A cooling apparatus for holders such as glasses, provided with a gas source (2) in which gas under pressure is stored, a pipe (3) and a spray opening (4), wherein the pipe is included between the spray opening and the gas source, for passing gas under pressure from the gas source to the spray opening, wherein a cooling (30) is provided which extends along and/or around at least a part of the pipe.
COOLING APPARATUS AND METHOD FOR COOLING HOLDERS

[0001] The invention relates to a cooling apparatus or method for cooling holders.

[0002] From EP 1 252 472 a cooling apparatus for glasses is known, which comprises a gas source and an outflow opening, with a pipe provided for supply of gas from the gas source to the spray opening. The gas is supplied under high pressure, in liquid form, and will pass into the gaseous phase adjacent the spray opening. By holding a glass upside down, hence with the drinking opening facing down, over the nozzle and then allowing gas to escape from the nozzle, the glass is cooled.

[0003] When the gas is blown off from the spray opening, the pressure in the pipe falls, so that gas bubbles are formed in the pipe. In addition, gas bubbles may form through a rise in temperature. As a result, with the passage of time, the liquid gas supply may be hindered, while moreover an irregular flow pattern is obtained. That is why in this known apparatus, in the pipe, a buffer reservoir is provided, in which an amount of liquid gas can be buffered and in which gas forming in the pipe can be captured. The part of the pipe that is included between the buffer reservoir and the spray opening is connected to an underside of the buffer reservoir. As liquid gas is buffered, a proper separation of gas and liquid gas can be obtained and any pressure differences may be smoothed. A gas blow-off valve is provided at the upper side of the buffer reservoir. The gas blow-off valve is so controlled that when the liquid level falls below a minimum level and the spray opening has been closed, gas is blown off, so that liquid gas can be supplemented.

[0004] This known apparatus is relatively complex in construction and use. Moreover, much gas is blown off via the gas blow-off valve, especially if the ambient temperature of the buffer reservoir is relatively high in proportion to, for instance, the desired target temperature of the holder. The buffer reservoir will usually be set up close to the spray opening and have a relatively high temperature, for instance room temperature. Then gas is blown off very frequently, for instance every eighth to tenth time after gas has been emitted through the spray opening, or more frequently, which can cause nuisance of noise and moreover the gas can give rise to nuisance or even to health problems.

[0005] One object contemplated by the invention is to provide a cooling apparatus and method for holders that forms an alternative to the known cooling apparatus. Another object that may be contemplated with a cooling apparatus or method is a simplification of the apparatus and/or operations. Another object may be a simplification and hence limitation in costs. A further object is to provide a safe cooling apparatus. Also other objects or effects can be achieved with a method or apparatus according to this description.

[0006] In this description, gas should be understood to mean at least a fluid that is gaseous at atmospheric pressure and room temperature and upon an increase of the pressure and/or reduction of the temperature can become liquid. In this description, liquid gas should be understood to mean at least gas that is in a liquid state at the relevant prevailing pressure and temperature. Unless specified otherwise, in this description, the pipe should be understood to mean at least a pipe suitable for liquid gas. Wherever in this description gas is mentioned, gas in a gaseous and/or in a liquid state is meant, unless this is specified otherwise or the context implies differently, for instance due to the prevailing pressure and/or temperature.

[0007] In a first aspect, a cooling apparatus is characterized in that it is provided with a gas source in which gas is stored under pressure in liquid form, a pipe and a spray opening. The pipe is included between the spray opening and the gas source, for passing gas in liquid form under pressure from the gas source to the spray opening. A cooling is provided which extends along and/or around at least a part of the pipe.

[0008] In a second aspect, a method is characterized in that gas in liquid form is supplied under pressure via a pipe to a spray opening, for emission of the gas. The preferably liquid gas in the pipe and/or the pipe itself is cooled with the aid of a cooling.

[0009] To clarify the invention, embodiments of a tapping apparatus and cooling circuit will be further elucidated with reference to the drawing. In the drawing:

[0010] FIG. 1 shows schematically a cooling apparatus for holders such as glasses;

[0011] FIG. 2 shows schematically in side elevation a holder on a part of a cooling apparatus;

[0012] FIG. 3 shows schematically and in partial cross section a portion of a cooling apparatus.

[0013] In this description, the same or corresponding parts have the same or corresponding reference numerals. The embodiments shown are shown for illustration only and should not be construed as limiting in any way. Cooling apparatuses and parts thereof can be used for at least partially removing at least one or more of the disadvantages of the prior art, or for achieving the advantages mentioned or other advantages, or offering an alternative. Also embodiments that do not obviate the disadvantages or do not obviate all of the disadvantages of the prior art, or do not achieve the advantages or do not achieve all of the advantages that are contemplated, can fall within the invention claimed by the claims.

[0014] In this description, holder should be understood to mean at least, though not exclusively, a beverage holder which allows drinking therefrom, such as a glass or cup. Cooling should herein be understood to mean at least an apparatus or operation by which the temperature of an object to be cooled, such as pipe or holder, can be lowered, in particular with respect to the environment or at least can be set and/or controlled.

[0015] In FIG. 1 there is schematically represented an embodiment of a cooling apparatus 1, provided with a gas source 2, a pipe 3 and a spray opening 4. The gas source 2 in this embodiment is a gas cylinder 5 which is represented partly in cross section. The gas cylinder 5 is provided with a valve 6 and a riser pipe 7 connected thereto, which extends to near the bottom 8 of the gas cylinder 5. The pressure in the gas cylinder 5 can be relatively high, for instance 50 to 60 bar when the gas cylinder 5 has just been filled. In another embodiment, the gas cylinder can contain gas under a pressure of more than 10 bar, preferably more than 20 bar, more particularly more than 30 bar. The gas in the gas cylinder 5 is hence substantially liquid. In an advantageous embodiment the gas is CO₂. The gas will preferably be chosen such that it can be emitted directly into the atmosphere or at least is a gas that is naturally present in the atmosphere. In particular in an embodiment in which a gas has been chosen that cannot be emitted directly into the atmosphere, or where such is not desired, an exhaust 9 may be provided, as will be further elucidated hereinafter. As gas cylinder 5, for instance a gas
cylinder 5 of the type 2506 of the firm ACP, Heusden-Zolder may be used, with a connection for instance according to DIN477/NBN226. Naturally, also other types of gas cylinders can be used, whether or not with riser pipe and/or valve. A gas cylinder 5 for use in an apparatus 1 according to the invention can for instance have a content of 10 liters, 25 liters or 50 liters or other content.

[0016] The pipe 3 is connected to the gas cylinder 5 via the valve 6. The valve 6 can be a shut-off whose passage can be controlled or which may for instance have only two positions: completely open or completely closed. In another embodiment, several positions can be chosen. Between the valve 6 and the pipe 3, a regulating valve 10 or similar pressure regulating unit may be provided, in particular a liquid gas liquid reduction valve, with which the pressure can be set, in principle regardless of the pressure in the gas cylinder 5 and/or in the pipe 3. In the pipe 3, for instance a pressure may be set of a few tens of bars, for instance approximately 20 or 30 bar. Such a regulating valve 10 may for instance be designed as type HPR 800, a one-stage regulating valve for inert, reactive, combustible and oxidizing gases and gas mixtures of medium to high purity, resistant to an input pressure of 230 bar. Also other types of reduction devices may be used. With the pressure regulating unit, the pressure with which the liquid gas is introduced into the pipe 3 can be set such that it does not fluctuate or fluctuates only minimally. Between the reduction device 10 and the pipe 3, further a non-return valve 11 may be included, with which gas can be prevented from flowing back from the pipe 3 in the direction of the gas cylinder 5. If pipe 3 is uncoupled from the gas cylinder 5, at the non-return valve 11, moreover, gas is prevented from flowing out of the pipe 3 into the atmosphere, which may be undesired especially when for instance CO₂ gas is used, for instance in view of health.

[0017] At the end 12 of the pipe 3 remote from the gas cylinder 5, the spray opening 4 is provided. Spray opening 4 should herein be understood to mean at least, though not exclusively, an opening through which gas can be emitted from the pipe, while the gas can be emitted in both liquid and gaseous form, or as a combination. Especially upon outflow of the gas, it may pass from the liquid form into the gaseous form, as a result of pressure reduction. The spray opening 4 may for instance be provided in a nozzle 13 and may for instance be formed by a substantially straight, open passage having a diameter of, for instance, a few tens of millimeters or less. The nozzle 13 can be chosen simply, for instance depending on the desired amount of gas that is to be emitted per unit time, the desired outflow rate, the desired outflow direction and/or a desired outflow pattern. For instance, with a nozzle 13 there may be emitted between approximately 2 and 15 grams of CO₂ per second, in particular between approximately 4 and 10 grams of CO₂ per second, more particularly between approximately 6 and 7 grams per second. The nozzle 13 may for instance be chosen so as to give substantially a jet or spray configuration as an outflow pattern directly upon the outflow. An example of a nozzle suitable for this application is an oil combustion nozzle, for instance Delavan types A, B, or W, for instance in the range of 1.00 and 10.00 GPH, with different spray angles, to be chosen depending inter alia on the shape and/or dimensions of the holders. Such nozzles are for instance supplied by Delavan Spray Technologies, Bambergs, S.C., USA. As a valve, for instance a direct-acting solenoid valve may be used, for instance as obtainable via M&M International, Bedford, GB.

[0018] In the embodiments shown in FIGS. 1-3, the spray opening 4 is included in a housing 14. In the housing 14, between the second end 12 of the pipe 3 and the spray opening 4 and nozzle 13, a control valve 15 is included, with which the gas passage between the pipe 3 and the spray opening 4 can be opened and closed. The control valve 15 may be connected to a control device 16, with which the control valve 15 can be opened and closed. On or at the housing 14 and/or at or on the control device 16, a control panel 17 may be provided, with which for instance a control behavior of the control valve 15 can be controlled or set and/or adjusted. Moreover, instead or additionally, control buttons 18 may be provided, with which the control valve 15 can be operated.

[0019] Near the spray opening 4 a support 19 is provided, on which an edge of a holder 20, here shown as a glass, can be placed, so that the holder 20 is placed upside down above and/or over the spray opening. In the embodiment shown, the spray opening 4 can have an outflow direction P which is approximately parallel to and may substantially coincide with a longitudinal axis L of the holder 20 when placed on the support 19. This can be advantageous in view of symmetry.

[0020] In the embodiment shown in FIG. 2, at the spray opening 4 an exhaust 9 is provided. The exhaust 9 is here designed, by way of example, in the form of a ring 22 extending, at least in top plan view, partly around the spray opening and defining at least a suction surface 23 which, in side elevation, is situated below the spray opening 4. Connected to the exhaust is a discharge pipe 24, with which exhausted gas can be removed to the atmosphere, preferably outside the space R in which the apparatus 1 is set up.

[0021] Gas detection means 25 may be connected to the control device 16, allowing for instance the pressure regulating device 10, the non-return valve 11, the control valve 15 and/or the valve 6 to be closed when for instance the gas concentration in the environment of the apparatus 1 runs up above a limit value. In this way, hazard can be prevented. Also, one or more of the valves and devices 6, 10, 11, 15 may be closed by the control device 16 when the pressure in the pipe 3 falls below a minimum limit value or rises above a maximum limit value.

[0022] In the embodiment shown in FIGS. 1 and 2, the support 19 is so configured that the control valve 15 can be operated with it. To this end, the support 19 is for instance coupled to a shaft 27, with which a switch 28 can be operated, whereby, via the control device 16, the control valve 15 is activated and, for instance, opened as long as the support 19 is being pressed down by the holder, or for a time inputted in the control device 16, for instance, though not limited to, a few seconds. Thus, for instance, for a beer glass of average size, for instance approximately 250 to 350 ml, the control valve may be opened for a time of between approximately 5 seconds and 12 seconds, more particularly for instance approximately 7 seconds, so that during that time for instance between approximately 15 and 75 grams of CO₂ are squirted out, more particularly between approximately 20 and 75 grams, for instance between approximately 20 and 40 grams of CO₂, more particularly between approximately 30 and 35 grams or, for instance, between 30 and 75 grams, more particularly between 45 and 75 grams, such as 60 grams, for relatively large or heavy glasses. The time between one time opening of the control valve 15 and following closing thereof can be designated as a cooling cycle. With an apparatus according to the invention, the cooling cycle can preferably
be set, for instance the duration thereof, for instance between 0 and 60 seconds, and depending on, for instance, the holder to be cooled, the desired temperature of the holder and/or the ambient temperature. Thus, with an apparatus according to the invention, for instance a glass can be cooled to an average temperature of less than 4°C or to a temperature below 0°C, so that ice formation on the glass can occur. For instance, the temperature can be controlled between 5 and −4°C. This can be done, for instance, in a time of a cycle of less than 10 sec. The temperatures and times mentioned are naturally mentioned for illustration only and should not be construed as limiting in any way. The control valve 15 may also be driven on the basis of the amount of gas that is emitted through the spray opening in a cooling cycle.

[0023] In the embodiment shown in FIG. 3, detection means 26 are arranged near the spray opening 4, with which the presence of a holder 20 near the spray opening 4 can be determined. On the basis of a signal from the detection means 26, the control device 16 can then be controlled for opening the control valve 15 and starting a cooling cycle. This can for instance be executed and controlled in a manner as described hereinabove with reference to FIG. 2. Alternatively, the cycle can last as long as a holder 20 is being detected near the spray opening 4.

[0024] In an embodiment, indication means 29 may be provided on the housing, with which it can for instance be indicated that a cycle is in progress, that the apparatus 1 is switched on and/or what temperature has been set and/or has been reached. Further, lighting means V may be provided, for instance around the spray opening 4, with which a holder can be lighted during cooling.

[0025] In an apparatus 1 according to the invention, a cooling 30 is provided, with which at least a part of the pipe 3 can be cooled. With the cooling 30, the pipe 3 and the gas therein can be cooled, to which end the cooling 30 extends at least along and/or around at least a part of the pipe. The cooling 30 in the embodiment shown comprises a jacket 31 which extends around the most part of the length of the pipe 3. Between a part of the jacket 31 and the outside of the pipe 3, a channel 32 is provided which is connected to a cooler 33. The cooler 33 can be an in-line cooler. With it, a cooling medium can be pumped through the channel 32, for instance glycol, a glycol mixture or water or other suitable cooling medium, with which the pipe 3 can be cooled. Indirectly, the gas is thereby cooled as well. In this way, the formation of gas bubbles in the pipe 3 is largely prevented, so that venting of the pipe 3 during use is not necessary or in any case is necessary only very sporadically. A venting device and/or a buffer reservoir are thus not necessary. In particular, this can prevent formation of gas bubbles which adversely affect the operation of the cooling apparatus 1.

[0026] In an apparatus 1 according to the invention, the gas source 2 can be set up relatively far from the spray opening 4, for example a few meters, without gas bubble formation becoming a problem.

[0027] With an apparatus 1 according to the invention, a holder 20 can be cooled as follows.

[0028] The valve 6 is opened, for instance wholly, and with the pressure regulating device 11 a desired pressure in the pipe 3 is set, for instance above 30 bar. The pressure of the liquid gas in the pipe is high as far as the closed control valve 15. With the control device 16, an optimum cooling cycle can be set, for instance depending on the holder 20 to be cooled and the desired cooling temperature, for instance 0°C. If a holder 20 is pressed onto the support 19, a cooling cycle is started and gas squirts out of the spray opening into the inner space 20A of the holder, against the walls thereof. Vaporizing gas draws heat from the air in the holder 20 and from the wall 20B thereof, so that cooling occurs. The gas such as CO₂, which is heavier than air, will sink and be suctioned out by the exhaust. After a desired cooling time and/or a desired amount of gas which has been pressed into the holder 20, the control valve 15 is closed and cooling is stopped.

[0029] With the cooling 30, for instance a temperature of the pipe 3 is set that is lower than the temperature of the gas source 2, in particular the gas cylinder 5 or the gas present therein. In particular, for instance a temperature of the pipe or the gas therein can be set below 10°C, more particularly below 5°C, still more particularly below 0°C. Surprisingly, it has been found that in this way gas bubble formation in the gas can be considerably limited or even prevented, especially at the lower temperature, also when the apparatus and/or the gas cylinder 5 are set up, for instance, at room temperature.

[0030] In the embodiments shown, within the jacket 31, furthermore, a beverage line 34 is provided, which is also cooled by the cooling liquid in the channel 32. The beverage line 34 can for instance extend between a keg or other container 37 to a point near or in acountermount 38. The jacket 31 with pipe 3, channel 32, beverage line 34 and possibly a return channel 35 for the cooling liquid may be included in or designed as a line 36, for instance as a python line which is commonly used in, for instance, beer tapping apparatuses.

[0031] The invention is not in any way limited to the apparatus and methods shown and described in the description and drawings. Alternative embodiments that fall within the claims are understood to be included in this description, among which at least combinations of parts of the embodiments shown and alternatives thereto. Other temperature ranges and cooling times can be set and/or used. Multiple pipes and/or beverage lines may be combined in one apparatus 1, while moreover multiple spray openings 4 may be provided on a pipe and/or in a housing. Other gases than CO₂ can be used.

1. A cooling apparatus for holders such as glasses, provided with a gas source in which gas is stored under pressure, a pipe and a spray opening, wherein the pipe is included between the spray opening and the gas source, for passing gas under pressure from the gas source to the spray opening, wherein a cooling is provided which extends along and/or around at least a part of the pipe.

2. A cooling apparatus according to claim 1, wherein the cooling comprises a jacket which extends around a part of the pipe.

3. A cooling apparatus according to claim 2, wherein through the jacket, also a beverage line extends, while the jacket is preferably part of a python line, preferably connected to or connectable to an in-line cooler.

4. A cooling apparatus according to claim 1, wherein between the spray opening and the pipe a controllable valve is included, with the spray opening preferably being a nozzle.

5. A cooling apparatus according to claim 1, wherein a control device is provided for controlling the amount of gas that is emitted from the spray opening per unit time and/or the time during which, per cooling cycle, gas is emitted from the spray opening.

6. A cooling apparatus according to claim 1, wherein the gas is CO₂ gas or CO₂-containing gas, wherein the cooling is so configured that the temperature of the pipe and/or gas
7. A cooling apparatus according to claim 1, wherein near the spray opening an exhaust is provided.
8. A cooling apparatus according to claim 1, wherein the apparatus is further provided with gas detection means for detecting a gas level outside the gas source above a limit value.
9. A cooling apparatus according to claim 1, wherein the apparatus, in particular the pipe, is arranged for passing liquid gas to the spray opening.
10. A cooling apparatus according to claim 1, wherein near and preferably around at least a part of the spray opening a support is provided for a holder to be cooled.
11. A cooling apparatus according to claim 1, wherein detection means are provided near the spray opening, for detection of a holder.

12. A cooling apparatus according to claim 1, wherein in the pipe and/or between the pipe and the gas source a liquid gas-liquid gas pressure regulating unit is provided.
13. A cooling apparatus according to claim 1, wherein a gas discharge device is provided.
14. A method for cooling holders such as glasses, wherein gas in liquid form is supplied under pressure via a pipe to a spray opening, for emitting the gas, wherein the gas in the pipe and/or the pipe is cooled with the aid of a cooling.
15. A method according to claim 14, wherein the gas in the pipe and/or the pipe is cooled to a temperature below 10° C., more particularly below 5° C., still more particularly below 0° C., preferably between 5 and -4° C.
16. A method according to claim 14, wherein as gas, CO₂ is used.

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