**Introduction**

A client has prepared a draft patent application directed to a stopper for wine bottles. The client is aware of three reference documents (R1-R3). Review the below description with the figures from your client's draft patent application, as well as documents R1-R3, and then complete questions 1 and 2.

**Description from Client's Written Draft Patent Application**

[001] The present invention relates to stoppers for wine bottles.

[002] Bottle stoppers for wine bottles comprising a body made of cork are known (see for example document R1). Cork is provided from layers of bark of cork oak trees. Cork is a material with a randomly distributed, continuous network of interconnected air channels running through the material. The material itself is impermeable to liquids and to gasses such as air. However, gasses can flow through the interconnected air channels. Thus, cork is impermeable to liquids, but permeable to gasses such as air. When a bottle stopper made of cork closes the neck of a bottle, gasses can flow through the interconnected air channels of the cork between the interior and the exterior of the bottle. An exchange of gasses between the interior of the bottle and the exterior of the bottle is necessary for the wine to mature. The optimal rate of exchange of gasses through the stopper differs from wine to wine.

[003] A drawback with these known stoppers is that the gas permeability of the cork varies greatly depending on the tree from which it was sourced. It is therefore difficult to predict how quickly wine will mature in bottles closed with these stoppers.

[004] Brief description of the drawings:

FIG. 1 is a perspective cross-sectional view of a first bottle stopper of the present application.

FIG. 2 is a perspective cross-sectional view of a second bottle stopper of the present application.

FIG. 3 is a perspective cross-sectional view of a third bottle stopper of the present application.

[005] The bottle stopper 10 of FIG. 1 comprises a body 2. The body 2 is made of rubber. The rubber can be, for example, natural or synthetic rubber that is impermeable to liquid and gas. The bottle stopper 10 further comprises a narrow air channel 3, which extends through the body 2. When the stopper closes the neck of a bottle, gasses can flow through the air channel between the interior and the exterior of the bottle. Because the air channel 3 is very narrow, liquid cannot flow through it. The optimal rate of exchange of gasses maturing a specific wine can be achieved by selecting a stopper 10 having an air channel 3 of an appropriate diameter.

[006] The second embodiment (shown in FIG. 2) enables the rate of exchange of gasses through a stopper to be more precisely determined. The bottle stopper 20 of FIG, 2 comprises all the components of the bottle stopper 10 shown in FIG. 1. The bottle stopper 20 additionally comprises a filter plate 4. The filter plate 4 is attached to the body 2 with glue.

[007] The filter plate 4 can be made of, for example, an aluminum foil with perforations forming micro air channels. The filter plate 4 has a predetermined permeability to gasses such as air but is impermeable to liquids. The filter plate 4 therefore prevents liquids from coming into contact with the air channel 3. The

diameter of the air channel 3 and the gas permeability of the filter plate 4 determine the gas permeability of the stopper 20.

[008] The filter plate may fall into the wine if it is pushed away from the body of the stopper by a corkscrew when opening the wine bottle. For this reason, bottle stoppers of the second embodiment should be made longer than conventional bottle stoppers.

[009] The bottle stopper 30 of FIG. 3 comprises a body 2. The body 2 is made of synthetic rubber. The synthetic rubber is impermeable to all fluids, whereby the term fluids includes both liquids and gasses. The bottle stopper 30 further comprises a first air channel 3a, a second air channel 3b and a filter plate 34. The first air channel 3a extends from a first planar surface of the stopper 30 through the body 2. The second air channel 3b continues from the first air channel 3a and extends through the body 2 up to a second planar surface opposite to the first planar surface. The filter plate 34 is fixed within the body 2 so that gasses can flow between the first air channel 3a and the second air channel 3b through a part of the filter plate 34. Fixing the filter plate 34 within the body prevents the filter plate 34 from falling into the wine by the action of a corkscrew.

[010] The filter plate 34 can be made of any metal foil with perforations forming micro air channels, thereby providing a predictable permeability to gasses such as air but being impermeable to liquids. Hence, the gas permeability of the stopper 30 is determined by selecting the diameter of the air channels 3a and 3b and by selecting a filter plate 34 with a predetermined gas permeability.

**Drawings from Client's Patent Application**

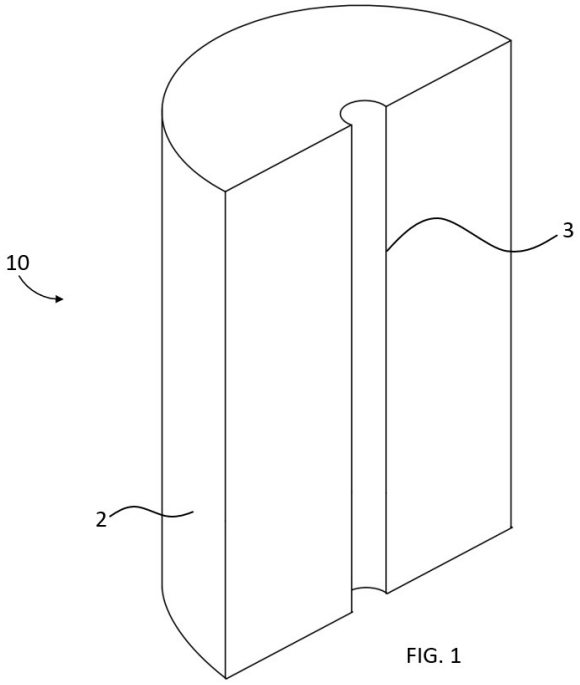


FIG. 1

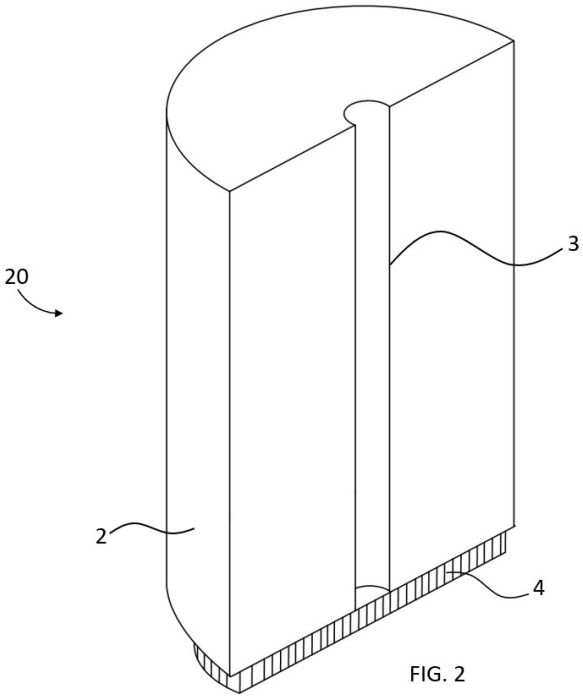


FIG. 2

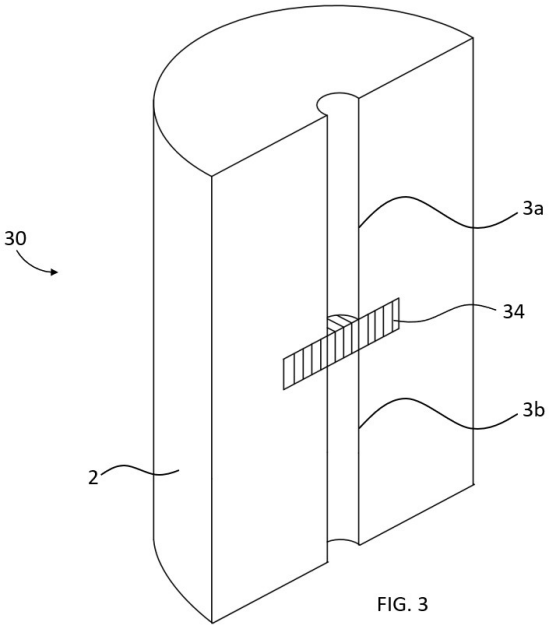


FIG. 3

**R1 Description**

[001] FIG. 1 shows a stopper 100 for closing a bottle, with one half cut away. The stopper 100 is made of cork. Cork is provided from layers of bark of cork oak trees. Cork is a material with a randomly distributed, continuous network of interconnected air channels running through the material. The material itself is impermeable to liquids and to gasses such as air. However, gasses can flow through the interconnected air channels. Thus, a stopper made of cork is impermeable to liquids, but permeable to gasses such as air.

[002] An exchange of gasses between the interior of the bottle and the exterior of the bottle is necessary for the wine to mature. When the bottle stopper 100 closes the neck of a bottle, gasses can flow between the interior and the exterior of the bottle via the air channels 103. The optimal rate of exchange of gasses through the cork differs from wine to wine.

**R1 Drawings**

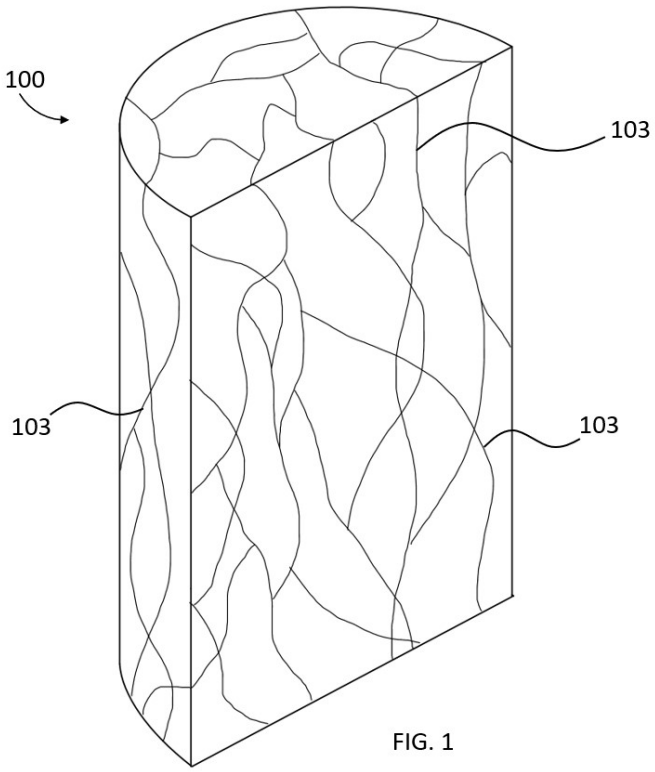


FIG. 1

**R2 Description**

[001] This document describes a stopper for closing a bottle with an improved seal between the stopper and the neck of a bottle compared to stoppers made only from cork.

[002] FIG. 1 shows a stopper 200, with one half cut away. The stopper 200 comprises a cylindrical core 202a made of cork and a cylindrical tube 202b made of synthetic rubber. The synthetic rubber is impermeable to liquids and gasses.

[003] When the stopper 200 closes a bottle, the core 202a enables air to be exchanged between the interior and exterior of the bottle via a randomly distributed, continuous network of interconnected air channels running through the cork. The tube 202b ensures that the cork core 202a does not disintegrate when the stopper 200 is in contact with wine for a long time.

[004] The stopper 200 is made by gluing a cylindrical core 202a made of cork into a cylindrical tube 202b made of synthetic rubber. A strong glue is used so that the core 202a does not detach from the tube 202b, even when the bottle is opened using a corkscrew.

**R2 Drawings**

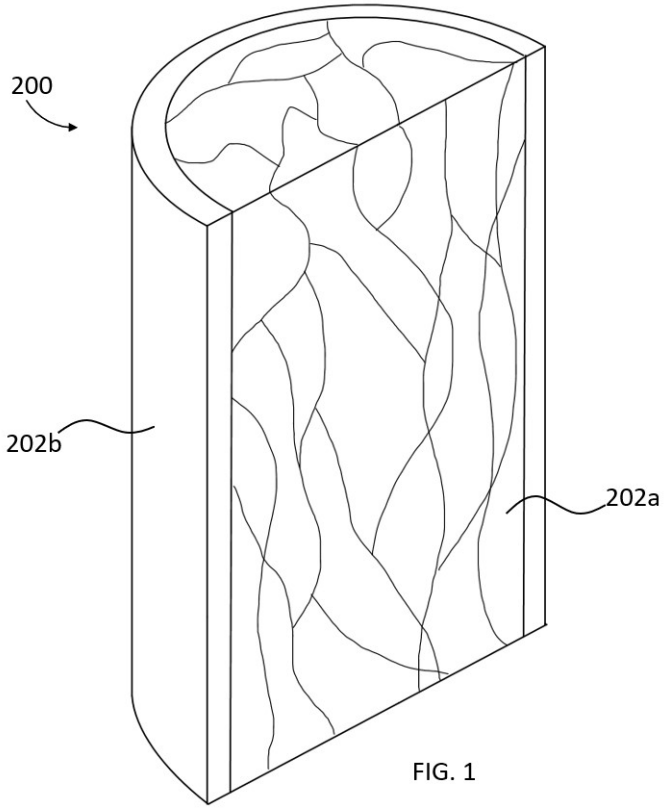


FIG. 1

**R3 Description**

[001] This document describes a stopper for closing a bottle, which can be easily compressed when it is inserted into the neck of the bottle. This makes it easy to insert the stopper into the neck of the bottle.

[002] FIG. 1 shows the stopper 300, with one half cut away. The stopper 300 comprises a cylindrical body 302 and a through-hole 303. The body 302 is made of natural or synthetic rubber. Rubber is a resilient material which is impermeable to liquids and gasses. Synthetic rubber is preferred, since it is less prone to deteriorate over time than natural rubber. Due to the through-hole the stopper can be easily compressed.

[003] FIG. 2 shows, in cross section, the stopper 300 after it has been inserted into the neck of a bottle 305. The body 302 is compressed and the lower part of the through-hole is completely closed. The stopper is completely impermeable to liquids and gasses and tightly closes the bottle.

**R3 Drawings**

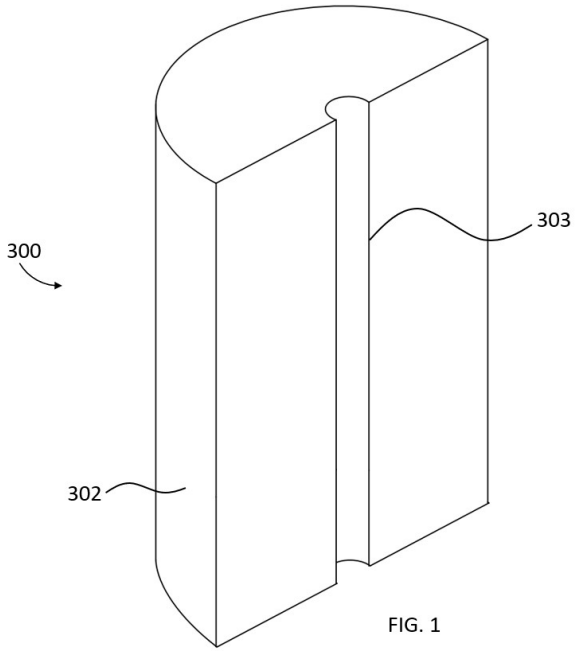


FIG. 1

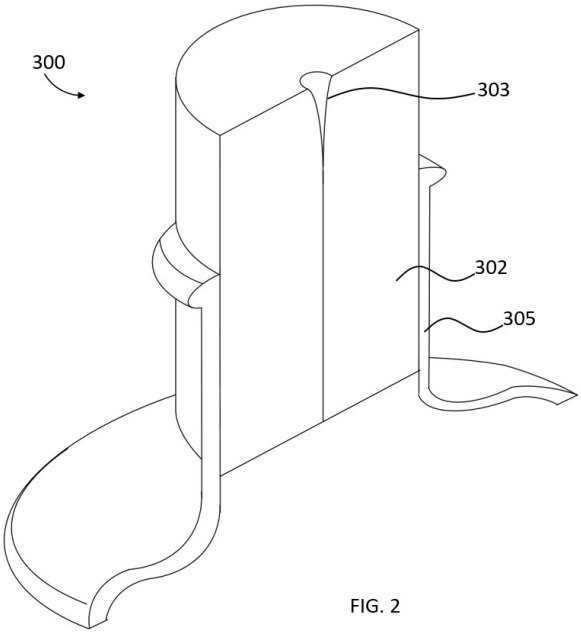


FIG. 2

**Question 1**

Assume only R1 and R2 is the known prior art. Briefly describe (max 250 words) what is the inventive feature of our client's stopper for a wine bottle. Draft one independent apparatus claim and 2 dependent claims.

**Question 2**

Now assume R3 is prior art in addition to R1 and R2. Briefly describe (max 250 words) what is the inventive feature of our client's stopper for a wine bottle. Draft one independent apparatus claim.