(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 441 355 A1

(12) # EUROPEAN PATENT APPLICATION

(43) Date of publication:
13.02.2019 Bulletin 2019/07

(21) Application number: **18187854.7**

(22) Date of filing: **07.08.2018**

(51) Int Cl.:
B67D 1/12 *(2006.01)* ***B67D 1/08*** *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **07.08.2017 GB 201712672**

(71) Applicant: **Universal Dispense Systems Limited**
Hounslow Middlesex
TW4 6DF (GB)

(72) Inventors:
- **COOK, Robert**
  Hounslow, Middlesex TW4 6DF (GB)
- **O'SHEA, Anthony**
  Hounslow, Middlesex TW4 6DF (GB)

(74) Representative: **Edson, Russell Gregory**
Withers & Rogers LLP
4 More London Riverside
London SE1 2AU (GB)

(54) **FOAM ON BEER (FOB) DETECTOR**

(57) A foam on beer (FOB) detector 300 is disclosed with a double walled chamber 310 to keep the FOB detector and any fluid inside it at a low temperature, i.e. by inhibiting the fluid inside the FOB detector from absorbing heat from its surroundings. An embodiment relates to active cooling of the internal chamber of the FOB detector by providing a cooling flow channel 350 within the chamber to directly cool the fluid inside the FOB detector.

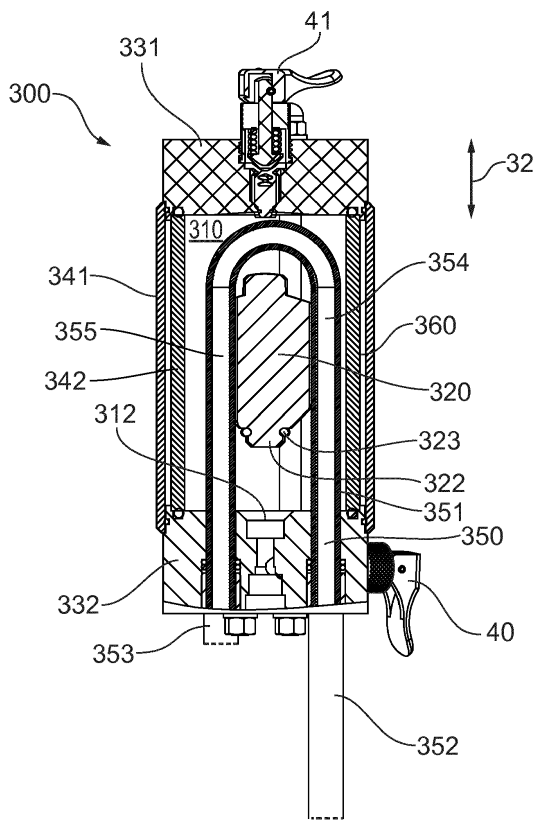

FIG. 3

Printed by Jouve, 75001 PARIS (FR)

Description

Field of the invention

[0001] The present invention relates to a foam on beer ("FOB") detector. In particular, the present invention relates to a FOB detector configured to allow for reduced maintenance operations.

Background

[0002] Beer dispensing systems are used in the commercial food and beverage industry to provide on demand dispensing of beer. One known beer dispensing system includes a tap, a beer line, and a bulk container of beer which is known in the art as a keg. In this known beer dispensing system, a user becomes aware that the keg is almost empty when, upon moving the tap to an open position, beer foam is dispensed from the tap instead of beer. At this point, the keg will need to be replaced, the tap will need to be opened and the foam in the line will need to be replaced by beer before beer can then be dispensed from the tap instead of foam. Replacing foam in the beer line with beer can take time, and can result in beer being wasted.

[0003] Foam on beer ("FOB") detectors have been developed in the past to overcome this problem of replacing foam in the line. A FOB detector is inserted into the line between the keg and the tap in a further known beer dispensing system. The FOB detector acts as a valve to stop fluid passing from the keg to the tap when foam reaches the FOB detector. With a FOB detector installed in the system, the user becomes aware that the keg is almost empty when foam reaches the FOB, and the line does not fill with foam because the FOB detector closes the line and prevents further low through the line until the operator has replaced the keg and resent the FOB detector.

[0004] A drawback of both of these known beer dispensing systems is that all equipment in contact with the beer (e.g. beer lines; FOB detector) requires regular cleaning to prevent microbial growth and avoid contamination. Regular cleaning can take time and can result in the beer dispensing system being out of use for significant periods of time. This operation also takes up time and related human and chemical resources in the cleaning operation. There is therefore a need for improvement in beverage dispensing systems.

Summary of the Invention

[0005] A foam on beer (FOB) detector is disclosed which provides a first novel aspect relating to the provision of a double walled chamber to the FOB detector to keep the FOB detector and any fluid inside it at a low temperature, i.e. by inhibiting the fluid inside the FOB detector from absorbing heat from its surroundings. A second aspect relates to active cooling of the internal chamber of the FOB detector by providing a cooling flow channel within the chamber to directly cool the fluid inside the FOB detector. The combination of these aspects in a FOB detector can provide further additional advantages.

[0006] The invention can therefore provide a Foam on Beer (FOB) detector with improved performance. In one aspect, the FoB detector has a double walled chamber to provide improved heat insulation. This reduces heat absorption from the surroundings by a beverage temporarily residing in the chamber.

[0007] In the second aspect, the FOB detector has a cooling flow channel, configured to carry a cooling fluid through the chamber. This results in the fluid in the chamber remaining at a low temperature.

[0008] Both the double-walled chamber and the cooling flow channel, either alone or in combination, have the advantage of reducing microbial growth in the foam detection device by virtue of the lower temperatures which are maintained. This has the advantage of providing a system in which less frequent cleaning is required.

[0009] The double-walled chamber has the additional or alternative advantage of reducing or preventing condensation gathering on the outside of the foam detection device since less heat is absorbed from the surroundings. This reduces issues relating to pooling or gathering of water in unwanted places.

[0010] The invention therefore provides, in a first aspect, a foam detection device for a beverage dispensing system comprising any or all of the following features:

a chamber comprising:

> a chamber wall, a fluid inlet and a fluid outlet and a fluid flow path passing from the fluid inlet, into and through the chamber, and out of the fluid outlet of the chamber;
> a flow path interrupter disposed in the fluid flow path within the chamber and configured to interrupt the flow path from the fluid inlet to the fluid outlet of the chamber upon detection of foam in the chamber;
> wherein the chamber wall is a double-wall comprising an inner wall and an outer wall and a void between the inner and outer walls, wherein the void at least partially surrounds the fluid flow path through the chamber.

[0011] The flow path interrupter may be a float, the float preferably being disposed in the chamber and configured to translate in the fluid chamber to open and close the fluid flow path.

[0012] The inner and outer walls of the chamber may be arranged such that the void defined between the inner wall and the outer wall is a sealed enclosed space. The sealed enclosed space may comprise a gas or a vacuum. The void between the inner wall and the outer wall may have a lower coefficient of thermal conductivity than the inner wall and/or outer wall.

The void between the inner wall and the outer wall may be a filled void and may comprise a material having a lower coefficient of thermal conductivity than the inner and/or outer wall.

[0013] The inner wall and the outer wall may be configured such that a lateral dimension of the void defined between the inner wall and the outer wall is less than 1/10th of a lateral dimension of the chamber.

[0014] The void may extend over at least ¼ of the fluid flow path through the chamber in an axial direction of the chamber, more preferably the void extends over at least ½ of the length of the fluid flow path through the chamber in an axial direction of the chamber.

[0015] The void may extend over substantially all of the fluid flow path through the chamber, preferably in an axial direction of the chamber.

[0016] The inner wall and/or the outer wall may comprise a substantially transparent material.

[0017] The inner wall may be configured to have a greater structural strength than the outer wall, or vice versa.

[0018] The inner wall and the outer wall may each have a thickness, the inner wall may have a greater thickness than the outer wall.

[0019] The chamber may comprise at least one end wall. At least one of the inner and outer walls may abut an inner face of the end wall of the chamber.

[0020] An inner face of the outer wall may mate with an outer face of the at least one end wall.

[0021] The chamber may comprise a first end wall at a first longitudinal end of the chamber and may comprise a second end wall at a second longitudinal end of the chamber.

[0022] At least one of the inner and outer walls may abut an inner face of the first end wall and/or an inner face of the second end wall.

[0023] At least one inner surface of the outer wall may mate with an outer face of the first end wall and an outer face of the second end wall.

[0024] A seal may be provided between the end of the abutting wall and the first and/or second end wall.

[0025] A seal may be provided between the end of the outer wall and the first and/or second end wall.

[0026] The first end wall and the second end wall may each comprise an internal face and a side face. The inner wall may be attachable to the internal face of the first end wall and/or the internal face of the second end wall. The outer wall may be attachable to the side face of the first end wall and/or the side face of the second end wall.

[0027] In a second aspect, the invention provides a foam detection device for a beverage dispensing system comprising and or all of the following features:

a chamber comprising a fluid inlet, a fluid outlet, and a fluid flow path passing from the fluid inlet, into and through the chamber, and out of the fluid outlet of the chamber;

a flow path interrupter disposed in the fluid flow path within the chamber and configured to interrupt the flow path from the fluid inlet to the fluid outlet of the chamber upon detection of foam in the chamber;

a cooling fluid flow path passing at least partially through the chamber and configured to permit heat transfer between the fluid flow path and the cooling fluid flow path.

[0028] The flow path interrupter may be a float, the float preferably being disposed in the chamber and configured to translate in the chamber to open and close the fluid flow path.

[0029] The cooling flow channel may enter the chamber via an end wall of the chamber.

[0030] The cooling flow channel may exit the chamber via an end wall of the chamber.

[0031] The cooling flow channel may enter the chamber via a secondary end wall of the chamber and may exit the chamber via a primary end wall of the chamber. The cooling flow channel may both enter and exit the chamber via the same end wall of the chamber. The cooling flow channel may enter the chamber via a side wall of the chamber.

[0032] The cooling flow channel may be a cooling pipe. The cooling pipe may be substantially U-shaped such that it defines a curved end and two substantially parallel arms.

[0033] The float of the flow interrupter and the cooling pipe may be configured such that the float can be located between the two substantially parallel. The float may be moveable towards or away from the curved end of the cooling pipe between the two-parallel arms.

[0034] The chamber may further comprise a first end wall and a second end wall, and at least one tie rod, the tie rod being configured to connect, and preferably retain, the first end wall to the second end wall.

[0035] The chamber may comprise two tie rods, the two tie rods being arranged to each side, or on opposite sides, of a plane defined by the cooling pipe, such that the float is located between the two tie rods.

[0036] There is further provided a beverage dispensing system comprising any or all of the following features:

a fluid source, the fluid source being configured to contain fluid;

a fluid dispensing line, the fluid dispensing line being connectable to the fluid source to allow fluid to leave the fluid source through the fluid dispensing line;

a fluid dispensing means, the fluid dispensing means being connectable to the fluid dispensing line and being operable to restrict or allow fluid to pass through the fluid dispensing means;

a foam detection device as described above, the foam detection device being arranged in the fluid dispensing line, such that fluid passing from the fluid source passes through the foam detection device before passing to the fluid dispensing means.

[0037] The fluid dispensing line may comprise a first part and a second part, the first and second parts being attached to the foam detection device and arranged such that fluid passes from the fluid source, through the first part of the fluid dispensing line, then through the foam detection device, then through the second part of the fluid dispensing line, to the fluid dispensing means.

[0038] The fluid dispensing system may further comprise a first coolant source and a first coolant line, the first coolant source being configured to deliver coolant fluid, and the first coolant line being connectable to the first coolant source to allow coolant fluid to leave the first coolant source through the first coolant line, the first coolant line being arranged such that it is in thermal contact with the first part and/or the second part of the line.

[0039] The fluid dispensing system may further comprise a second coolant line, the second coolant line being connectable to the cooling flow channel of the foam detection device such that the second coolant line and the cooling flow channel are in fluid communication with each other. The second coolant line may be connected to a second coolant source.

[0040] The invention further provides a kit of parts for the device of the first aspect disclosed herein, the kit comprising any or all of the following features:

an inner wall;
an outer wall;
a fluid inlet and a fluid outlet;
a flow interrupter;

the kit of parts being configured such that, when assembled, the inner wall, outer wall, the fluid inlet, fluid outlet and flow interrupter provide the device according to the first aspect disclosed herein.

[0041] The invention further provides a kit of parts for the device according to the second aspect described herein comprising any or all of the following features:

a chamber part; and
a cooling flow channel part
the kit of parts being configured such that, when assembled, the chamber and cooling flow channel provide the device of the second aspect described herein.

Brief Description of the Figures

[0042] Further details of specific embodiments will be apparent from the following detailed description of preferred embodiments, in which:

Figure 1 is a schematic showing a known cooling system;
Figure 2 is a schematic showing an embodiment of a beer dispensing system according to the present invention;
Figure 3 is a first cross-sectional view a foam detection device according to the present invention; and
Figure 4 is a second cross-sectional view of the foam detection device of Figure 3, taken at a different angle to the cross-section shown in Figure 3.

Detailed Description of Preferred Embodiments

[0043] Figure 1 shows a known beer dispensing system 100. The system comprises a tap 10 for dispensing beer into a drinking vessel such as a glass. The tap 10 is commonly disposed at a delivery position such as on a bar top 11. The tap 10 is fluidly connected to other elements of the beer dispensing system 100 via a fluid delivery line 20. The fluid delivery line 20 may comprise at least a first part 21 and a second part 22. The first part can be disposed between the tap 10 and a foam on beer (FOB) detector 30. The second portion 22 of the fluid delivery line 20 may be disposed between the FOB detector 30 and a beer source such as a keg 40. A pressure source 50 may be connected to the keg 40 via a pressure line 51. This pressure source 50 can be configured to deliver pressure to the keg 40 to drive beer under pressure out of keg 40 and to the tap 10 through the delivery line 20 and the FOB detector 30. The FOB detector is equipped with flow interruption means, which are configured to interrupt the flow of beer through the FOB detector when the FOB detector detects foam in the beer flowing through it. This is commonly achieved using a float configured to drop when density of the fluid is sufficiently reduced by the presence of bubbles of gas in the fluid passing through it. The dropping of the float them blocks an exit to the chamber of the FOB detector, preventing further flow through the system until the keg is changed and the FOB detector refilled with fluid by an operator.

[0044] Beer is commonly cooled between the keg 40 and the tap 10 and so a coolant source 60 may be provided. The coolant source 60 is commonly connected to some form of heat exchanger 61 for extracting heat from the beer in the delivery line 20 in order to cool the beer once it arrives at the tap 10. One such means of achieving this is as shown in figure 1, in which the flow path of the coolant along an outward 62 and return 63 flow path is kept in thermal contact with the delivery line 20 over a portion of its length to cool the beer along that portion of its length. As has been mentioned above, a drawback of known beer dispensing systems is that they require regular cleaning in order to avoid microbial growth in all parts of the system. Such microbial growth can be detrimental to the quality, flavour and aroma of the beverage dispensed through the system and therefore generally detracts from the user experience. Cleaning operations are generally carried out regularly and must be thorough. One element which requires such cleaning and which can be more difficult to clean thoroughly than mere pipework is the FOB detector 30.

[0045] In the following, a number of aspects of a new FOB detector are described which can aid in reducing the amount of down-time and cleaning effort associated with cleaning operations of both the beverage delivery lines and the FOB detector itself.

[0046] The FOB detector of the invention provides two principal novel aspects. The first aspect relates to the provision of a double walled chamber to the FOB detector to keep the FOB detector and any fluid inside it at a low temperature, i.e. by avoiding fluid inside the FOB detector absorbing heat from its surroundings.

[0047] The second aspect relates to the active cooling of the internal chamber of the FOB detector by providing a cooling flow channel within the chamber to directly cool the fluid inside the FOB detector. As will become apparent from the following description, the combination of these aspects in a FOB detector can provide further additional advantages.

[0048] Figure 2 illustrates a system 200 according to an aspect of the invention. The system 200 is similar to the system 100 of figure 1 and so similar numerals are used for similar components, but prefixed with a 2 in the system of figure 2.

[0049] The system is configured similarly to the system of figure 1, but as can be seen in figure 2, a coolant line 270 is connected to the FOB detector 300 of the system of figure 2, to deliver coolant to an interior space of the chamber of the FOB detector 300.

[0050] The system comprises a coolant delivery line 271 for delivering a coolant to the FOB detector 300 and a coolant return line 272 for the coolant fluid in the coolant delivery line 270 to return to the coolant source 260 for subsequent recooling to remove heat extracted from the FOB detector.

[0051] This configuration is different to compared to systems in which the beer in the fluid delivery lines 220 is only cooled either before the FOB detector 30 of figure 1, or after the FOB detector 30 of figure 1.

[0052] Either of those configurations have at least two drawbacks. Firstly, if the coolant is only delivered to the fluid delivery line 20 of figure 1 after the FOB detector, then the FOB detector 30 remains at ambient temperature and thus there is no inhibition of microbial growth in the FOB detector 30 by any kind of cooling.

[0053] Alternatively, the cooling line 61 could be applied to the delivery line 22 before the FOB detector 30. However, the FOB detector 30 has a relatively large external surface area to enable the chamber to have a sufficient size and to enable the user to see inside the chamber to check for the presence of foam in the FOB detector. The FOB detector in this instance is cooler than its surrounding environment and this causes it to absorb heat, thus re-heating the already cooled beer in the FOB detector. This can result in problems of condensation forming on the FOB detector. This can both hinder the user from seeing inside the FOB detector, and can also cause undesirable liquid deposits on and around the area of the FOB detector. Therefore, providing a coolant fluid flow to the interior space of the new FOB detector 300 can counter all of these effects. By cooling the interior of the FOB detector, the effect of heat absorption from its surroundings can be countered. Further, actively cooling the interior of the FOB detector allows the fluid inside the FOB detector and its internal surfaces to be kept at a lower temperature, which inhibits by microbial growth. This results in beer which passes through the FOB detector remaining fresh for longer and ultimately can result in a reduced requirement for such regular cleaning intervals as compared to the known systems.

[0054] As will be appreciated, the coolant supply 270 to the FOB detector 300 can come from the same coolant source 260 as that provided for the fluid delivery lines 220, or from a different source. Indeed, coolant may only be applied to the FOB detector 300 and the cooling of the fluid delivery line 220 is optional in the novel configurations described. Insulation may be applied to the lines in place of active cooling.

[0055] Figure 3 shows a cross section through an example of an FOB detector according to certain embodiments of the invention.

[0056] The FOB detector 300 comprises a chamber 310 through which beer passes on its way from a beer source such as a keg (not shown) to a beer output device such as a tap (not shown). The beer flows into the FOB detector by a known fluid inlet (not shown) in figure 3 and flows out of the FOB detector through a fluid outlet 312. The flow path is such that the beer flows into the chamber 310, and then down and out of the outlet 312. In normal operation, the chamber 310 is substantially filled with the beer being dispensed. A flow path interrupter is provided. The function of the flow path interrupter is to interrupt the fluid flow through the FOB detector when foam is detected in the beer. In the example shown in figure 3, this flow path interrupter is in the form of a float 320. The float is disposed in the chamber 310 such that it can translate in a substantially longitudinal direction as illustrated by arrows 321. As will be understood from the figure, when the float 320 translates in a downward direction, i.e. towards the fluid outlet 312, a flow interrupting end 322, which may be provided with a flow interrupting seal 323, engages the fluid outlet 312 to prevent outward flow through the fluid outlet 312. When the chamber 310 is sufficiently full of beer during normal operation, then the float will normally be retained at a sufficient height that beer can flow out of the outlet 312. As is known in FOB detectors, when foam substantially fills the chamber, then the weight of foam displaced by the float 320 will be less than the weight of the float 320 itself. The float will cease to have net upward buoyancy in the chamber 310 and it will descend to the outlet 312. This operation is well known to the skilled person and so details of specifics of the design of such a float and dimensions required are not explained in any greater detail. The chamber and float is typically designed to function with aerated, carbonated or still liquids with a specific gravity greater than 0.95. Although a float is illustrated, it will be appreciated that the advantages of the novel features of the invention can be obtained with other kinds of flow interrupter, such as mechnically or electronically actuated valves, connected to suitable sensors to close off the flow path upon detection of foam in the FOB detector.

[0057] The chamber 310 of the FOB detector is defined by first and second end walls 331 and 332 and by at least one side wall 341, 342, which side walls will be discussed in more detail later. As shown in the figure, the FOB detector comprises a cooling fluid flow path 350. The cooling fluid flow path passes at least partially through the internal space of the chamber 310, so as to guide cooling fluid through the chamber itself and to allow the cooling fluid to cool beer in or flowing through the chamber 310. The cooling fluid can be any fluid suitable for use in cooling systems as will be well known to one skilled in the art of beverage cooling systems. In the illustrated example, the cooling fluid flow path is provided within a pipe 351. In the illustrated example, the cooling flow channel 350 enters the chamber through an end wall 332 and exits the chamber through the same end wall 332. However, configurations can be envisaged in which the cooling flow channel 350 enters the chamber through a first end wall 331 and exits the chamber through a second end wall 332 or vice versa. Configurations can of course be envisaged in which the cooling flow channel enters and/or exits the chamber 310 via one or more side walls 341, 342 of the chamber 310, although these are not illustrated in the figures. In a broad sense, the cooling fluid flow channel can be provided in any such manner as permits cooling fluid to flow through the internal space of the chamber 310 to enable the cooling fluid to cool the beer or other fluid residing in the chamber 310. The coolant fluid can flow into the chamber via a fluid inlet 352, and exits the fluid chamber via a cooling fluid outlet 353, and these can be connected to any known source of cooling fluid in a standard manner. As is generally known in FOB detectors, when the float 320 descends into the fluid outlet 312 it cannot be lifted again until pressure is duly equalised in the chamber 310 and the outlet 312. Pressure equalisation valves 40 and 41 are provided for this purpose in a standard manner as is already known for FOB detectors and so their function and operation is not described in detail, as this will already be known to the person skilled in the art of FOB detectors.

[0058] As can be appreciated, it is necessary for the float 320 to have sufficient volume to provide sufficient buoyancy to remain buoyant in the chamber 310 when filled with beer, but it is also necessary for the float 320 to move within and around any pipe 351 provided within the chamber 310. To descend, as illustrated, the float 320 may have a form which is configured to sit at least partially between first 354 and second 355 portions of the cooling flow channel 350. As shown, the cooling channel may be substantially U-shaped, but any suitable form could also be employed, whilst configuring the float 320 to fit in and/or around the cooling flow channel as necessary. The cooling channel 350 may therefore pass at least partially through the spatial envelope of the float 320 and the float 320 may comprise one of more cut away portions to accommodate the cooling channel 350.

[0059] A further novel aspect of the FOB detector is shown in both figures 3 and 4, but will be described in particular in relation to figure 4 in the following. As described above, a problem which has been identified by the inventor in relation to existing FOB detectors is that the large surface area of the chamber 310 can cause heat absorption into the beer inside the FOB detector when that beer is cooler than the surrounding atmosphere. This is particularly relevant when the beer has been cooled and in these cases the heat absorption can reduce the overall cooling efficiency of the beverage delivery system. That is particularly relevant where the beer has been cooled before entry into the FOB detector, for example, if the FOB detector is located near to a beer tap of the dispensing system than the cooling system. It is also relevant of the beer source is cooled in any way, such as a keg being stored in a cooled cellar or refrigerated area. Further, the described heat absorption means that the chamber 310 of the FOB detector is not kept as cool as it might otherwise be. A further drawback of heat absorption by beer inside the FOB detector is that the relatively cool outer surfaces of the FOB detector may attract condensation from the surrounding air and that condensation has two main drawbacks. Firstly, the walls of the FOB detector must remain at least partially transparent to allow the user to identify whether there is indeed foam in the FOB detector or not, and whether it has been properly reset to remove that foam when a keg has been changed. Further, such condensation can cause pooling of water when it drips from the FOB detector to surfaces below the FOB detector and this can cause issues with moisture or dampness gathering in those areas.

[0060] Having identified these drawbacks of existing FOB detector designs, the inventor devised a double-walled chamber as shown in the figures. As such, the FOB detector 300 is provided with a chamber which has a wall which is a double-wall comprising an inner wall 342 and an outer wall 341 and a void between the inner and outer walls, the void at least partially surrounding some or all of the fluid flow path through which the beer in the chamber flows. As shown in figure 4, an outer wall 341 is provided at an outer side of an inner wall 342. Avoid 360 is formed in between those inner and outer walls. The void is preferably filled with either a gas, or is provided with a vacuum, or at least a partial vacuum relative to the surrounding atmosphere. Any material which assists with thermal insulation can be provided in the void if necessary. However, it is preferred that a gas is used which does not reduce transparency of the overall wall structure. For the reasons described above, the first and second, inner and outer, walls, 341 and 342 are preferably transparent in order to allow the user to see inside the chamber 310 of the FOB detector. If transparency is not relevant in a particular installation, any material having a lower coefficient of thermal conductivity than the inner 342 and/or outer 341 walls can assist with improving the thermal insulation of the chamber 310 and so provides the benefits described in that regard. However, it is preferred that a transparent gas such as air is provided in the void to assist with thermal insulation. Figures 3 and 4 illustrate a particular construction of FOB detector which can provide this double-walled chamber. However, other constructions can be envisaged. The void 360 is ideally a sealed and enclosed space in order to contain the gas provided within it. However, at least some of the thermal insulation benefit could be provided if the space 360 is not perfectly sealed from the surrounding environment. In the FOB detector illustrated, the inner wall 342 is configured to abut against at least one of the end walls 331 and 332. One or more seals 333 and 334 may be provided at a region where the inner wall abuts or otherwise engages with either or both of the end walls 331 and 332.

[0061] Outer wall 341 can also be provided with a means of engagement with the end walls 331 and/or 332. As illustrated, it can beneficial for the outer wall 341 to have one or more of its inner surfaces engage with an outer surface 335 or 336 of one or more of the end walls 331 and 332. Again, a seal 337 or 338 may be provided between the outer wall and one or more of the end walls 331 and 332. The engagement of an outer wall 341 with the any of the one or more end walls may be via radially facing mating faces of the respective components. As will be appreciated from figure 4 and figure 3, this construction can enable the walls to be assembled in a substantially longitudinal or axial direction of the substantially cylindrically shaped FOB detector, in the direction as illustrated by arrows 321.

[0062] As can be seen in figure 4, one or more tie bars 371, 372, may be provided to retain one or more of the end walls 331, 332 in contact with the one or more chamber walls 341 and 342. The tie bars 371 and/or 372 is/are generally arranged to retain the assembly together by longitudinal tension. As will be appreciated from the figure, the abutting of the end walls on the inner wall in the arrangement illustrated provides a reaction force so that the end wall is retained between the inner wall 342 and a retaining means located on the tie bars. For example, a first end wall, 332, may be retained between an abutting end of inner wall 342 and one or more fixing means 372 and 373. Similarly, end wall 341 may be retained between fixing means 374 and 375 and the inner wall 342. As will be appreciated, other arrangements are possible, in which, for example, the end wall may abut both of the inner 342 and outer 341 walls. The tie bars may be formed as threaded bars with separable engagement means at both ends, or may be in a form of a nut and bolt formation, or other fixing means such as rivets or circlips could of course be incorporated. In general, the tie bars act to provide a longitudinal tension force holding the assembly together in the longitudinal direction. Lateral alignment of an end wall and a side wall of the device may be provided by the structure of the one or more end walls. Such alignment means can include the mating faces for the outer wall provided on the one or more end walls. These cause alignment with the outer wall 341. One or more lips 339A or 339B may also be provided to align one or more of the end walls 331 and 332 with the inner wall 342 or outer wall 341. As will be appreciated, as illustrated in figure 4, one or more seals 381, 382, 383, 384, may be provided on one or more of the tie bars to prevent fluid egress along the longitudinal direction of the bores provided in the end walls which accommodate the tie bar or tie bars. Similar seals may be provided on the cooling pipe 351 for the same purpose.

[0063] The fob detector 300 can of course be integrated into the system described in relation to Figure 2. However, as will be appreciated, the internal cooling of the FOB detector can be implemented in the absence of the double walled chamber and vice versa. However, when both of these aspects are implemented together, they provide a particularly advantageous arrangement.

[0064] Although a specific form and arrangement of foam detection device and beer dispensing system is shown in the figures, it will be appreciated that various changes could be made to the device shown whilst still performing the function of the present invention as defined in the appended claims.

[0065] Combinations of features also envisaged are described by the following numbered clauses:

1. A foam detection device for a beverage dispensing system comprising:

    a chamber comprising:

        a chamber wall, a fluid inlet and a fluid outlet and a fluid flow path passing from the fluid inlet, into and through the chamber, and out of the fluid outlet of the chamber;

        a flow path interrupter disposed in the fluid flow path within the chamber and configured to interrupt the flow path from the fluid inlet to the fluid outlet of the chamber upon detection of foam in the chamber;

        wherein the chamber wall is a double-wall comprising an inner wall and an outer wall and a void between the inner and outer walls, wherein the void at least partially surrounds the fluid flow path through the chamber.

2. A foam detection device according to clause 1, wherein the flow path interrupter is a float, the float being disposed in the chamber and configured to translate in the fluid chamber to open and close the fluid flow path.

3. A foam detection device according to clause 1 or clause 2, wherein the inner and outer walls of the chamber are arranged such that the void defined between the inner wall and the outer wall is a sealed enclosed space.

4. A foam detection device according to clause 3, wherein the sealed enclosed space comprises a gas or a vacuum.

5. A foam detection device according to any of clauses 1 to 4, wherein the void between the inner wall and the outer wall has a lower coefficient of thermal conductivity than the inner and/or outer wall.

6. A foam detection device according to any of clauses 1 to 3 or 5, wherein the void between the inner wall and the outer wall is a filled void and comprises a material having a lower coefficient of thermal conductivity than the inner and/or outer wall.

7. A foam detection device according to any preceding clause, wherein the inner wall and the outer wall are configured such that a lateral dimension of the void defined between the inner wall and the outer wall is less than 1/10 of a lateral dimension of the chamber.

8. A foam detection device according to any preceding clause, wherein the void extends over at least ¼ of the fluid flow path through the chamber in an axial direction of the chamber, more preferably the void extends over at least ½ of the length of the fluid flow path through the chamber in an axial direction of the chamber.

9. A foam detection device according to any preceding clause, wherein the void extends over substantially all of the fluid flow path through the chamber in an axial direction of the chamber.

10. A foam detection device according to any preceding clause, wherein the inner wall and/or the outer wall each comprise a substantially transparent material.

11. A foam detection device according to any preceding clause, wherein the inner wall is configured to have a greater structural strength than the outer wall.

12. A foam detection device according to any preceding clause, wherein the inner wall and the outer wall each have a thickness, the inner wall having a greater thickness than the outer wall.

13. A foam detection device according to any preceding clause, wherein the chamber comprises at least one end wall.

14. A foam detection device according to clause 13, wherein at least one of the inner and outer walls abuts an inner face of the end wall of the chamber.

15. A foam detection device according to clause 14, wherein an inner face of the outer wall mates with an outer face of the at least one end wall.

16. A foam detection device according to clause 13, wherein the chamber comprises a first end wall at a first longitudinal end of the chamber and a second end wall at a second longitudinal end of the chamber.

17. A foam detection device according to clause 16, wherein at least one of the inner and outer walls abuts an inner face of the first end wall and/or an inner face of the second end wall.

18. A foam detection device according to clause 17, wherein at least one inner surface of the outer wall mates with an outer face of the first end wall and an outer face of the second end wall.

19. A foam detection device according to clause 17 wherein a seal is provided between the end of the abutting wall and the first and/or second end wall.

20. A foam detection device according to clause 18, wherein a seal is provided between the end of the outer wall and the first and/or second end wall.

21. A foam detection device according to any preceding clause, wherein the first end wall and the second end wall each comprise an internal face and a side face, and wherein the inner wall is attachable to the internal face of the first end wall and the internal face of the second end wall, and wherein the outer wall is attachable to the side face of the first end wall and the side face of the second end wall.

22. A foam detection device for a beverage dispensing system comprising:

- a chamber comprising a fluid inlet, a fluid outlet, and a fluid flow path passing from the fluid inlet, into and through the chamber, and out of the fluid outlet of the chamber;
- a flow path interrupter disposed in the fluid flow path within the chamber and configured to interrupt the flow path from the fluid inlet to the fluid outlet of the chamber upon detection of foam in the chamber;
- a cooling fluid flow path passing at least partially through the chamber and configured to permit heat transfer between the fluid flow path and the cooling fluid flow path.

The fluid flow path may be a fluid flow channel.

23. A foam detection device according to clause 22,

wherein the flow path interrupter is a float, the float being disposed in the chamber and configured to translate in the chamber to open and close the fluid flow path.

24. A foam detection device according to clause 22 or clause 23, wherein the cooling flow path enters the chamber via an end wall of the chamber.

25. A foam detection device according to any of clauses 22 to 24, wherein the cooling flow path exits the chamber via an end wall of the chamber.

26. A foam detection device according to clause 25, wherein the cooling flow path enters the chamber via a secondary end wall of the chamber and exits the chamber via a primary end wall of the chamber.

27. A foam detection device according to clause 25, wherein the cooling flow path both enters and exits the chamber via the same end wall of the chamber.

28. A foam detection device according to any of clauses 22 or 23, wherein the cooling flow path enters the chamber via a side wall of the chamber.

29. A foam detection device according to any of clauses 20 to 26, wherein the cooling flow path is a cooling pipe.

30. A foam detection device according to clause 29, wherein the cooling pipe is substantially U-shaped such that it defines a curved end and two substantially parallel arms.

31. A foam detection device according to clause 29 when dependent on clause 23, wherein the float and the cooling pipe are configured such that the float can be located between the two substantially parallel arms of the cooling pipe, and the float is moveable towards or away from the curved end of the cooling pipe between the two-parallel arms.

32. A foam detection device according to clause 22, wherein the chamber further comprises a first end wall and a second end wall, and at least one tie rod, the tie rod being configured to connect the first end wall to the second end wall.

33. A foam detection device according to clause 22, wherein the chamber comprises two tie rods, the two tie rods being arranged to each side of a plane defined by the cooling pipe, such that the float is located between the two tie rods.

34. A beverage dispensing system comprising:

a fluid source, the fluid source being configured to contain fluid;

a fluid dispensing line, the fluid dispensing line being connectable to the fluid source to allow fluid to leave the fluid source through the fluid dispensing line;

a fluid dispensing means, the fluid dispensing means being connectable to the fluid dispensing line and being operable to restrict or allow fluid to pass through the fluid dispensing means;

a foam detection device as described in any preceding clause, the foam detection device being arranged in the fluid dispensing line, such that fluid passing from the fluid source passes through the foam detection device before passing to the fluid dispensing means.

35. A fluid dispensing system according to clause 34, wherein the fluid dispensing line comprises a first part and a second part, the first and second parts being attached to the foam detection device and arranged such that fluid passes from the fluid source, through the first part of the fluid dispensing line, then through the foam detection device, then through the second part of the fluid dispensing line, to the fluid dispensing means.

36. A fluid dispensing system according to clause 34 or clause 35, wherein the fluid dispensing system further comprises a first coolant source and a first coolant line, the first coolant source being configured to deliver coolant fluid, and the first coolant line being connectable to the first coolant source to allow coolant fluid to leave the first coolant source through the first coolant line, the first coolant line being arranged such that it is in thermal contact with the first part and/or the second part of the line.

37. A fluid dispensing system according to any of clauses 34 to 36, when including a foam detection device as described in any of clauses 22 to 33, wherein the fluid dispensing system further comprises a second coolant line, the second coolant line being connectable to the cooling flow path of the foam detection device such that the second coolant line and the cooling flow path are in fluid communication with each other.

38. A fluid dispensing system according to clause 20, wherein the second coolant line is connected to a second coolant source.

39. A kit of parts for the device of any of clauses 1 to 21, comprising at least:

an inner wall;

an outer wall;

a fluid inlet and a fluid outlet;

a flow interrupter;

the kit of parts being configured such that, when assembled, the inner wall, outer wall, the fluid inlet, fluid outlet and flow interrupter provide the device of any of clauses 1 to 21.

40. A kit of parts for the device of any of clauses 22 to 33, comprising at least:

a chamber part; and

a cooling flow path part

the kit of parts being configured such that, when assembled, the chamber and cooling flow path provide the device of any of clauses 22 to 33.

Claims

1. A foam detection device for a beverage dispensing system comprising:

a chamber comprising:

a chamber wall, a fluid inlet and a fluid outlet and a fluid flow path passing from the fluid inlet, into and through the chamber, and out of the fluid outlet of the chamber;
a flow path interrupter disposed in the fluid flow path within the chamber and configured to interrupt the flow path from the fluid inlet to the fluid outlet of the chamber upon detection of foam in the chamber;
wherein the chamber wall comprises a double-wall comprising an inner wall and an outer wall and a void between the inner and outer walls, wherein the void at least partially surrounds the fluid flow path through the chamber.

2. A foam detection device according to claim 1, wherein the flow path interrupter is a float, the float being disposed in the chamber and configured to translate in the fluid chamber to open and close the fluid flow path.

3. A foam detection device according to claim 1 or claim 2, wherein the inner and outer walls of the chamber are arranged such that the void defined between the inner wall and the outer wall is a sealed enclosed space.

4. A foam detection device according to claim 3, wherein the sealed enclosed space comprises a gas or a vacuum, wherein the void between the inner wall and the outer wall preferably has a lower coefficient of thermal conductivity than the inner and/or outer wall.

5. A foam detection device according to any of claims 1 to 4, wherein the void between the inner wall and the outer wall is a filled void and comprises a material having a lower coefficient of thermal conductivity than the inner and/or outer wall.

6. A foam detection device according to any preceding claim, wherein the inner wall and the outer wall are configured such that a lateral dimension of the void defined between the inner wall and the outer wall is less than 1/10 of a lateral dimension of the chamber.

7. A foam detection device according to any preceding claim, wherein the void extends over at least ¼ of the fluid flow path through the chamber in an axial direction of the chamber, more preferably the void extends over at least ½ of the length of the fluid flow path through the chamber in an axial direction of the chamber, more preferably the void extends over substantially all of the fluid flow path through the chamber in an axial direction of the chamber.

8. A foam detection device according to any preceding claim, wherein the inner wall and/or the outer wall each comprise a substantially transparent material.

9. A foam detection device according to any preceding claim, wherein the inner wall and the outer wall each have a thickness, the inner wall having a greater thickness than the outer wall, wherein the inner wall is preferably configured to have a greater structural strength than the outer wall.

10. A foam detection device according to any preceding claim, wherein the chamber comprises at least one end wall, wherein at least one of the inner and outer walls preferably abuts an inner face of the end wall of the chamber, and wherein an inner face of the outer wall preferably mates with an outer face of the at least one end wall.

11. A foam detection device according to claim 10, wherein the chamber comprises a first end wall at a first longitudinal end of the chamber and a second end wall at a second longitudinal end of the chamber.

12. A foam detection device according to claim 11, wherein at least one of the inner and outer walls abuts an inner face of the first end wall and/or an inner face of the second end wall, wherein at least one inner surface of the outer wall preferably mates with an outer face of the first end wall and an outer face of the second end wall, wherein a seal is preferably provided between the end of the abutting wall and the first and/or second end wall, and wherein a seal is preferably provided between the end of the outer wall and the first and/or second end wall.

13. A foam detection device according to any preceding claim, wherein the first end wall and the second end wall each comprise an internal face and a side face, and wherein the inner wall is attachable to the internal face of the first end wall and the internal face of the second end wall, and wherein the outer wall is attachable to the side face of the first end wall and the side face of the second end wall.

14. A beverage dispensing system comprising:

a fluid source, the fluid source being configured to contain fluid;
a fluid dispensing line, the fluid dispensing line being connectable to the fluid source to allow fluid to leave the fluid source through the fluid dispensing line;
a fluid dispensing means, the fluid dispensing means being connectable to the fluid dispensing line and being operable to restrict or allow fluid to pass through the fluid dispensing means;
a foam detection device as claimed in any preceding claim, the foam detection device being arranged in the fluid dispensing line, such that fluid passing from the fluid source passes through the foam detection device before passing to the fluid dispensing means.

15. A kit of parts for the device of any of claims 1 to 14, comprising at least:

an inner wall;
an outer wall;
a fluid inlet and a fluid outlet;
a flow interrupter;

the kit of parts being configured such that, when assembled, the inner wall, outer wall, the fluid inlet, fluid outlet and flow interrupter provide the device of any of claims 1 to 14.

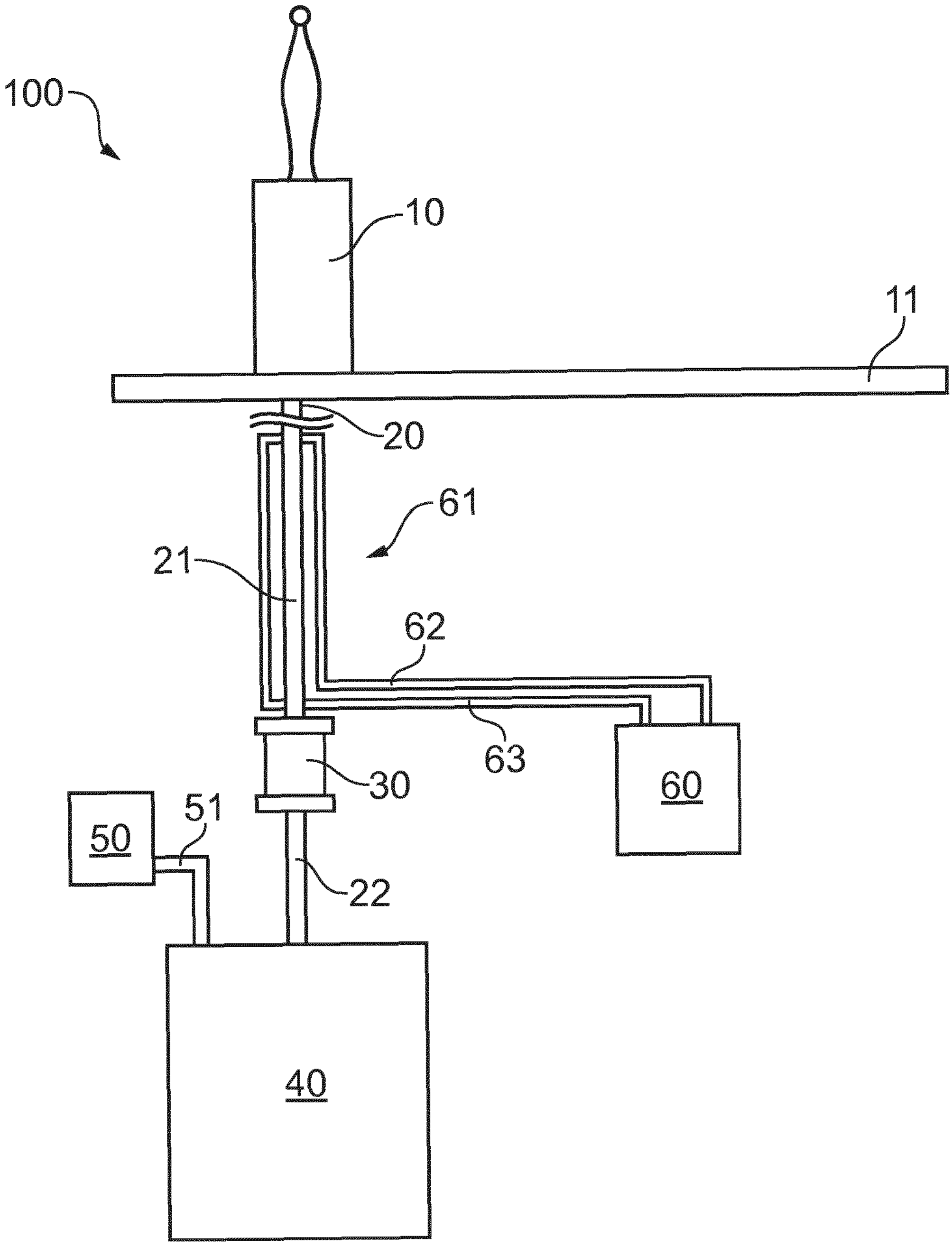

FIG. 1 (Prior Art)

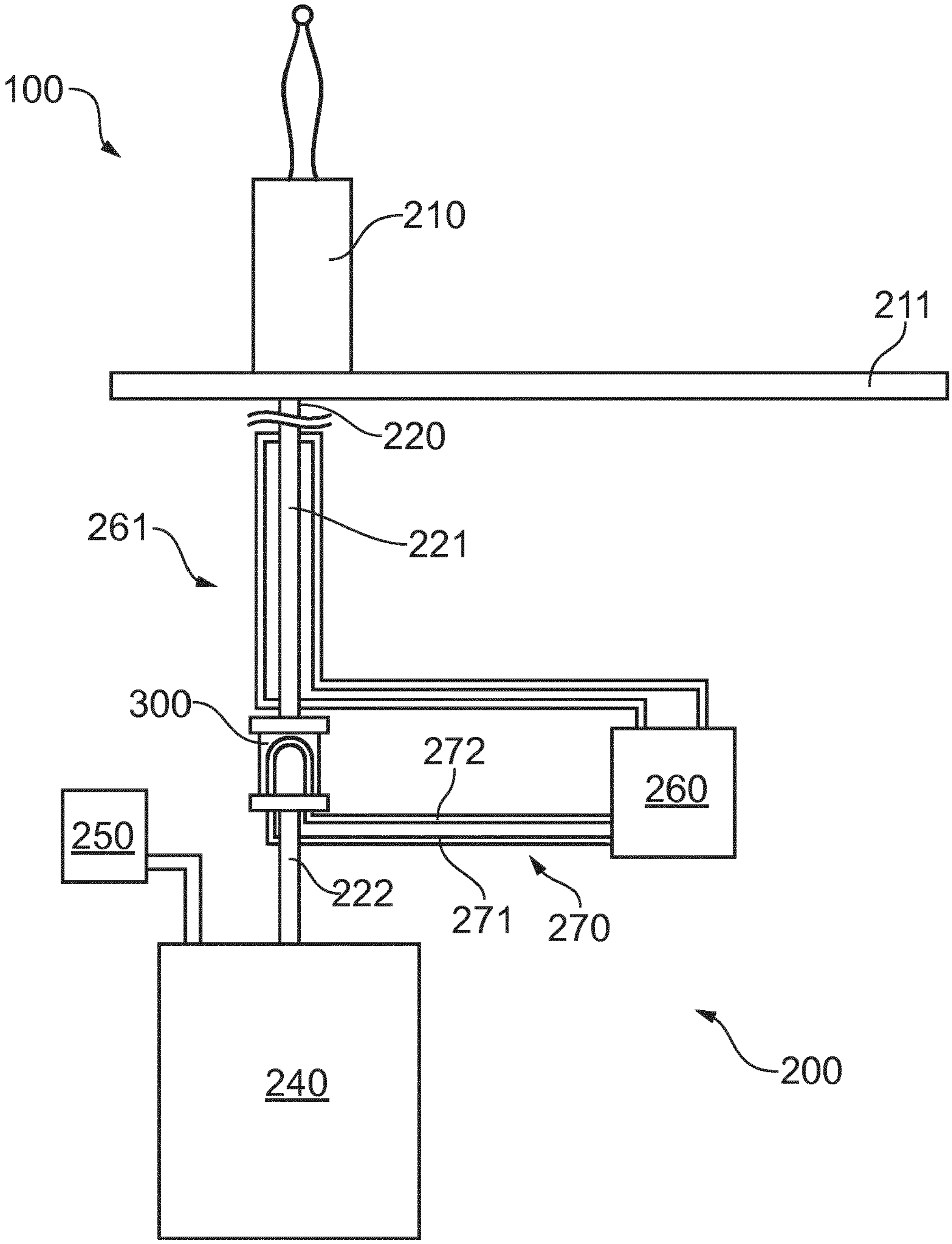

FIG. 2

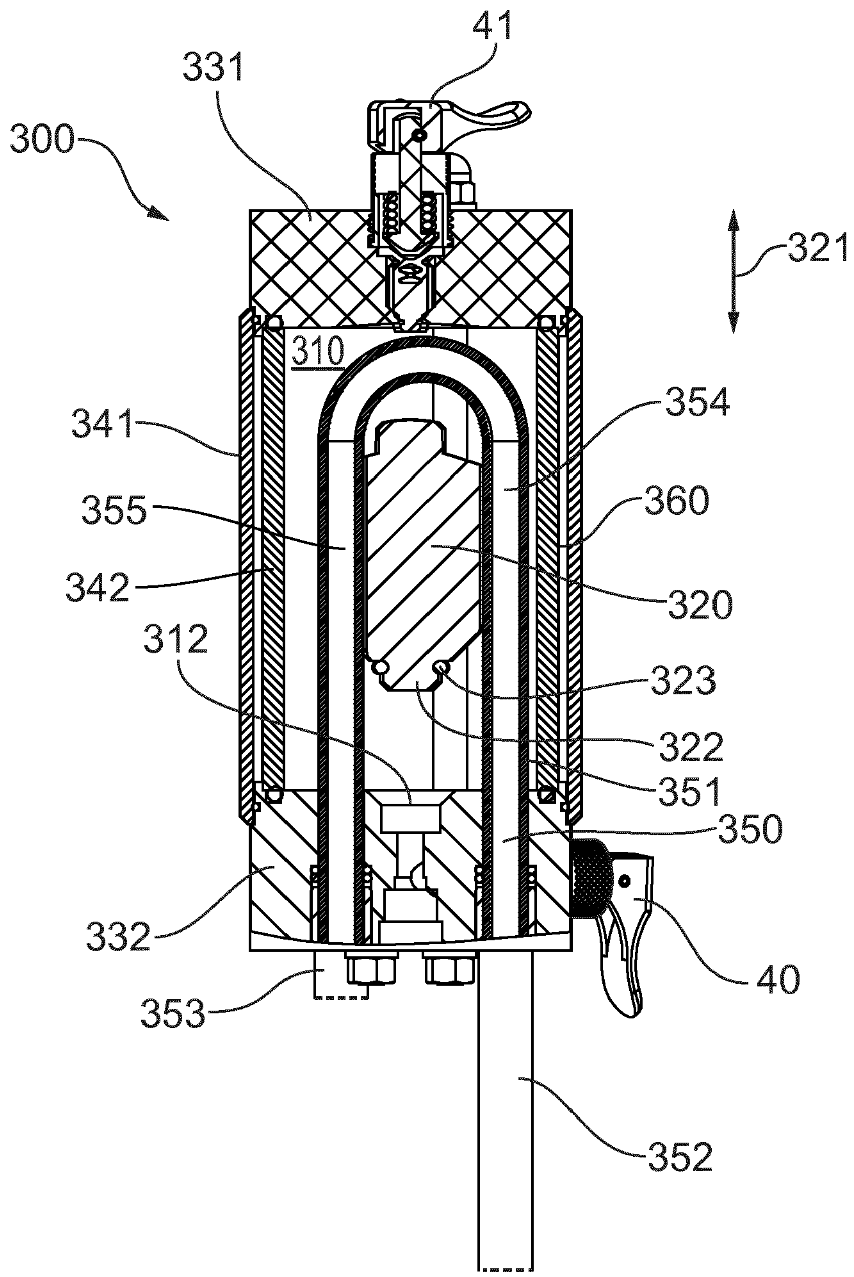
41
331
300
321
310
341
354
355
360
342
320
312
323
322
351
350
332
40
353
352

FIG. 3

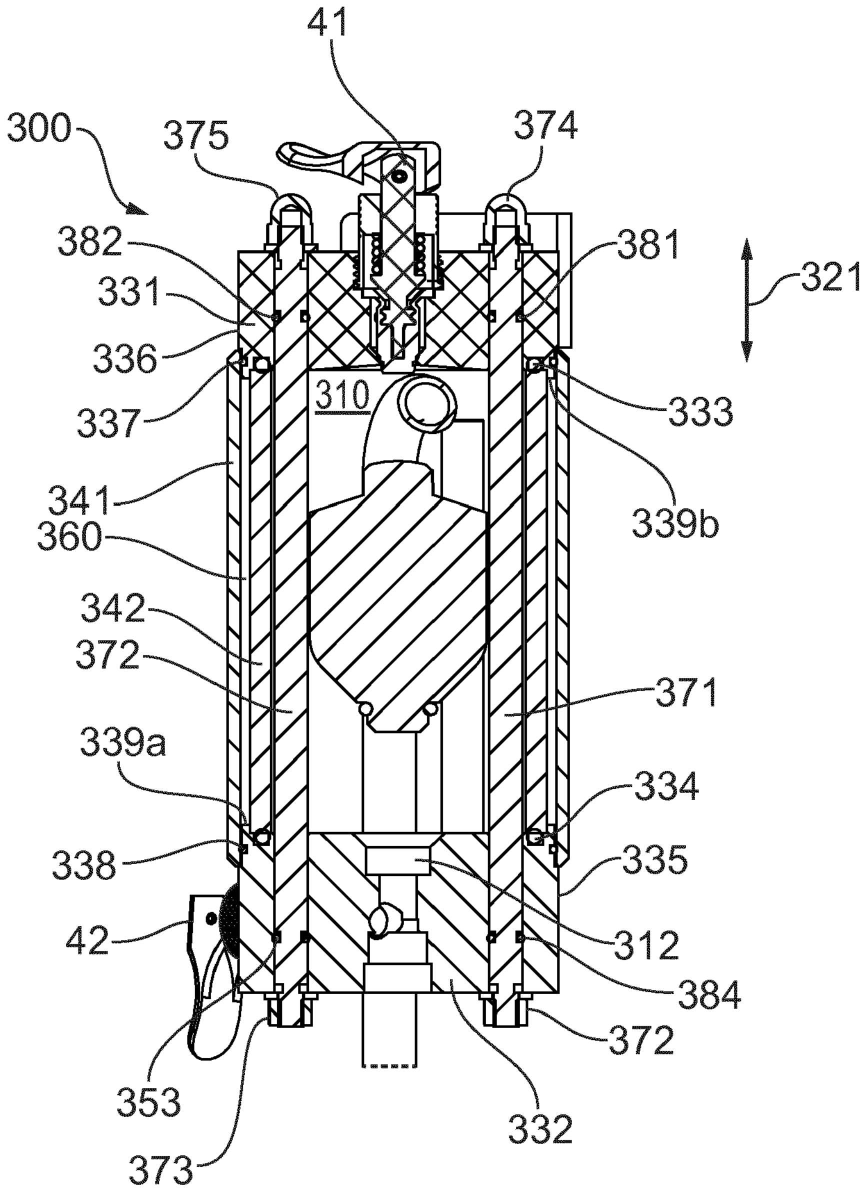
41
300
375
374
382
381
321
331
336
337
333
310
339b
341
360
342
372
371
339a
334
338
335
42
312
384
372
353
332
373

FIG. 4

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 18 18 7854

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 3 162 757 A1 (CARLSBERG BREWERIES AS [DK]) 3 May 2017 (2017-05-03) * paragraph [0045] * -----	1-14	INV. B67D1/12 B67D1/08
A	WO 2017/072114 A1 (CARLSBERG BREWERIES AS [DK]) 4 May 2017 (2017-05-04) * page 13, line 1 - line 11 * * page 15, line 1 - page 16, line 4 * -----	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

B67D

The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
Munich	30 October 2018	Desittere, Michiel

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons
& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 18 18 7854

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

30-10-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 3162757 A1	03-05-2017	DK 3162757 T3	24-09-2018
		EP 3162757 A1	03-05-2017
WO 2017072114 A1	04-05-2017	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82