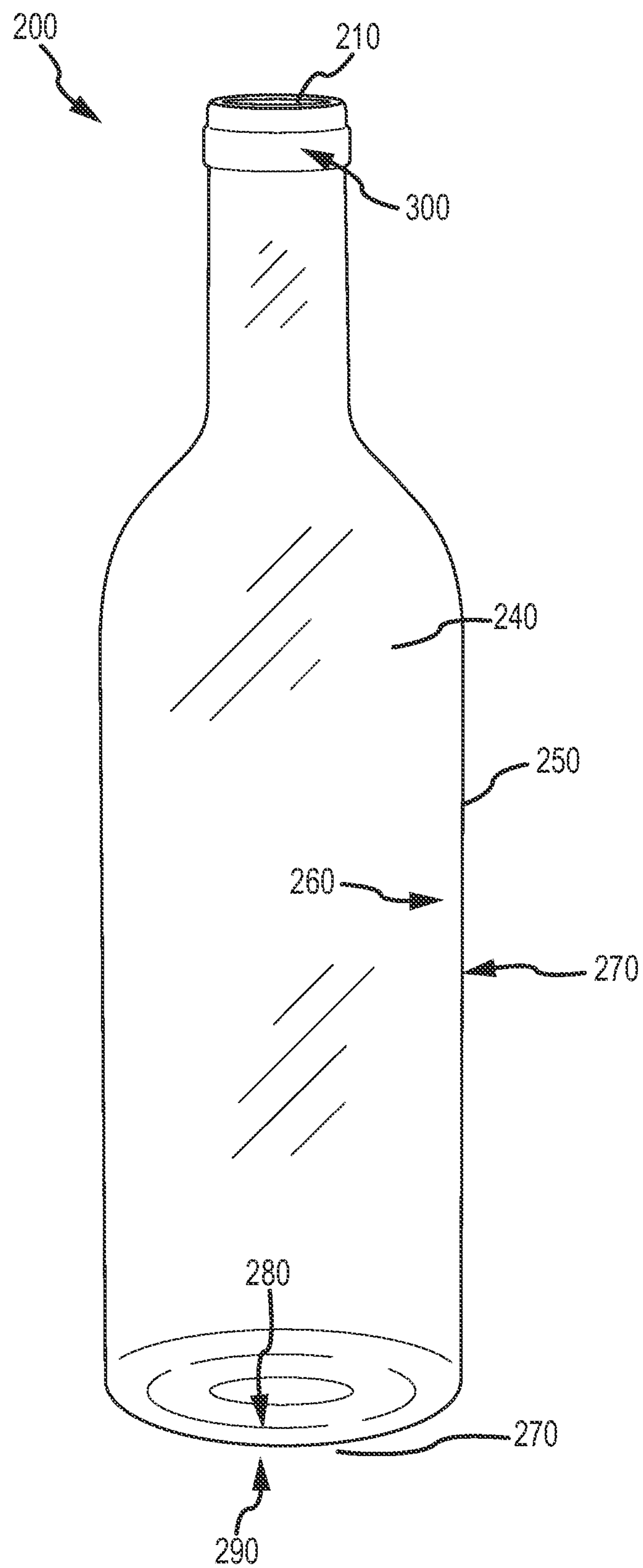


FIG. 2B

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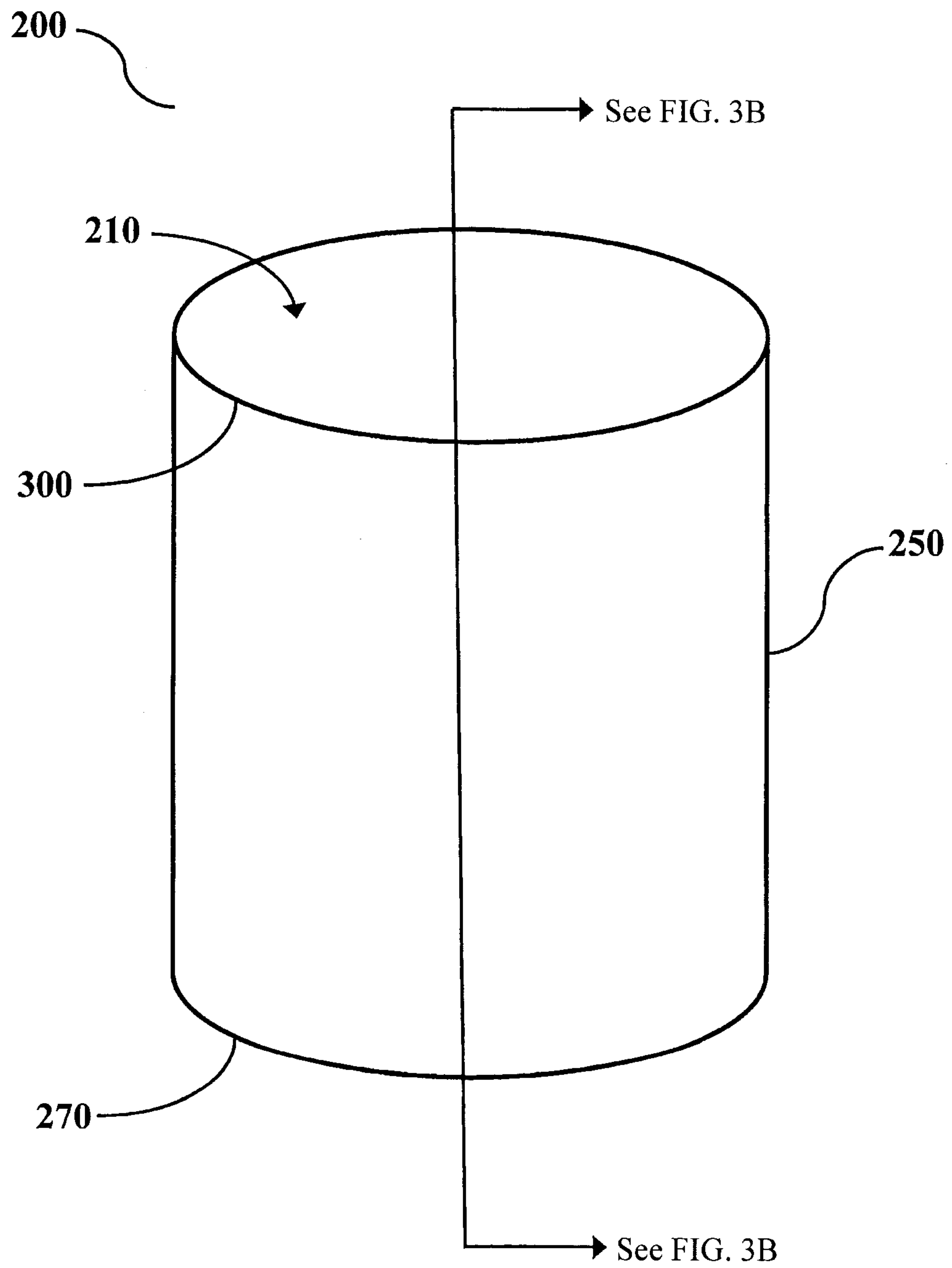
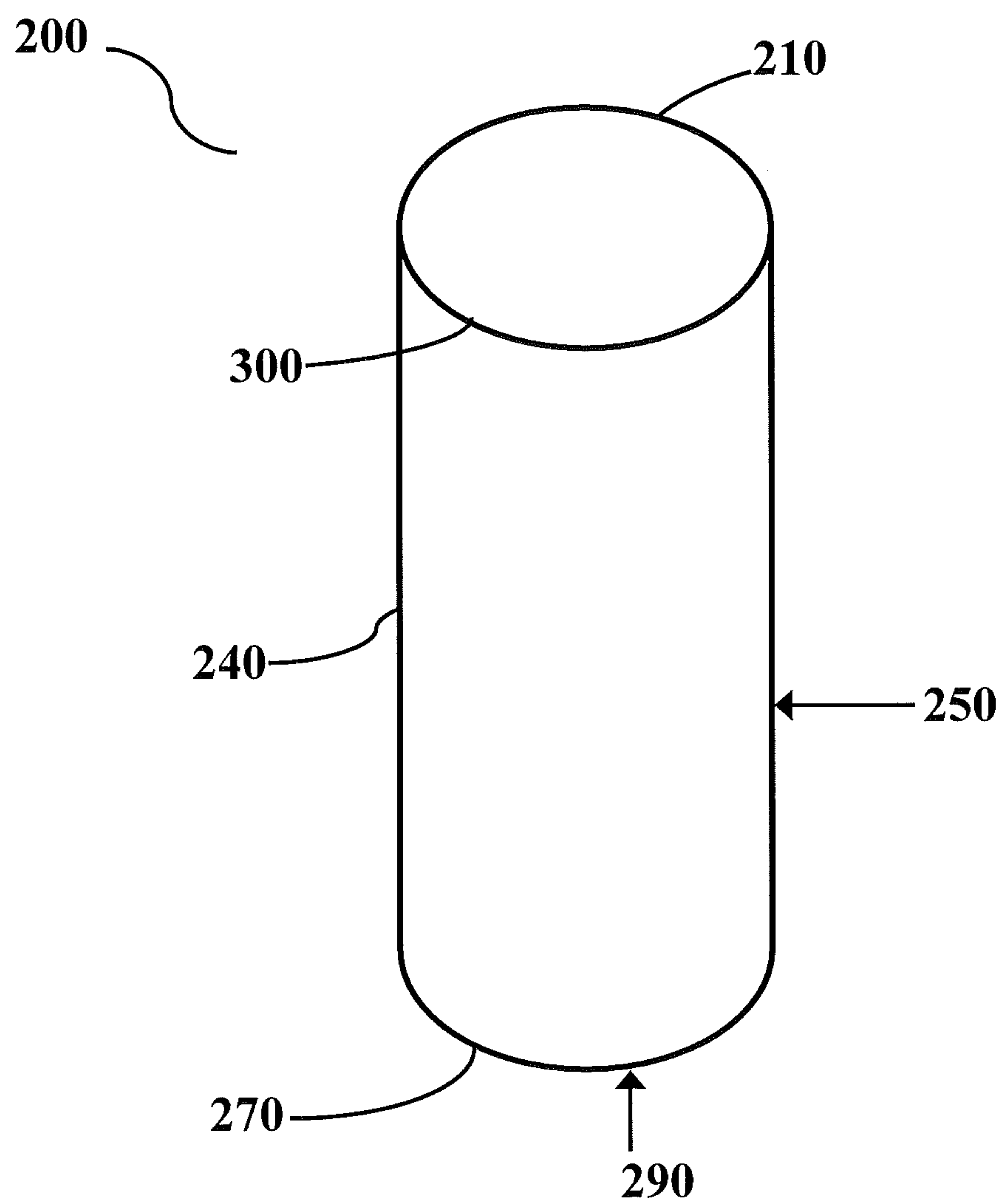


FIG. 3A

**FIG. 3B**

100

**Fermented and/or
matured Wine**

110

120

**Contact Wine with
Transition Metal
Compound**

130

**Fill Container
with Wine**

140

Seal Container

150

**Form Insoluble
Transition Metal
Compound**

