A cork-based stopper (10) for bottles (18) comprises a plug (12) of natural or agglomerated cork, on that end face thereof to be located in the bottle interior there being applied a diaphragm (14) of plastic material suitable for food use. The diaphragm (14) ensures the seal while simultaneously isolating the cork plug from contact with the drink, so preventing it assuming the undesirable taste of cork.

Claim

1. A cork-based stopper for bottles, comprising a plug of natural or agglomerated cork, characterised in that on that end face of the cork plug to be located in the bottle interior there is applied a diaphragm of plastic material suitable for food use.
NOTICE OF ENTITLEMENT

I, John Gordon Hinde, of Spruson & Ferguson, St Martins Tower, 31 Market Street, Sydney, New South Wales 2000, Australia, being the patent attorney for the Applicant(s)/Nominated Person(s) in respect of Application No 55338/98 state the following:--

The Applicant(s)/Nominated Person(s) has/have entitlement from the actual inventor(s) as follows:--

The Applicant(s)/Nominated Person(s) is/are the assignee(s) of the actual inventor(s).

The Applicant(s)/Nominated Person(s) is/are the applicant(s) of the basic application(s) listed on the Patent Request. The basic application(s) listed on the Patent Request is/are the first application(s) made in a Convention Country in respect of the invention.

DATED this 26 day of March 1998

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AUSTRALIA

PATENTS ACT 1990

PATENT REQUEST: STANDARD PATENT

I/We, the Applicant(s)/Nominated Person(s) specified below, request I/We be granted a patent for the invention disclosed in the accompanying standard complete specification.

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[54] Invention Title:
Cork-based Protected Stopper

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COMPLETE SPECIFICATION

FOR A STANDARD PATENT

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Invention Title: Cork-based Protected Stopper

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

5845
CORK-BASED PROTECTED STOPPER

This invention relates to stoppers based on natural or agglomerated cork, as are traditionally used for corking bottles of alcoholic drinks in particular.

As a normal consumer of alcoholic drinks and in particular of wine well knows, bottles in which such drinks are preserved and sold are traditionally corked with cork stoppers.

As known to the expert of the art, the most valuable stoppers of this type consist of a single piece of cork and are known as natural stoppers, these being currently used in particular for quality wines.

Since the 1930s stoppers of agglomerated cork have been known and used, ie those formed not from a single piece of natural cork but obtained by joining cork granules together with a suitable adhesive. In addition to being less costly than natural stoppers, these agglomerated stoppers allow the use of that cork (representing most of the total cork production) which would otherwise not be suitable for transformation into natural stoppers, and hence also help to satisfy the ever increasing market demand for stoppers (consequent on the increasing production of bottled wine), while cork production has remained virtually constant.

In any event, whether dealing with natural or agglomerated stoppers, it can happen that their constituent cork presents defects which can substantially change the organoleptic profile of
the drink contained in the relative bottle. These defects are mainly already present in the starting cork, but can also be acquired during the manufacture of the stoppers or during their storage if they are stored in an unsuitable environment. The result is that the drink contained in a bottle corked with a stopper presenting a defect of this type can assume an abnormal taste, generally defined as a cork taste (see pages 12 to 15 of the Proceedings of the 5th International Wine Symposium - Cork in Enology - Pavia, Italy 12-13 May 1993, published by Chiriotti Editori, Pinerolo). This defect in practice destroys the commercial value of the drink contained in the bottle and has given rise to numerous cases of litigation between bottlers and cork manufacturers. The damage is obviously greater the higher the quality of the drink (for example in the case of sparkling wines by the champenoise or classical method and the great wines laid down for ageing).

For many years, plastic stoppers which do not present this drawback have also been used for this purpose. However the consumer automatically associates such stoppers with a low quality drink, hence the widely held opinion of well known and qualified experts in this field is that "... cork stoppers cannot be dispensed with for the great wines, but it is also true that a solution must be urgently sought which does not affect the wire quality" (round-table contribution by A.G. Denari at the conclusion of the aforesaid Symposium, reported on page 127 of the said Proceedings). In conclusion he stated: "I must however say that although cork creates many problems, I cannot envisage a screw or crown stopper for a quality product. It is an absolutely unavoidable question of image. I therefore hope that research will be able to reduce to a minimum, if not completely eliminate, the disagreeable taste linked with the use of cork" (contribution by U. Caselli, again reported on page 127 of the said Proceedings).

It is therefore an object of this invention to provide a cork-based stopper which does not present the aforesaid drawbacks.
Before illustrating how this object is attained by the invention, it is again worth noting that cork is a natural product forming the tugmental tissue (20 to 50 mm thick) of the Quercus suber, a product which cannot be standardized because its composition and structural characteristics can vary from region to region of production, from forest to forest of the same region, from tree to tree of the same forest, and can also depend on the age of the cork. Consequently, as a result of parasite attack, irrational gathering and the seasoning of the panels obtained from the tree, the cork can present uniformity defects of the suberose texture which alter the physical and mechanical characteristics of the stopper, such as its specific gravity, porosity, elasticity and permeability. The result is that the stopper cannot properly perform its function of preventing the wine leaking through the stopper with the bottle horizontal or inclined, to emerge on its outer surface (phenomenon known as seepage by the expert), to the extent of causing gaseous exchange with the outside, and exposing the wine to the danger of oxidation.

It is therefore another object of the invention to provide a cork-based stopper which is free from seepage deriving from the stopper, rather than from other causes (such as excessive ovalization of the bottle neck interior or maladjustment of the cork-fitting machine).

A further object of the invention is to provide a cork-based stopper which when fitted into a bottle appears to be a usual cork stopper.

The aforesaid objects are attained by a cork-based stopper according to the invention, comprising a natural or agglomerated cork plug, characterised in that on that end face of the cork plug to be located in the bottle interior there is applied a diaphragm of plastic material suitable for food use (and hence also not able to influence the organoleptic characteristics of the drink). Such a plastic material is for example polyethylene or polyethylene-terephthalate (PET), which do not transfer any particular taste to
the drink contained in the bottle. In particular, polyethylene is
already used to clad the interior of crown caps and also to form
the so-called bidulle for corksing bottles in which fermentation of
sparkling wine produced by the champenoise method or classical
method takes place.

Conveniently the stopper is formed such that that end to which the
diaphragm is applied is slightly tapered, preferably frusto-
conical, the lateral surface of the diaphragm forming a part of
the lateral surface of the tapered portion, or even the entire
surface of this latter.

By virtue of the invention, the cork plug can be formed from cork
not of first quality, because there is always the assurance that
the stopper itself will not give rise to seepage nor influence the
organooleptic characteristics of the drink contained in the bottle.

Said diaphragm of plastic material can be applied to the cork plug
by gluing, using one of the suitable known glues compatible with
food use.

If the plastic material of the diaphragm is of injection-mouldable
type, the stopper can also be constructed by inserting the
suitably prepared cork plug into a suitable mould and then
injection-moulding the diaphragm onto it.

The diaphragm can also be formed by immersing the relative end of
the cork plug into a bath of plastic material in the viscous
state, then finishing by punching or centrifuging.

Another possibility is to form the diaphragm by pouring the
relative plastic material onto the corresponding end of the
suitably prepared cork plug. If this is done, the quantity of
plastic material required to form each diaphragm (which will
depend on the thickness required for this latter) must be suitably
metered, the combination then being pressed by a suitably shaped
punch, or be centrifuged. The thickness of said diaphragm is
chosen such as to obtain the required stopper impermeability and will depend on the type of plastic material used. For example, in the case of a polyethylene diaphragm, a thickness of at least 1 mm has been found appropriate, whereas for PET the thickness can be smaller.

It is convenient for the diaphragm to turn for a short distance along the lateral surface of the cork plug. In this case the end of the plug must be suitably prepared by forming a circumferential step in the vicinity of its relative end, to provide in it the space for receiving the turned part of the diaphragm.

As the stopper is provided with said plastic diaphragm only on the end which is to lie within the bottle, the plastic diaphragm cannot in practice be seen by a consumer observing a bottle corked with this stopper, especially in the case of wine bottles, which are normally of rather dark glass.

However, to avoid having to orientate the stopper in a determined manner during its fitting (to ensure that that end comprising the diaphragm lies within the bottle), it can be convenient to provide a plastic diaphragm at both ends of the cork plug. However in this case the latter object is not achieved, because that diaphragm which remains outside can be seen by a consumer observing a bottle corked with such a stopper, although once the bottle has been opened the consumer will realize that the stopper is in effect composed almost exclusively of cork.

To prevent the diaphragm separating from the cork plug during bottling, recesses or cavities can be provided in the relative surface of the cork plug for engagement by corresponding projections provided on the diaphragm, so achieving better anchoring of the diaphragm to the cork plug.

As already stated, the plastic diaphragm (which is overall of circular shape, as is the surface of the cork plug to which it is applied) has a frusto-conical lateral surface, with the minor base
of the cone frustum facing outwards. The diameter of this minor base is suitably determined on the basis of the inner diameter of the neck of the bottle for which the stopper is intended. This is currently possible because glass works guarantee a certain inner diameter of the bottle neck plus or minus not more than 1 mm to a depth of 45 mm.

The invention will be more apparent from the ensuing description of some embodiments thereof. In this description reference is made to the accompanying drawings, on which:

- Figure 1 is a side view of a stopper of the invention, of the type provided with only one plastic diaphragm;
- Figure 2 is a view thereof in the direction of the arrow 2 of Figure 1;
- Figure 3 is a longitudinal section therethrough on the line 3-3 of Figure 2;
- Figure 4 is a cross-section therethrough on the line 4-4 of Figure 3;
- Figure 5 is a coaxial vertical section through the top of a glass wine bottle corked with the stopper of the preceding figures;
- Figure 6 is analogous to Figure 5, the stopper being however of the type for sparkling wine.
- Figure 7 is a side view of a stopper provided with a plastic diaphragm at each of the two ends of the stopper;
- Figure 8 is a view thereof in the direction of the arrow 8A or 8B of Figure 7;
- Figure 9 is a longitudinal section therethrough on the line 9-9 of Figure 8;
- Figure 10 is a coaxial vertical section through the top of a glass wine bottle corked with the stopper of Figures 7-9;
- Figure 11 is a side view of a modification of the stopper of the invention, the diaphragm of which turns up for a short distance along the lateral surface of the cork plug, to involve a part of the adjacent frusto-conical portion;
- Figure 12 is a view thereof in the direction of the arrow 12 of Figure 11;
Figure 13 is a side view of the cork plug used in the stopper of Figures 11 and 12, showing its prior preparation;

Figure 14 is a longitudinal section through the stopper of Figures 11 and 12 taken on the line 14-14 of Figure 11;

Figure 15 is a view analogous to Figure 10 but in which the stopper is of the type shown in Figures 11-14;

Figure 16, analogous to Figure 14, shows a further modification of the stopper of the invention;

Figure 17 is an enlarged partial coaxial longitudinal section through a further modification of the stopper of the invention;

Figure 18, analogous to Figure 17, shows a further modification of the stopper of the invention.

From an examination of Figures 1-4, it can be seen that the stopper 10 consists of a cork plug 12 and a diaphragm 14 of plastic material applied to one of its ends. The plug 12 can be of natural cork or of agglomerated cork, but the diaphragm 14 must be of a type of plastic material compatible with food use, and hence by definition unable to alter the organoleptic characteristics of the drink contained in the bottle which the stopper is intended to cork and ensure a seal. As already stated, a suitable plastic material can be for example polyethylene or PET.

As can be seen from Figures 1-4, the diaphragm 14 has a frusto-conical lateral surface which, in the specific illustrated example, connects to a corresponding frusto-conical surface of the corresponding terminal portion of the plug 12. It can be seen that on that face facing the plug 12, the diaphragm 14 comprises four inwardly inclined protuberances 16 (which could be of a different number or shape, or even be lacking) which are inserted into relative cavities 18 (Figure 3) provided in the relative end surface of the plug 12. As can be seen from Figure 3, these protuberances and cavities are inclined towards the axis of the plug 12, their purpose being to improve the anchoring of the diaphragm 14 to the plug 12 so that the diaphragm 14 does not separate from the plug 12 during bottling and/or uncorking.
The diameter of the diaphragm 14 is chosen such that when the stopper 10 has been inserted to cork a bottle 18 (in Figure 5 the same stopper, which is now deformed, is indicated by 10'), any contact between the drink contained in the bottle 18 and the cork plug 12' is prevented, the diaphragm 14 essentially forming an impermeable barrier.

Figure 6 shows that even the characteristic mushroom-shaped stoppers for sparkling wine can be formed in accordance with the principles of this invention, the stopper 30' having been provided with a diaphragm 34' analogous to the diaphragm 14' of Figure 5.

To the consumer both the bottle 18 of Figure 5 and the bottle 48 of Figure 6 will appear to be provided with a totally usual stopper. In this respect, even if the bottle is of colourless glass (which is rare, especially for wine) it is difficult for the consumer to notice the plastic diaphragm through the bottle, especially if a plastic material suitably coloured with food-quality pigments is used.

As already stated, the diaphragm can be applied to the cork plug in various ways, for example by gluing using a suitable glue compatible with food use. If the plastic material used is of the injection-mouldable type, the diaphragm can be formed directly on the plug after its insertion in a suitable mould, or by pouring the plastic material over the plug, or by immersing the plug, as already described.

Figures 7 to 10 show a modified embodiment 60 of the aforedescribed stopper. The stopper 60 has a diaphragm 64 at each of the two ends, and has the advantage of not having to be orientated during bottling. Against this, the consumer can see that the exposed part of the stopper is of plastic, although on uncorking the bottle he will realize that the stopper is nearly totally of cork. It is however to be noted that this drawback is essentially psychological.
A modification of the stopper of Figures 1-4 is shown in Figures 11-14. The relative stopper 70 has a diaphragm 74 which turns for a certain distance along the lateral surface of the plug 72, to cover a frusto-conical end part of the plug 72.

Figure 12 shows that in this specific case there are only two fixing protuberances 76 (but there could be more, for example four as in the preceding cases, or they could also be lacking), again inclined inwards.

As can be seen from Figure 13, and even more clearly from its enlarged circled detail, the relative end of the cork plug 72 has been suitably machined to form the frusto-conical seat for receiving the turned part 74A of the diaphragm 74.

It is apparent from Figure 15 that the stopper 70 forms a circumferential seal between the stopper 70 and bottle 78 which is much better than in the case of the stoppers 10 and 60.

This is because as cork is a substantially elastic material, when the stopper is inserted into the neck of the bottle (Figure 15), the cork (in a compressed state) contained within the turned edge 74A' presses this latter against the neck of the bottle.

It is apparent that a diaphragm such as the described diaphragm 74 can also be provided at the other end of the plug, to hence obtain a stopper which does not require orientation on corking, ie of the stopper 60 type shown in Figures 7-10.

A diaphragm of the type indicated by 74 can evidently also be used for a sparkling wine stopper (not shown).

As can be seen from Figure 16, with the stopper 80 (which is a modification of the stopper 70), the relative diaphragm 84 is turned along the lateral surface of the plug 82 for a distance 84A which involves the entire frusto-conical end of the stopper. In this specific case, diaphragm anchoring protuberances such as
those (16, 66, 76) of the already illustrated stoppers are not provided (but they could be).

Figures 17 and 18 show how the turned part (94A and 104A) of the relative stoppers (90 and 100) decreases in thickness until it disappears. In particular, in the case of the stopper 90 (Figure 17) the turned part 94A of the diaphragm 94 involves the entire relative frusto-conical end of the cork plug 92. In the case of the stopper 100 (Figure 18) the turned part 104A of the diaphragm 104 involves only the more outer of two consecutive coaxial frusto-conical portions, of different contained angle, which form the tapered end of the plug 102.

As will be apparent from the foregoing, what is truly important is that the stopper of the invention completely eliminates the drawbacks deriving from the conventional cork stoppers (whether natural or agglomerated), so totally satisfying a requirement which with the passage of time has become increasingly important to the operators in this field.

Finally it is important to note that the stopper of the invention eliminates the seepage due to defects of the conventional stopper (of natural or agglomerated cork), whereas it cannot totally eliminate leakage of the drink between the neck of the bottle and the stopper due to excessive ovalization of the inner surface of the bottle neck or to defects of the corksing machine. It is necessary to state this because seepage due to this cause is sometimes wrongly attributed to the stopper, but is instead due to bottle defects.

It should also be noted that neither does the stopper of the invention eliminate those defects (abnormal odour and taste of the wine) often attributed to the stopper but which instead are due to technical accidents occurring during the vinification process or during wine storage prior to its bottling.

From tests effected with a dynamometer it has been found that the
force required to extract a stopper of the invention provided with a polyethylene diaphragm is substantially similar to that for extracting a traditional stopper, whereas to extract a stopper with a PET diaphragm a slightly greater force is required. This suggests that a stopper with a PET diaphragm is more suitable for corking bottles containing sparkling wine.
Claims:
The claims defining the invention are as follows:

1. A cork-based stopper for bottles, comprising a plug of natural or agglomerated cork, characterised in that on that end face of the cork plug to be located in the bottle interior there is applied a diaphragm of plastic material suitable for food use.

2. A stopper as claimed in claim 1, wherein that end of the stopper to which the diaphragm is applied is tapered, the lateral surface of the diaphragm constituting the whole or a part of the lateral surface of the tapered portion.

3. A stopper as claimed in claim 2, wherein the tapered end portion of the stopper is of frusto-conical shape.

4. A stopper as claimed in claim 1, wherein the diaphragm is applicable to the cork plug by gluing using a glue suitable for food use.

5. A stopper as claimed in claim 1, wherein if the plastic material used to form the diaphragm is of injection-mouldable type, the diaphragm can be formed by injection moulding by means of a suitable mould into which the cork plug is inserted.

6. A stopper as claimed in claim 1, wherein if the plastic material is pourable, the diaphragm can be formed by pouring a suitable quantity of plastic material onto the relative end of the cork plug, then finishing by punching or centrifuging.

7. A stopper as claimed in claim 1, wherein if the plastic material is usable in viscous form, the diaphragm can be formed by immersing the relative end of the cork plug into the plastic material, then finishing by punching or centrifuging.

8. A stopper as claimed in claim 1, wherein another diaphragm is provided on the other end of the cork plug.
9. A stopper as claimed in claim 1 or 8, wherein the diaphragm comprises anchoring protruberances which engage with corresponding recesses provided in the cork plug.

10. A stopper as claimed in claim 1 or 8, wherein the lateral surface of the diaphragm is frusto-conical, the minor base of the cone frustum facing outwards.

11. A stopper as claimed in claim 1 or 8, wherein the diaphragm turns for a short distance along the lateral surface of the cork plug.

12. A stopper as claimed in claim 11, wherein the relative end of the cork plug is previously prepared to present a step for receiving the turned part of the diaphragm.

13. A stopper as claimed in claim 12, wherein the turned part of the diaphragm involves the entire frusto-conical end of the stopper.

14. A stopper as claimed in claim 11, wherein the turned part of the diaphragm has a gradually decreasing thickness.

15. A stopper as claimed in claim 14, wherein the thickness of the turned part of the diaphragm decreases to zero.

16. A stopper as claimed in claim 15, wherein the tapered end of the cork plug is formed of two consecutive coaxial frusto-conical portions of different contained angle, the turned part of the diaphragm involving only the more outer of said two frusto-conical portions.

17. A stopper as claimed in claim 1, wherein the cork plug is of the sparkling wine type.

18. A stopper as claimed in claim 1 or 8, wherein the plastic material with which the diaphragm is formed is polyethylene or polyethylene terephthalate (PET).

19. A cork-based stopper for bottles, substantially as hereinbefore described with reference to the accompanying drawings.

Dated 16 February, 1998
Enoplastic S.p.A.

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CORK-BASED PROTECTED STOPPER

ABSTRACT

A cork-based stopper (10) for bottles (18) comprises a plug (12) of natural or agglomerated cork, on that end face thereof to be located in the bottle interior there being applied a diaphragm (14) of plastic material suitable for food use. The diaphragm (14) ensures the seal while simultaneously isolating the cork plug from contact with the drink, so preventing it assuming the undesirable taste of cork.