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(71) Applicant: **Stampaggio Gomma S.n.c. di Piloni Celestino & Bossi Enrico**
21020 Bodio Lomnago (Varese) (IT)

(72) Inventors:
- **Piloni, Vittorio**
  Cassinetta di Biandronno (Varese) (IT)
- **Piloni, Luigi**
  Inarzo (Varese) (IT)

(74) Representative: **Tansini, Elio Fabrizio et al**
c/o BUGNION S.p.A.
Viale Lancetti 17
20158 Milano (IT)

(54) Closure having venting means

(57) A closing device for casks comprises a main body (2) to be sealingly inserted into a through hole of a wine-making container, and an active member (3) connected with the main body (2) to enable the gases accumulated within the wine-making container to expand externally of the container itself; the active member (3) comprises a venting duct (5) formed in the main body (2) and a shutter element (4) operatively active in the venting duct (5).

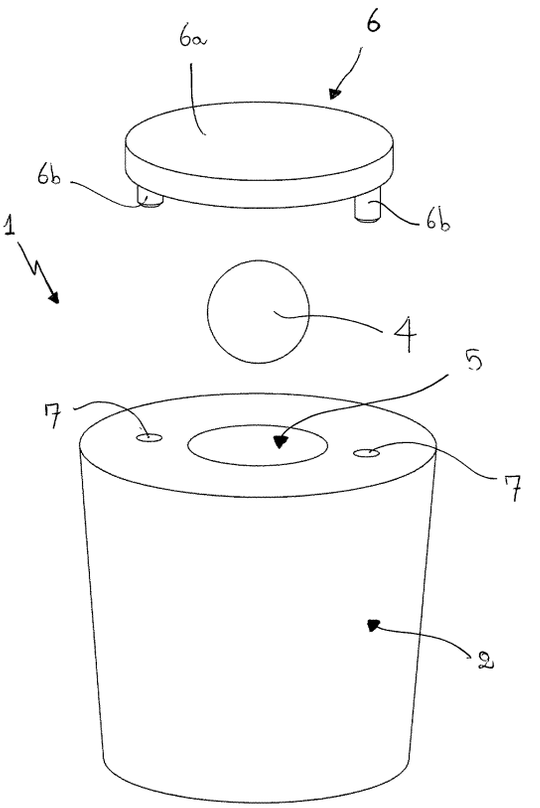

FIG. 1

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Description

[0001] The present invention relates to a closing device, in particular for wine containers such as casks and the like.

[0002] It is known that production of wines or alcoholic drinks derived from grapes fermentation is essentially based on pressing of the crops of the last-mentioned fruit, followed by storage of the products from pressing, typically called musts (from which possible undesirable waste such as grape skins or pips are suitably filtered off) within dedicated containers.

[0003] Such containers, commonly known with the general name of casks, can be sized and built in very different shapes; in fact, the main characteristics of wines are identified not only by the quality of the pressed grapes, but also by the "storage" typology to which musts are submitted and therefore ultimately they also depend on the features of the casks in which musts are allowed to stand during the necessary period so that they may reach the required maturement for bottling and/or consumption.

[0004] In the very wide range of the production methodologies currently employed, a position of a certain prestige is held by those wine-making methods addressed to achievement of products with particularly refined organoleptic characteristics which involve "maturement" of the wine in casks of particular conformation.

[0005] These casks are called in jargon "barriques" or "kegs" (in the Italian language also "carati" or "caratelli") and are distinguishable from the other wine-making containers because they have rather compact sizes and are made of types of wood expressly studied for the purpose of giving the wine particularly intense characteristics (due to gradual release into the wine being matured of the tannins contained in such particular types of wood).

[0006] In substance, the production processes based on use of barriques provide for the wine to be deposited into these casks for a given period of time, during which it undergoes a complex series of chemical/physical reactions that will exactly give it the desired features.

[0007] A typical phenomenon that takes place during the wine residence time in such containers is given by accumulation within the barriques themselves of a non negligible volume of gases resulting from wine fermentation.

[0008] This phenomenon (that obviously also appears in the case in which the most common barrels of great volume are adopted) is particularly harmful when barriques are used; in fact their more reduced strength (as compared with big barrels, that are much more massive and therefore better withstand inner overpressures) exposes them in particular to risks of deformation or even of bursts, above all due to the great intensity of the mechanical action exercised by gases (which may give rise to pressure values of about 2 atmospheres!).

[0009] In order to prevent such accidents, a periodic inspection of the barriques is made necessary, which operation is practically followed by evacuation of the fermentation gases. In this connection it is not to be forgotten that wine ferments with great intensity over a period that can be generally quantified in some weeks, and it is exactly during this period that a great number of manual interventions on the casks is made necessary for the purpose of discharging such fermentation gases; obviously, when the period of "fermentative activity" of the wine is over, it is necessary to ensure a perfect tightness of the casks, since a prolonged contact with the external air would spoil the product.

[0010] The barriques are generally stowed in cellars in a rather high number (due to their reduced sizes) and are disposed in such a manner that they have their tapping/charging hole oriented vertically and upwardly.

[0011] Traditionally, evacuation of the fermentation gases is carried out manually and intervention of an operator working each time on a single barrique is required. Essentially the concerned operator reaches the plug of a barrique, opens it (thus enabling gases to be released in the environment where the barrique is) and subsequently, after substantially balancing the inner barrique pressure, closes it again and carries out the same operation on the subsequent cask.

[0012] The above described known art has some important drawbacks.

[0013] In fact, it is well apparent that due to the necessity to carry out inspections and manual venting operations on the casks at regular intervals, a heavy burden of work is involved for the operators that in addition must execute all these operations manually (since in general barriques are stacked up, which makes it difficult to perform the opening and/or closing operations of their respective plugs in a mechanized manner).

[0014] In association with the above, it is also to be noted that the necessity to carry out frequent venting of the fermentation gases over limited periods of time makes the work very unpractical because the work calendar must take account of these particular periods of "fermentative activity" of the wines; consequently, work organization becomes rather heavy since it is necessary to take into consideration the manual work force to be employed for the periodical venting operations and subsequent restoration of the perfect barrique tightness at the end of the intense fermentation period.

[0015] In addition, the operation of opening and closing the barriques' plug exposes wine to risks of undesirable pollution by dust or other particles that may lay down externally of the container and then accidentally fall thereinto when the barrique is opened.

[0016] Another non negligible drawback consists in that the fermentation gases tend to saturate the environment where barriques are kept which obviously results in worsening of the operator's work conditions, which is particularly felt when a very high number of containers to be submitted to venting is present.

[0017] In the light of the above, the present invention

aims at providing a closing device, particularly for wine containers such as casks and the like, capable of substantially obviating the above described drawbacks.

[0018] In particular, it is an object of the invention to provide a closing device adaptable to any typology of wine-making container which enables automation of the procedure of venting the fermentation gases, without therefore obliging the operators of this particular sector to carry out manual and periodical interventions.

[0019] In addition, the present invention aims at providing a closing device capable of maintaining a high quality of the must being fermented, by preventing any plausible cause of infiltration of foreign materials even during the time that venting of the fermentation gases occurs.

[0020] It is a final object of the present invention to conceive a closing device enabling the above listed operating characteristics to be achieved together with very reduced production costs and installation modalities quite compatible with the already existing wine-making containers (i.e. without making it necessary to carry out modifications to the casks or barriques to which the device will be applied).

[0021] Further features and advantages will become more apparent from the detailed description of some preferred but not exclusive embodiments of a closing device, particularly for wine containers such as casks and the like, in accordance with the present invention. Such a description will be taken hereinafter with reference to the accompanying drawings, given by way of example only, in which:

- Fig. 1 is an exploded perspective view of the closing device in accordance with the present invention;
- Fig. 2 is a sectional side view of the closing device in Fig. 1 (along line II-II in Fig. 1); and
- Fig. 3 is a sectional side view of an alternative embodiment of the device shown in Fig. 1 (still along line II-II in Fig. 1).

[0022] With reference to the drawings, a closing device in accordance with the present invention has been generally identified by reference numeral 1.

[0023] It essentially comprises a main body 2 which is generally such shaped that it can be sealingly inserted into a corresponding through hole formed in a wine-making container (which obviously can be a barrique or also any other container commonly used for production of wines, spirits or drinks resulting from must fermentation). Typically, the main body 2 has a frusto-conical conformation, so that it can adapt itself to the round holes formed in the casks.

[0024] If required by current needs, it is obviously possible to give the main body 2 different shapes (it may be in the form of a truncated pyramid, for example), so that it can adapt itself to holes of shapes different from the circular one.

[0025] Advantageously, device 1 comprises an active member 3 which is operatively connected to the main body 2 to allow the gases accumulating within the barrique (or the cask, or in general the wine-making container as employed in the different cases) to expand to the outside of the container itself.

[0026] In other words, such an active member 3 performs the important function of venting outwardly the excess pressure resulting from production of the fermentation gases by the must under "maturement" (said gases mainly consisting of carbon dioxide); conveniently, the structure (and consequently operation) of the active member 3 is adapted to enable automatic venting of said gases when a predetermined gas pressure is reached within the wine-making container.

[0027] From an operational point of view, it is to be noted that the active member 3 can be reversibly moved between a closed position in which it prevents fluid communication between the inner volume of the wine-making container and the surrounding atmosphere (thereby ensuring a perfect air-tightness between these two spaces) and an open position in which, on the contrary, it enables occurrence of fluid communication between the inner volume and the surrounding atmosphere (thereby, in other words, allowing venting of fermentation gases).

[0028] In more details in terms of structure, it is possible to see from the accompanying figures that the active member comprises a shutter element 4 which can be operatively moved between the above mentioned open and/or closed positions; such a shutter element 4 is housed within a venting duct 5, which in turn is integrally formed in the main body 2.

[0029] Conveniently, the venting duct 5 has a first orifice 2a (such shaped that it can be brought into fluid communication with the inner volume of the wine-making container) and a second orifice 2b, obviously opposite to the first orifice 2a (which is such shaped that it can be put into fluid communication with the external environment).

[0030] In other words, the venting duct 5 puts the inner volume of the wine-making container in communication with the external environment, except for the appropriate arrangement of the shutter element 4 inside it.

[0031] In the preferred but not exclusive embodiment shown in the accompanying drawings, the shutter element 4 is operatively active close to the second orifice 2b but, if required, it is possible to have a venting duct 5 such shaped that the shutter element 4 will be operatively active close to the first orifice 2a.

[0032] In accordance with the present invention, the shutter element 4 is moved to the open position when the fermentation gases contained in the inner volume of the wine-making container reach a predetermined opening pressure; in this way, the fermentation gases themselves push the shutter element (which obviously has suitably calculated shape and mass to cause reaching of the open position only if pushed by a predetermined pressure value, which can be referred to as

"opening pressure") and thus they can freely expand into the surrounding atmosphere.

[0033] Advantageously, the venting duct axially crosses the main body 2 and is designed, under engagement conditions of device 1 with the wine-making container, to take a substantially vertical orientation (in this manner, the shutter element 4 is brought back to the closed position by fall, following reduction of the pressure value of the fermentation gases until a predetermined pressure, referred to as "closure pressure").

[0034] As can be viewed from the accompanying figures, the venting duct 5 is essentially made up of at least one connecting portion 5a and one housing portion 5b which is in fluid communication with the connecting portion 5a.

[0035] The connecting portion 5a which practically has a constant outflow section (for the sake of the greatest manufacturing simplicity) extends from the first orifice 2a; in accordance with the present invention, such a connecting section 5a has a maximum section smaller than the cross section of the shutter element 4, so that the shutter element placed in the closed position, completely stops said section up.

[0036] Unlike what happens for the connecting portion 5a, the housing portion 5b (practically prolonging in the extension of the connecting portion 5a itself) has a geometric conformation adapted to house the shutter element 4 at least partly; in particular, in the accompanying figures such a housing portion 5b, as seen, has a concave shape (in the form of a paraboloid for example, or of a hollow cylinder with a rounded end) on the bottom of which the shutter element 4 comes to rest in its closed position.

[0037] Conveniently, the shape of the shutter element 4 partly matches that of the housing portion 5b, so that adhesion between its surface and that of the housing portion 5b in the closed position is maximized.

[0038] In accordance with a particularly advantageous embodiment, the shutter element 4 is a spheroidal body (clearly for an easy construction and practical availability of same), whereas the housing portion 5b has an abutment bottom substantially conforming in shape to the spheroidal body itself. By virtue of this mutual conformation of the shutter element, a perfect seal of the venting duct is ensured even when the shutter element 4 is rotated along one of its axes following interaction with the flow of the fermentation gases; in other words, since the shutter element 4 is a spheroidal body, it can advantageously rest on the abutment bottom always in the same manner (being the surface of a sphere perfectly homogeneous) and consequently can offer the same sealing action irrespective of its relative orientation.

[0039] For the purpose of enabling venting of the fermentation gases while at the same time preventing an undesirable entry of insects and/or corpuscles into the wine-making container, the present invention can be provided with a protection element 6; such a protection element 6 is operatively active close to the second orifice 2b (the one facing the external environment).

[0040] Conveniently, the protection element 6 is shaped in a manner suitable to enable the fermentation gases to expand in the surrounding atmosphere when the shutter element 4 is moved to the open position, i. e. it is made in such a manner that it constitutes a barrier against passage of solid bodies but does not stop gas flows.

[0041] It is to be noted that this operational feature is at all events accomplished, within the spirit of the present invention, in a manner adapted to keep a great manufacturing simplicity and without resorting to particular materials and/or working operations; for instance, free passage of the gases is allowed through the interfacing region between the protection element 6 and the main body 2 by utilising the natural gibbosity of the two components themselves (this gibbosity can result from a working that does not involve a particular surface finishing or a very high precision), or the protection element 6 can be linked to the main body 2 in such a manner that free spaces are in any case created between these two components (this particular construction mode will be explained in the following).

[0042] The protection element 6 comprises a closing body 6a, of a substantially flat shape (a disc-shaped body, for example), with which at least one engagement body 6b is fixedly and integrally associated (in the accompanying figures there are two engagement bodies 6b positioned at the opposite ends of a diameter of the lower face of the disc-shaped element). Obviously, the engagement body 6b is operatively active between the protection element and the main body 2 to mutually engage them.

[0043] In the embodiment shown, the engagement bodies 6b are substantially in the form of a prism (in particular, a cylindrical prism), and they are designed to be fitted into corresponding housing seats 7 (substantially having a shape conforming to said bodies). In other words, each of the housing seats 7 is suitable to receive one of the engagement bodies 6a under operating conditions.

[0044] At this point it is to be noted that the engagement bodies 6a in a particularly appreciated embodiment of the present invention are shaped in a cylindrical conformation (that obviously will match the shape of the housing seats 7), so as to enable easy rotation of the closing body 6a around one of its engagement bodies under given operating conditions (if the shutter element 4 is wished to be inspected, for example).

[0045] Conveniently, the device 1 in accordance with the present invention can be provided with a return element 8 operatively associated with the shutter element 4 to move it to the closed position. Such a return element can be useful to cause return of the shutter element 4 to the closed position when the mere force of gravity acting thereon is not sufficient to close the device itself (for instance, when engagement of a particularly lightweight

shutter element 4 is involved, which element could be jammed into the housing portion 5b in such a position that the connecting portion 5a, and therefore the inside of the cask, would be still maintained in communication with the surrounding atmosphere).

[0046] In order to enable the maximum construction simplicity, the return element 8 is made up of a spring; such a spring has a first end linked to the main body 2 (or, alternatively, to the protection element 6) and a second opposite end operatively active on the shutter element 4 itself. In accordance with the present invention, the first spring end can be secured following different configurations (for example close to the abutment bottom or in a suitably shaped cavity formed in the main body 2 or it may adhere to the lower face of the closing body 6a and extend within the housing portion 5a), but always in such a manner that it can act on the shutter element 4 to bring it back to the closed position.

[0047] Advantageously and in accordance with rules and regulations in force in the wine-making field, both the main body 2 and the protection element 6 are (at least partly) made of elastomer material; in accordance with the present invention silicone rubber is used, so as to offer an excellent closure of the hole formed in the wine-making container due to softness of the material itself.

[0048] In accordance with the present invention, the main body 2 may also be made of more than one material, provided the outer portion thereof is made of a silicone elastomer material: in this way this outer portion is adapted to come into engagement against the through hole formed in the wine-making container, whereas the inside of the main body 2 can be advantageously made of any material which for instance could be more adapted to be worked by a material removal process (so that the venting duct 5 can be efficiently dug therein).

[0049] Correspondingly, the protection element 6 too can be fully or partly made of silicone rubber, thus enabling an easy and quick manufacture of same and in addition an excellent handling.

[0050] Furthermore, it is to be pointed out the fact that when a protection element 6 of silicone rubber is available, it is advantageously possible (in order to allow passage of the fermentation gases while at the same time inhibiting entry of solid matter into the cask) to arrange the housing seats 7 at a slightly shorter distance than the distance at which the engagement bodies 6b are. In this way, by fitting the engagement bodies 6b into the housing seats 7, the closing body 6a will slightly bend, thereby creating thin gaps which are sufficiently large to cause venting of the fermentation gases (obviously when the shutter element 4 is in the open position) but at the same time sufficiently small to prevent entry of solid matter such as insects or dirt particles.

[0051] It is finally to be mentioned the fact that in the present invention the shutter element can be advantageously made up of a glass marble, in order to ensure low production costs, easy availability, compactness of the shutter element together with an appropriate weight and finally also in order that the device 1 would maintain a high tightness in the closed position.

[0052] Alternatively, the shutter element can be made of silicone rubber as well, or more generally it may consist of any material; still within the scope of the present invention the shutter element may have a core made of a given material (an iron or wood ball, for example), externally surrounded by a silicone rubber or glass portion.

[0053] The invention achieves important advantages.

[0054] First of all, it is to be noted that the substantial identicalness in the outer shape of the present device ensures a complete adaptability of the same to all wine-making containers presently on the market; in this way a great advantage in terms of marketability and correspondence with the sale requirements is achieved.

[0055] Obviously, an immediate advantage of the present invention resides in that, due to the appropriate sizes of its components, the concerned closing device is capable of venting the overpressures resulting from fermentation gases in a quick and efficient manner so that an operator is no longer required for control and manual execution of these operations.

[0056] In association with the above feature, it is to be also noted that use of such a closing device expedites drawing up and organization of the work calendar; in addition such a closing device lends itself to be easily replaced, at the end of the wine fermentation period, with traditional silicone plugs in a quick and efficient manner.

[0057] In addition to the above, the intrinsic structural simplicity of the present device is able to ensure an optimal operation and at the same time an unlimited liability in time; furthermore, the characteristics of the materials employed in the construction of the present device make it adapted to be used several times, so that duration of the device exceeds the typical operating life of a barrique.

[0058] It will be also recognized that due to the architecture of this invention, the wine under maturement is perfectly isolated from any possible intrusion of macroscopic objects and/or infiltration of moisture and particulate from the outside, even if the barriques are stowed in cellars that are particularly damp or infested by insects and other animals.

[0059] Finally, the present invention can be put into practice with few and simple construction operations, so that production costs are very low and particularly skilled manpower and/or specialized machinery is not required; still in terms of costs, it will be recognized that automation of the fermentation gas venting enables wine producers to greatly lower their production costs, because a great amount of manual work is no longer required from them and consequently manpower costs are reduced.

Claims

1. A closing device, particularly for containers such as casks and the like comprising a main body (2) such shaped that it can be sealingly inserted into a through hole formed in a wine-making container, **characterized in that** it further comprises at least one active member (3) operatively connected to said main body (2) to enable the gases accumulated within said wine-making container to expand externally of the container itself.

2. A device as claimed in claim 1, **characterized in that** said active member (3) can be moved between at least one closed position in which it inhibits fluid communication between an inner volume of the wine-making container and the surrounding atmosphere and an open position in which said fluid communication between said inner volume and the surrounding atmosphere is established.

3. A device as claimed in claim 1 or 2, **characterized in that** the active member (3) comprises:

   - at least one shutter element (4) operatively movable to said open position and/or to said closed position; and
   - at least one venting duct (5) integrally formed in the main body (2) and having a first orifice (2a) such shaped that it can be brought into fluid communication with the inner volume of the wine-making container, and a second orifice (2b) the shape of which makes it able to be put into fluid communication with the surrounding atmosphere.

4. A device as claimed in claim 3, **characterized in that** said shutter element (4) is operatively active close to the first orifice (2a) or the second orifice (2b), the shutter element being movable to the open position when the fermentation gases contained in the inner volume of the wine-making container reach a predetermined opening pressure.

5. A device as claimed in claim 3, **characterized in that** the venting duct (5) axially crosses the main body (2) and is designed, under engagement conditions of the device (2) with the wine-making container, to have a substantially vertical orientation, the shutter element (4) being moved to the closed position by falling into the venting duct (5) when said fermentation gases decrease to a predetermined closing pressure.

6. A device as claimed in claim 3, **characterized in that** the venting duct (5) comprises at least one connecting portion (5a) and at least one housing portion (5b) in fluid communication with said connecting portion (5a), the connecting portion (5a) preferably extending from the first orifice (2a) and more preferably having a maximum section smaller than the maximum cross section of the shutter element (4), the housing portion (5b) prolonging in the extension of the connecting portion (5a) and housing the shutter element (4) at least partly.

7. A device as claimed in claim 6, **characterized in that** the shape of the shutter element (4) matches that of the housing portion (5b) at least partly, the shutter element (4) being preferably a spheroidal body and the housing portion (5b) having an abutment bottom substantially conforming in shape to said spheroidal body.

8. A device as claimed in anyone of the preceding claims, **characterized in that** it further comprises a protection element (6) operatively active close to the second orifice (2b) to inhibit entry of foreign bodies into the wine-making containers, said protection element (6) being such shaped that it enables the fermentation gases to expand in the surrounding atmosphere when the shutter element (4) is moved to the open position.

9. A device as claimed in claim 8, **characterized in that** said protection element (6) comprises a closing body (6a) of substantially flat shape, preferably in the form of a disc, and at least one engagement body (6b) integral with said closing body (6a) and operatively active between the latter and the main body (2) to mutually engage them.

10. A device as claimed in claim 8, **characterized in that** said engagement body (6b) is substantially in the form of a prism, the main body (2) having a housing seat (7) substantially of a shape conforming to said prism and designed to receive the engagement body (6b) under operating conditions.

11. A device as claimed in anyone of the preceding claims, **characterized in that** it further comprises a return element (8), operatively associated with the shutter element (4) to move it to the closed position, said return element (8) being preferably a spring having a first end linked to the main body (2) or the protection element (6) and a second end opposite to the first one and operatively active on the shutter element (4).

12. A device as claimed in anyone of the preceding claims, **characterized in that** the main body (2) and/or shutter element (4) and/or protection element (6) are at least partly made of an elastomer material, preferably a silicone material, the main body (2) preferably having an outer portion of silicone elastomer material adapted to come into en-

gagement against the through hole formed in the wine-making container.

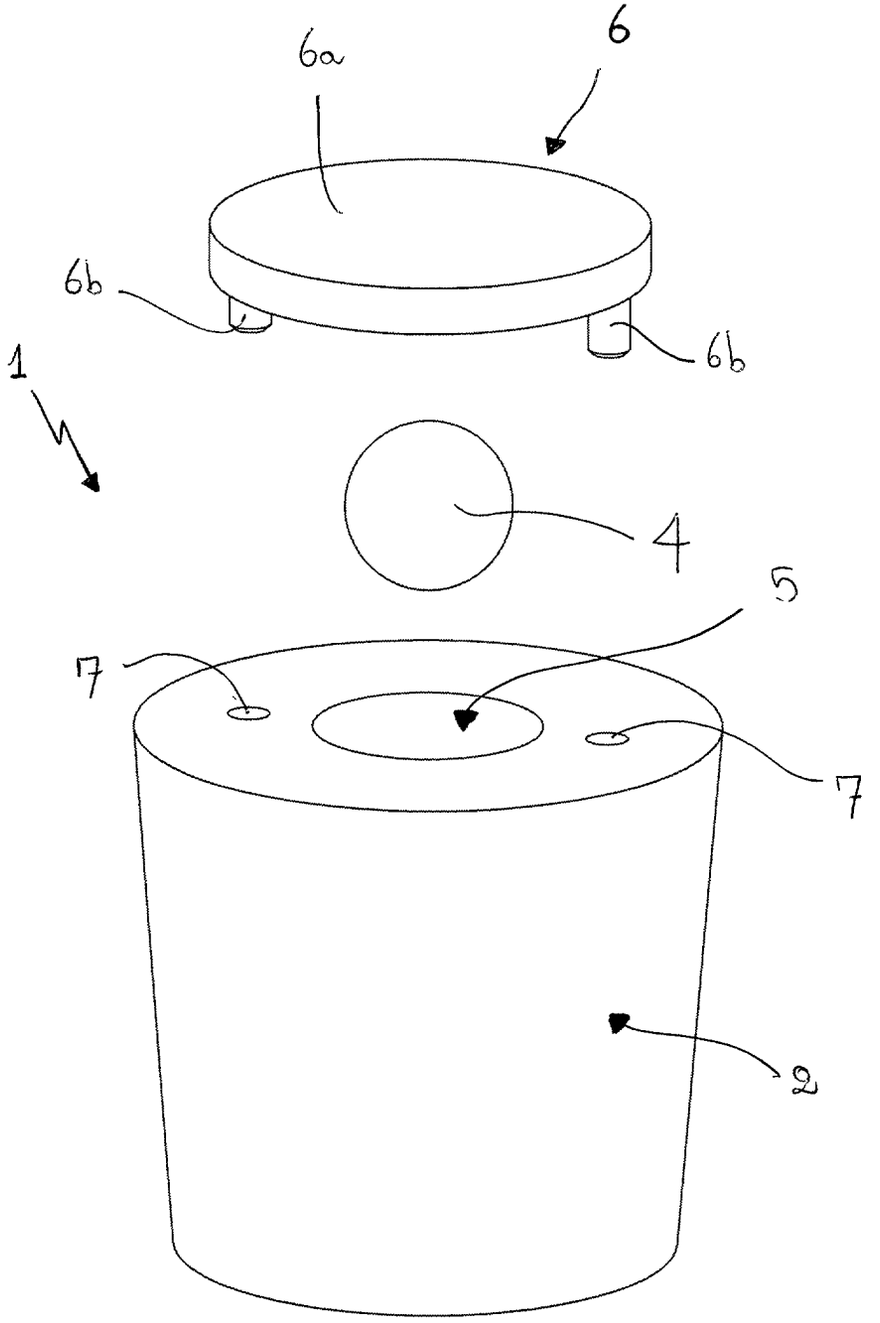

FIG. 1

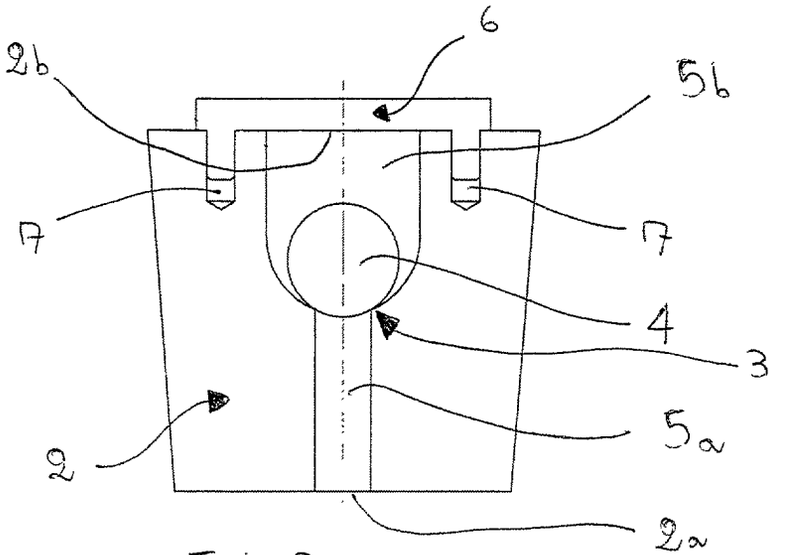

FIG. 2

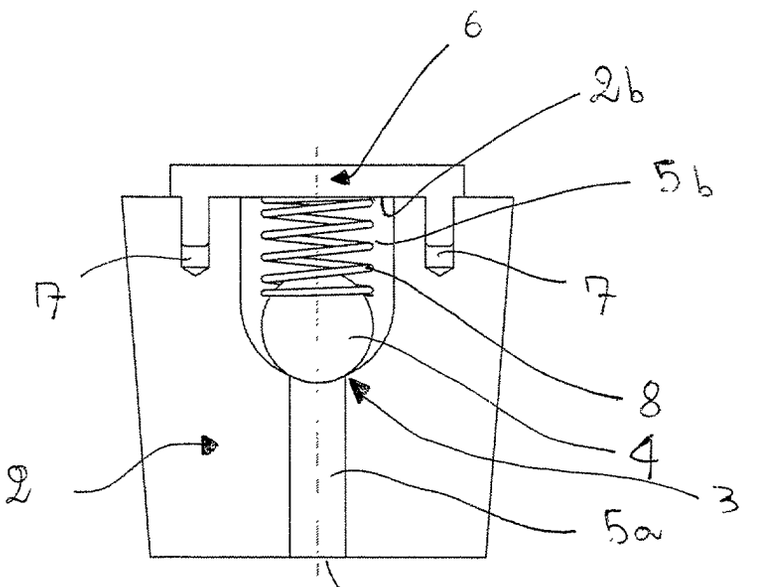

FIG. 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 83 0847

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	7 March 2002	Pernice, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 00 83 0847

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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