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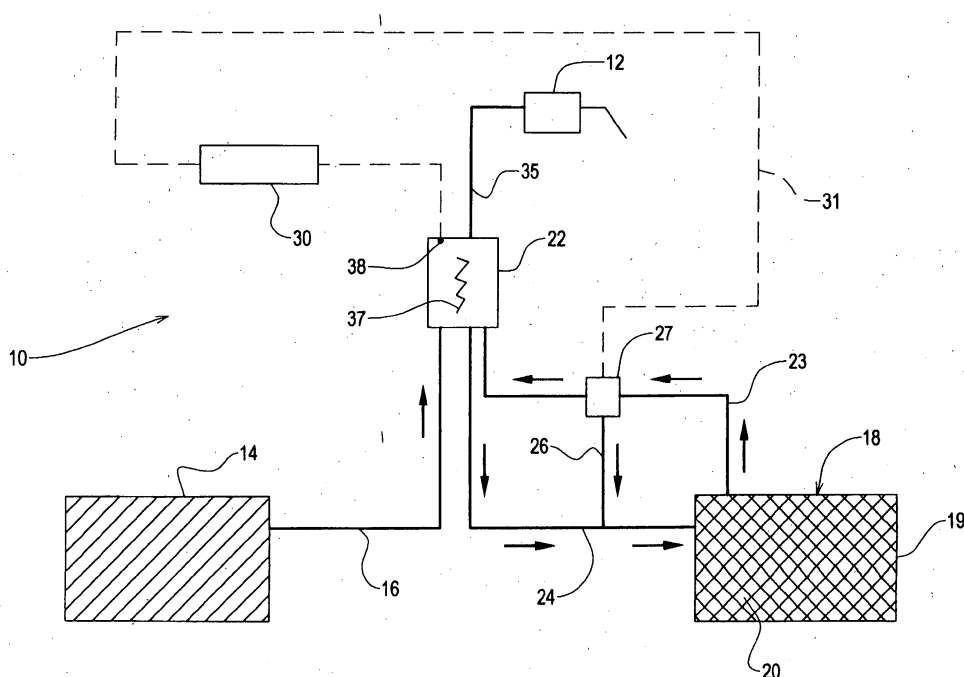
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(54) Refrigerated beverage dispensing system

(57) A beverage dispensing system 10 includes a dispensing head 12 for dispensing the beverage at a point of delivery at a temperature in a desired delivery temperature range, a first cooling apparatus 14 which cools the beverage to a temperature below the ambient temperature at the point of delivery and outside the desired temperature range, an upstream heat exchanger 22 to which the cooled beverage is supplied and in which heat is exchanged with the beverage to change the temperature of the beverage to lie in the desired delivery temperature range, a beverage supply conduit 35 ex-

tending between the heat exchanger 22 and the dispensing head 12 for supplying the beverage to the dispensing head 12, and there being a second cooling apparatus 18, which is separate from the first cooling apparatus 14, including a coolant delivery conduit 23 for delivering a coolant to the heat exchanger 22, and a control device 23, 30 for controlling the flow of coolant to the heat exchanger 22 in accordance with an input indicative of the temperature or changes in temperature of the beverage in or downstream of the heat exchanger 22.



EP 1 510 499 A1

Description

Description of Invention

[0001] This invention relates to a beverage dispensing system and more particularly to a system in which the beverage is stored e.g. in a cellar, and delivered to a dispensing head, for example, on a bar.

[0002] Conventionally, in a cellar of a public house or the like, a chiller is provided, which is operative to cool one, but usually a plurality of lines each of which conveys a different beverage to a or a plurality of dispensing heads on the bar. A particular chiller will not, however, be able to provide adequate cooling for an unlimited number of beverages. Thus, if the number of beverage dispensing heads requiring cooling increases above a maximum, for example if the public house or the like is extended to include an additional bar, the existing chiller may not have the capacity to provide adequate cooling for all of the dispensed beverages. Typically, when this occurs, the existing chiller is replaced by a new, larger capacity chiller.

[0003] Moreover, where a plurality of beverages are chilled in a common chiller, the temperatures of each of the beverages as dispensed, will tend to be about the same. In the case of the plurality of beverages each being beer for example, each dispensed beer may thus be dispensed with the same temperature typically in the order of 6°C to 8°C. However, the producers of some beers specify an optimum temperature for drinking the beer, and such optimum temperatures may vary from one beer to another. Also the common chiller may be required to chill soft drinks which typically are required to be served at colder temperatures than at least some beers.

[0004] From an economic point of view, and because space may be restricted, it is not usually viable to provide a plurality of chillers in a cellar for each of a plurality of beverages to be dispensed, or at least it is undesirable so to do.

[0005] It is known from GB2205638A to finely adjust the temperature of beverages supplied to a bar along a common insulated pipeline by means of a plurality of water filled heat exchanger module one of which is located adjacent the dispense point of each beverage. The temperature of the water in each module, and hence the temperature of the dispensed beverage, is finely adjusted by passing cooling water through the module in response to a temperature sensor which detects the temperature of water in the module. In one embodiment of the system described in GB2205638A, the central chiller is partitioned so that it contains two volumes of liquid coolant, each of which has its own re-circulating pump, both volumes of coolant being cooled using the same refrigeration unit. Coolant from one volume is circulated around the insulated pipeline to cool all of the beverages, whilst coolant from the other volume is circulated around the water filled modules. Thus, by virtue of this

system, the different beverages may be dispensed at different temperatures.

[0006] According to a first aspect of the invention we provide a beverage dispensing system including a dispensing head for dispensing the beverage at a point of delivery at a temperature in a desired delivery temperature range, a first cooling apparatus which cools the beverage to a temperature below the ambient temperature at the point of delivery and outside the desired delivery temperature range, an upstream heat exchanger to which the cooled beverage is supplied and in which heat is exchanged with the beverage to change the temperature of the beverage to lie in the desired delivery temperature range, a beverage supply conduit extending between the heat exchanger and the dispensing head for supplying the beverage to the dispensing head, and there being a second cooling apparatus which is separate from the first cooling apparatus, including a coolant delivery conduit for delivering a coolant to the heat exchanger, and a control device for controlling the flow of coolant to the heat exchanger in accordance with an input indicative of the temperature or changes in temperature, of the beverage in or downstream of the heat exchanger.

[0007] Thus in a system in accordance with the first aspect of the invention, the cooling provided by a system with an inadequate existing chiller, or cooling apparatus may be improved without the need to replace the existing chiller, simply by the addition of a second chiller and a heat exchanger circuit. Thus, the cost of upgrading an existing beverage dispensing system is substantially reduced.

[0008] Moreover, a common chiller may be provided for example in a location remote from the dispensing head or heads, such as in a cellar, for chilling each of a plurality of different beverages to a common temperature, whilst each beverage may have its own heat exchanger, for example provided close to the dispensing head, e.g. below a bar, and the temperature of each individual beverage as dispensed, may thus be adjusted e.g. by operation of the control device, to lie within the desired delivery temperature range for that beverage.

[0009] Thus for a bar for example serving several different beverages, each individual beverage may be dispensed at a temperature in a desired delivery temperature range appropriate for the particular beverage. The heat exchanger for the or each beverage physically may be relatively small and thus a plurality of such heat exchangers may be accommodated close to the dispensing head or heads, because the heat exchanger need only be capable of cooling the beverage, where the beverage supplied to the heat exchanger is below the ambient temperature at the point of delivery, further to a temperature in the desired delivery temperature range.

[0010] Preferably the first cooling apparatus includes a first refrigeration unit for reducing the temperature of a beverage in the first cooling apparatus, and the second cooling apparatus includes a second refrigeration

unit for reducing the temperature of a coolant in the second cooling apparatus.

[0011] The second cooling apparatus may also be provided close to the dispensing head, e.g. below a bar.

[0012] Preferably the first cooling apparatus is provided remote from the dispensing head, for example in a cellar.

[0013] The control device may be adapted to respond to the input by increasing the flow of coolant to the heat exchanger where it is desired to increase cooling of the beverage in the heat exchanger, and to reduce, including even stopping altogether, the flow of coolant to the heat exchanger where it is desired to reduce cooling of the beverage in the heat exchanger.

[0014] The heat exchanger may include a heating device, so that in the event that the temperature of the beverage supplied to the heat exchanger is below the desired delivery temperature range, the beverage may be heated to increase the temperature of the beverage which passes into the beverage supply conduit, to a temperature within the desired delivery temperature range.

[0015] Such a heating device may include a simple electrical resistance heater, or any other desired device for heating the beverage flowing through the heat exchanger. Of course during such heating the control device may stop the flow of coolant to the heat exchanger.

[0016] The second cooling apparatus may include a refrigerated container containing a single phase liquid such as glycol, the glycol being circulated as the coolant to the heat exchanger of the system, and returned to the container. The control device may in one example include a control valve, which may be driven from a stepper motor or another kind of motor, which valve controls the flow of coolant to the heat exchanger and is capable of diverting at least a proportion of the flowing coolant to a by-pass without the coolant passing to the heat exchanger, depending on the input. Alternatively, a speed-control pump may be used, to vary the rate of coolant flow to the heat exchanger. However the control device may otherwise control the flow of coolant to the heat exchanger, for example by varying the quantity of coolant being pumped from the refrigerated container, or otherwise. The control valve, alternatively, may be a binary switching valve, removing the requirement of a motor.

[0017] The heat exchanger may be of any desired suitable kind but preferably is a solid body of a material with a high thermal capacity and/or a high heat conductivity, such as metal, especially aluminium, there being provided in the body, a cooling passage e.g. in the form of a coil, for the coolant, and a passage, which may again be a coil, for the beverage. As will be understood by those skilled in the relevant field, a high thermal capacity is desirable so that the heat exchanger is able to store thermal energy. Such a body is thus cooled to a temperature in the desired delivery temperature range, by the coolant, and the flowing beverage may quickly be cooled as it passes through the body.

[0018] Where a heating device is provided, this may conveniently be a heating element which may be embedded in the body of the heat exchanger, or may surround the body of the heat exchanger, thus rapidly to heat the body to a temperature in the desired delivery temperature range where the temperature of the beverage supplied to the heat exchanger is below the temperatures in the desired delivery temperature range.

[0019] Preferably the control device includes a manually adjustable control so that an optimum serving temperature for the beverage within the desired delivery temperature range may be set.

[0020] The system preferably includes a plurality of dispensing heads, each dispensing head being provided with a heat exchanger, the second cooling apparatus including a plurality of coolant delivery conduits for delivering coolant to each of the heat exchangers.

[0021] In this case, the system may further include a plurality of control devices, one control device for controlling the flow of coolant to each heat exchanger.

[0022] According to a second aspect of the invention we provide a method of dispensing a beverage at a temperature in a desired delivery temperature range at a point of delivery from a dispensing head, the method including cooling the beverage using a first cooling apparatus to a temperature below the ambient temperature at the point of delivery and outside the desired delivery temperature range, supplying the beverage to an upstream heat exchanger, operating a control device to control the flow of a coolant from a second cooling apparatus which is separate from the first cooling apparatus to the heat exchanger along a coolant delivery conduit which delivers the coolant to the heat exchanger in accordance with an input indicative of the temperature or changes in temperature of the beverage in or downstream of the heat exchanger, whereby in the heat exchanger, heat is exchanged with the beverage to change the temperature of the beverage supplied thereto to lie in the desired delivery temperature range, and supplying the beverage to the dispensing head from the heat exchanger via a beverage supply conduit.

[0023] The method of the second aspect of the invention may include operating a heating device to increase the temperature of the beverage, where supplied to the heat exchanger at a temperature below the desired delivery temperature range, during which heating device operation, the flow of coolant to the heat exchanger may be at least reduced to a minimal flow, and preferably is stopped altogether.

[0024] According to a third aspect of the invention we provide a method of upgrading a beverage dispensing system including a dispensing head for dispensing the beverage at a point of delivery, a first cooling apparatus for cooling the beverage to a temperature below the ambient temperature at the point of delivery, and a beverage supply conduit extending between the first cooling apparatus and the dispensing head for supply cooled beverage to the dispensing head, wherein the method

includes the steps of inserting a heat exchanger in the beverage supply conduit, so that beverage from the first cooling apparatus passes through the heat exchanger before entering the dispensing head, adding a second cooling apparatus, the second cooling apparatus being adapted to supply a coolant to the heat exchanger.

[0025] Thus, by virtue of this aspect of the invention, the performance of a beverage dispensing system with an inadequate chiller may be improved without the need to replace the existing chiller.

[0026] Preferably, the method further includes the step of providing a control device for controlling the flow of coolant to the heat exchanger in accordance with an input indicative of the temperature or changes in temperature of the beverage in or downstream of the heat exchanger.

[0027] Specific and non-limiting embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawing which is a schematic view of a beverage dispensing system in accordance with the invention.

[0028] Referring to the drawing, a beverage dispensing system 10 is shown for delivering beverage, in the example beer, at a point of delivery, via a dispensing head 12. The system shown is particularly for a public house, hotel or the like, having a bar where one or more dispensing head 12 is located. The beer is stored in a remote location such as a cellar where there is a first cooling apparatus 14, a chiller 14 for example of the kind including an ice bank, through which the beer passes in a cooling coil for example. The beer may be passed through the cooling coil by virtue of a pump, preferably located upstream of the chiller 14, or it may pass through the coil as a result of its own pressure, via an insulated conduit 16, typically with other conduits containing different beverages, to the bar and thus to a dispensing head 12.

[0029] Thus the beer which passes from the cellar will be at a temperature below ambient temperature, typically in the range 6°C to 8°C, and usually provided that the dispensing head 12 is not a very large distance from the chiller 14, the serving temperature of the beer dispensed would be close to the chilled temperature.

[0030] In a conventional system, the beer in the conduit, adjacent the head 12, may be cooled by recirculated cooling water, so that chilled beer is always available for serving at the dispensing head 12 even if the beer is not served continuously.

[0031] Typically, the chiller 14 is used to cool a beverage or beverages to be dispensed from a plurality of dispensing heads, and a chiller 14 of an appropriate capacity to chill the volume of beverage it is envisaged will be dispensed when the system is set up is chosen. If, however, the volume of dispensed beverage increases significantly, for example if, the public house, hotel or the like is extended and the number of beverage dispensing heads increases, or if the performance of the chiller 14 has deteriorated with age, the existing chiller

14 may not be capable of providing adequate cooling.

[0032] In this case, typically the existing chiller would be replaced with a new, higher capacity, chiller, at significant expense. In accordance with the invention, however, the performance of an existing beverage dispensing system may be enhanced without the need to replace the existing chiller 14.

[0033] Moreover, the chiller 14 typically would chill several different beverages which ideally are required to be served at temperatures within unique desired delivery temperature ranges. For example, one beer may ideally be served at a temperature in the range 5°C to 7°C whilst another beer or other beverage may be required to be served at a temperature in the range 8°C to 10°C. In accordance with the invention, the temperature of the beer or other beverage may be adjusted as the beverage flows from the chiller 14 to the dispensing head 12, to lie in a desired delivery temperature range.

[0034] To effect this, the system 10 includes a second cooling apparatus 18 which preferably has a cooling capacity significantly smaller than that of the chiller 14 and a heat exchanger 22 through which cooled beverage from the chiller 14 flows prior to entering a dispensing head 12. The second cooling apparatus 18 is entirely separate from the central chiller 14 in that it includes its own refrigeration unit for reducing the temperature of the coolant in the cooling apparatus 18.

[0035] The second cooling apparatus 18 may be of any desired type, such as a refrigerated container 19 containing a single phase liquid such as glycol or a glycol/water mix 20 which is cooled by evaporating/expanding refrigerant (not shown), the glycol or glycol/water mix 20, being a coolant which as described below, may be circulated to the heat exchanger 22 to cool the beverage. Whilst it will be appreciated that the system may include a plurality of dispensing heads, for simplicity, a system including only one will be described below.

[0036] The cooling apparatus 18 thus includes a cooling circuit which includes a coolant delivery conduit 23 to the heat exchanger 22, a coolant return conduit 24 from the heat exchanger 22 back to the container 19, and a by-pass conduit 26 with there being a diverter control valve 27 which controls the flow of the coolant 20 as between the heat exchanger 22 and the by-pass 26.

[0037] The diverter valve 27 is a component of a flow control device which includes an electronic controller 30, the diverter valve 27 being stepper or other motor driven, or otherwise being electrically actuatable, under the control of the electronic controller 30, which signals the valve 27 as required, along a control line 31.

[0038] The heat exchanger 22 in this example is a solid body, such as a block of a highly heat conductive material, such as aluminium or another metal, there being provided in the body, a cooling passage e.g. in the form of a coil, for the coolant 20, and a passage, which may again be a coil, for the beverage from the insulated conduit 16 from the chiller 14.

[0039] Embedded within the solid body of the heat ex-

changer 22, or surrounding the body, preferably a heating device 37 such as an electrically operable heating element is provided which when operated imparts heat into the solid body which may be exchanged to the flowing beverage, as described below. In another arrangement the heating device 37 of the heat exchanger may be removed from the solid body.

[0040] Also, either embedded in the solid body of the heat exchanger 22 or otherwise in a position to sense the temperature of beverage leaving the heat exchanger 22 and flowing to the dispensing head 12 along a beverage supply conduit 35, there is a temperature sensor 38 which provides an input to the electronic controller 30 of the flow control device, which responds to the input by controlling the diverter valve 27, and operation of the heater device 37 of the heat exchanger 22.

[0041] Operation of the system 10 will now be described.

[0042] First, in the case of the temperature of the beverage from the chiller 14 being supplied to the heat exchanger 22 being higher than the desired delivery temperature or range of acceptable temperatures in a desired temperature range, the temperature sensor 38 providing the input to the electronic controller 30 of the flow control device will indicate that further cooling of the beverage flowing from the chiller 14 is required. This may be because the chiller 14 is working at or close to its maximum cooling capacity, and/or because no beverage has been dispensed for some time, and thus beverage in the insulated conduit 16 from the cellar, has warmed; and/or because of high ambient temperatures. The electronic controller 30 signals the diverter valve 27 to divert coolant, or more coolant, to the heat exchanger 22 thus to further cool the beverage flowing through the heat exchanger 22, to or at least towards a temperature within the desired delivery temperature range.

[0043] Desirably, the second cooling apparatus 18 is located very close to the heat exchanger 22 and dispensing head 12, e.g. beneath the bar, so that such additional cooling may be achieved very rapidly, before any significant volume of beverage at a temperature outside the desired delivery temperature range, has been dispensed.

[0044] As the temperature sensor 38 determines that the temperature of the beverage being dispensed has been cooled to a temperature within the desired delivery temperature range, the electronic controller 30 may signal the diverter valve 27 to close or progressively to reduce the flow of coolant to the heat exchanger 22 so that the beverage is not over-cooled in the heat exchanger 22.

[0045] It will be appreciated that the electronic controller 30 may be operated to respond to the input from the temperature sensor 38 according to an algorithm, so that the rate of change of temperature of the beverage can be determined, perhaps with some predictive effect, so that the temperature of the beverage being dispensed can very accurately be controlled. Other in-

puts to the electronic control which may be taken into consideration are the ambient temperature at the point of delivery at the dispensing head 12, historic information concerning the volume of beverage dispensed, and the temperature of the beverage attained by the chiller 14.

[0046] In a second case, the temperature of the beverage supplied to the heat exchanger 22 from the chiller 14 may be below the desired delivery temperature range for the particular beverage. This may be because of overly efficient cooling by the chiller 14 working below its maximum cooling capacity, or because of low ambient temperatures, or otherwise.

[0047] In this case, the electronic controller 30 would signal the diverter valve 27 to divert all or substantially all the coolant flowing in the cooling circuit to flow into the by-pass 26 and thus not to pass to the heat exchanger 22. Also, the heating element 37 may be operated to impart heat to the overly cooled beverage, so that the temperature of the beverage which passes into the beverage delivery conduit 35 and thus to the dispensing head 12 is increased to a temperature in the desired delivery temperature range.

[0048] It will be appreciated that during dispensing of the beverage at the dispensing head 12, the flow control device may actively control both the diverter valve 27 and the heating element 37 as required to achieve and maintain a desired delivery temperature.

[0049] By virtue of the invention, there is no requirement to recirculate beverage from adjacent the dispensing head 12 to the chiller 14; the chiller 14 may be further away from the bar (or at least the dispensing head 12) without compromising the delivery temperature of the beverage.

[0050] As mentioned above, the system may include a plurality of dispensing heads 12 which dispense a plurality of different beverages. In this case, preferably each dispensing head 12 is provided with its own heat exchanger 22, each heat exchanger 22 being supplied with coolant from the second cooling apparatus 18. All of the beverages are, however, cooled using the chiller 14.

[0051] Preferably each heat exchanger 22 is provided with a control device, as this enables a user to set a different desired delivery temperature for each dispensing head 12, which is particularly advantageous where a different beverage is dispensed from each dispensing head 12.

[0052] Thus, by virtue of the invention, a common chiller 14 may be provided for chilling a plurality of different beverages which may then each be dispensed at temperature in an individual desired delivery temperature range. Because a heat exchanger 22 is only required for one beverage, it may physically be small and thus readily accommodated in the vicinity of the dispensing head 12, e.g. beneath the bar.

[0053] It should be appreciated that a single heat exchanger 22 may be used to adjust the temperature of a

beverage dispensed from a plurality of dispensing heads 12, provided that these are each not too far from the heat exchanger 22. It should also be appreciated that a single controller 30 may be used to control flow of coolant to a plurality of heat exchangers 22, provided that the desired delivery temperatures of each of the various beverages passing through the heat exchangers 22 is the same.

[0054] If the range of desired delivery temperatures for the various dispensed beverages is too wide then it may be preferable to provide a third cooling apparatus, the second cooling apparatus 18 supplying coolant at a first temperature to some of the heat exchangers 22, and the third cooling apparatus supplying coolant at a second temperature to the remainder of the heat exchangers 22. Alternatively each heat exchanger 22 may be provided with its own cooling apparatus.

[0055] Desirably, the electronic processor 30 includes a manual input control, so that a user may set the desired temperature, or desired temperature range, at which the beverage is to be dispensed.

[0056] The system 10 may advantageously be applied to upgrading an existing beverage dispensing system which is providing inadequate cooling, without the need for replacing the existing cooling apparatus. This can be achieved by mounting a heat exchanger 22 in a beverage supply conduit to the or each dispensing head 12, and providing a further cooling apparatus 18 and cooling circuit to supply coolant to the heat exchanger 22. The additional cooling apparatus 18 supplements the cooling provided by the existing cooling apparatus 14, and thus enhances the performance of the beverage dispensing system.

[0057] Various other modifications may be made without departing from the scope of the invention.

[0058] For example, the cooling apparatus 18 may of a different kind to that described, for example a conventional refrigerator with the coolant being refrigerant which is circulated to and from the heat exchanger 22.

[0059] Instead of a diverter valve 27 to divert coolant to the by-pass 26, the flow of coolant to the heat exchanger 22 may otherwise be controlled, for example by controlling a coolant pump, which may be a variable displacement pump. The electronic controller 30 may be provided close to the diverter valve 27 or coolant pump, and a single electronic controller 30 at least may be provided to control valves 27/pumps of a plurality of systems in a multi-system installation.

[0060] In another embodiment, no heating device 37 may be provided, but the beverage may always be arranged to be supplied to the heat exchanger 22 at a temperature above the desired serving temperature, for example by suitable control of the chiller 14.

[0061] Other modifications may be made without departing from the scope of the invention.

[0062] The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms

of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

Claims

1. A beverage dispensing system (10) including a dispensing head (12) for dispensing the beverage at a point of delivery at a temperature in a desired delivery temperature range, a first cooling apparatus (14) which cools the beverage to a temperature below the ambient temperature at the point of delivery and outside the desired delivery temperature range, an upstream heat exchanger (22) to which the cooled beverage is supplied and in which heat is exchanged with the beverage to change the temperature of the beverage to lie in the desired delivery temperature range, a beverage supply conduit (35) extending between the heat exchanger (22) and the dispensing head (12) for supplying the beverage to the dispensing head, and there being a second cooling apparatus (18), which is separate from the first cooling apparatus (14), including a coolant delivery conduit (23) for delivering a coolant to the heat exchanger (22), and a control device (27) for controlling the flow of coolant to the heat exchanger (22) in accordance with an input indicative of the temperature or changes in temperature of the beverage in or downstream of the heat exchanger (22).
2. A beverage dispensing system (10) according to claim 1 wherein the first cooling apparatus (14) includes a first refrigeration unit for reducing the temperature of the beverage in the first cooling apparatus (14), and the second cooling apparatus (18) includes a second refrigeration unit for reducing the temperature of coolant in the second cooling apparatus (18).
3. A system according to claim 1 or 2 wherein the heat exchanger (22) is provided close to the dispensing head (12).
4. A system according to claim 1, 2 or 3 wherein the second cooling apparatus (18) is provided close to the dispensing head (12).
5. A system according to any one of claims 1 to 4 wherein the first cooling apparatus (14) is provided remote from the dispensing head (12).
6. A system according to any one of the preceding claims wherein the control device (27) is adapted to respond to the input by increasing the flow of cool-

ant to the heat exchanger (22) where it is desired to increase cooling of the beverage in the heat exchanger (22), and to reduce the flow of coolant to the heat exchanger (22) where it is desired to reduce cooling of the beverage in the heat exchanger (22).

7. A system according to any one of the preceding claims wherein the heat exchanger (22) includes a heating device (37) so that in the event that the temperature of the beverage supplied to the heat exchanger (22) is below the desired delivery temperature range, the beverage may be heated to increase the temperature of the beverage which passes into the beverage supply conduit, to a temperature within the desired delivery temperature range.
8. A system according to claim 7 wherein the heating device (37) includes an electrical resistance heater.
9. A system according to any one of the preceding claims wherein the control device (27) includes a control valve and the control valve is driven from a motor, which valve controls the flow of coolant to the heat exchanger (22) and is capable of diverting at least a proportion of the flowing coolant to a bypass without the coolant passing to the heat exchanger (22), depending on the input.
10. A system according to any one of the preceding claims wherein the heat exchanger (22) is a solid body of a material with a high heat conductivity, there being provided in the body, a cooling passage for the coolant, and a passage for the beverage.
11. A system (10) according to claim 10 where dependent upon claim 7 wherein the heating device (37) is a heating element either embedded in the body of the heat exchanger (22), or surrounding the body of the heat exchanger (22).
12. A system (10) according to any one of the preceding claims wherein the control device (27) includes a manually adjustable control to set an optimum serving temperature for the beverage within the desired delivery temperature range.
13. A beverage dispensing system (10) according to any one of the preceding claims wherein the system (10) includes a plurality of dispensing heads (12), each dispensing head (12) being provided with a heat exchanger (22), the second cooling apparatus (18) including a plurality of coolant delivery conduits (23) for delivering coolant to each of the heat exchangers (22).
14. A beverage dispensing system according to claim

16 wherein the system (10) further includes a plurality of control devices (27), one control device (27) for controlling the flow of coolant to each heat exchanger (22).

15. A method of dispensing a beverage at a temperature in a desired delivery temperature range at a point of delivery, from a dispensing head (12), the method including cooling the beverage using a first cooling apparatus (14) to a temperature below the ambient temperature at the point of delivery and outside the desired delivery temperature range, supplying the cooled beverage to an upstream heat exchanger (22), operating a control device (27) to control the flow of a coolant from a second cooling apparatus (18), which is separate from the first cooling apparatus (14), to the heat exchanger (22) along a coolant delivery conduit (23) which delivers the coolant to the heat exchanger (22) in accordance with an input indicative of the temperature or changes in temperature of the beverage in or downstream of the heat exchanger (22), whereby in the heat exchanger (22), heat is exchanged with the beverage to change the temperature of the beverage supplied thereto to lie in the desired delivery temperature range, and supplying the beverage to the dispensing head (12) from the heat exchanger (22) via a beverage supply conduit (35).
16. A method according to claim 15 wherein the method includes operating a heating device (37) to increase the temperature of the beverage, where supplied to the heat exchanger (22) at a temperature below the desired delivery temperature range.
17. A method according to claim 20 wherein during operation of the heating device, the flow of coolant to the heat exchanger (22) is at least reduced to a minimal flow, and preferably is stopped altogether.
18. A method of upgrading a beverage dispensing system including a dispensing head (12) for dispensing the beverage at a point of delivery, a first cooling apparatus (14) for cooling the beverage to a temperature below the ambient temperature at the point of delivery, and a beverage supply conduit extending between the first cooling apparatus (14) and the dispensing head (12) for supply cooled beverage to the dispensing head (12), wherein the method includes the steps of inserting a heat exchanger (22) in the beverage supply conduit (35), so that beverage from the first cooling apparatus (14) passes through the heat exchanger (22) before entering the dispensing head (12), adding a second cooling apparatus (18), the second cooling apparatus (18) being adapted to supply a coolant to the heat exchanger (22).

19. A method according to claim 18 wherein the method further includes the step of providing a control device (27) for controlling the flow of coolant to the heat exchanger (22) in accordance with an input indicative of the temperature or changes in temperature of the beverage in or downstream of the heat exchanger (22).

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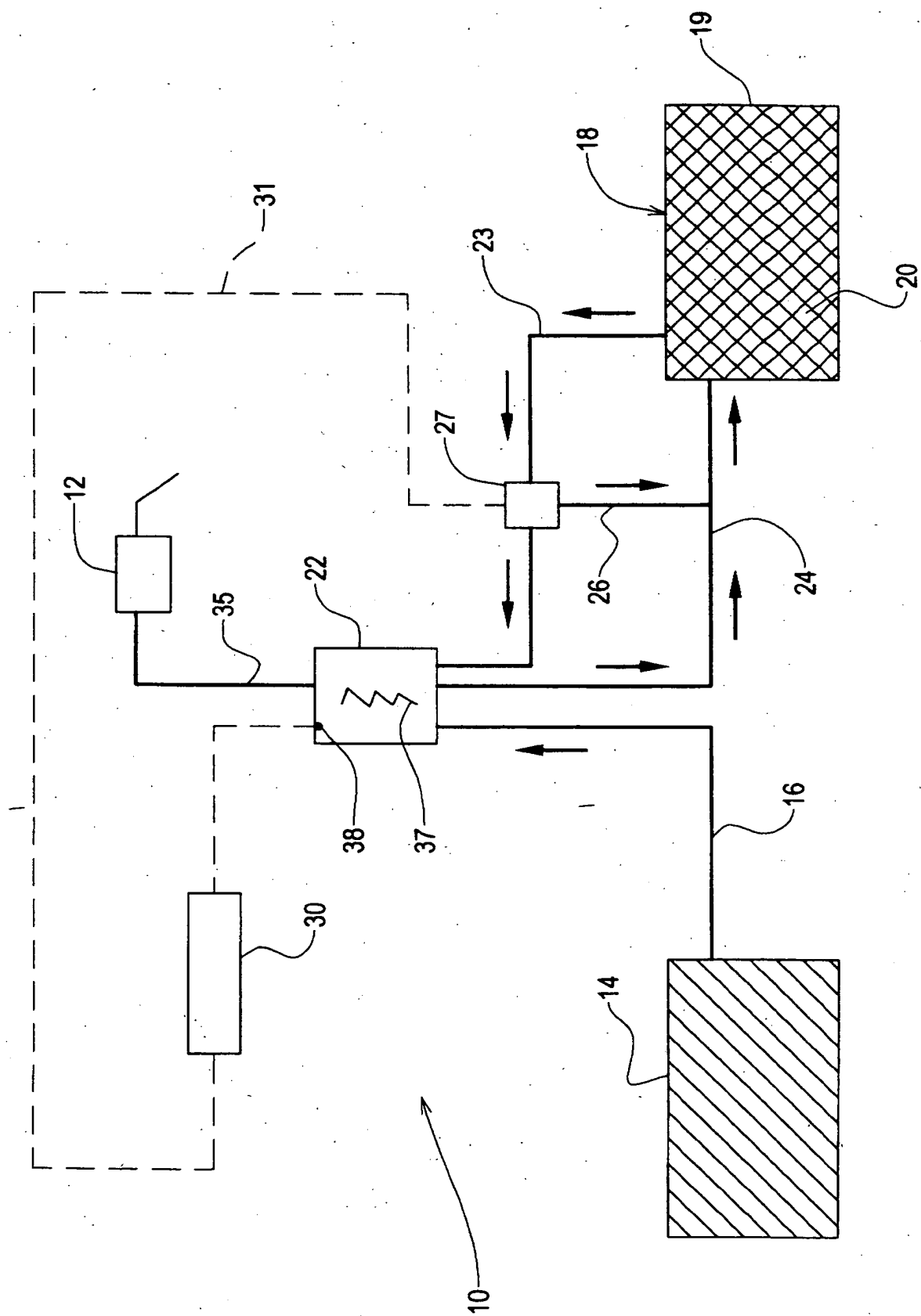
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European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 02 0154

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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