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(54) Carbonated beverage dispenser with recirculation

(57) A beverage dispense system for carbonated beverages has a pump 10 for circulating carbonated beverage in a loop 3 including a carbonator unit 2, a dispense head 1 and a cooling unit 11. A source of uncarbonated beverage is connected to the loop 3 via an on-off valve 17 for replacing carbonated beverage drawn off at the dispense head 1 in response to the level of beverage in the carbonator unit 2. The pump 10 is operable at low speed when circulating beverage in the loop 3 and at high speed when filling the carbonator unit 2.

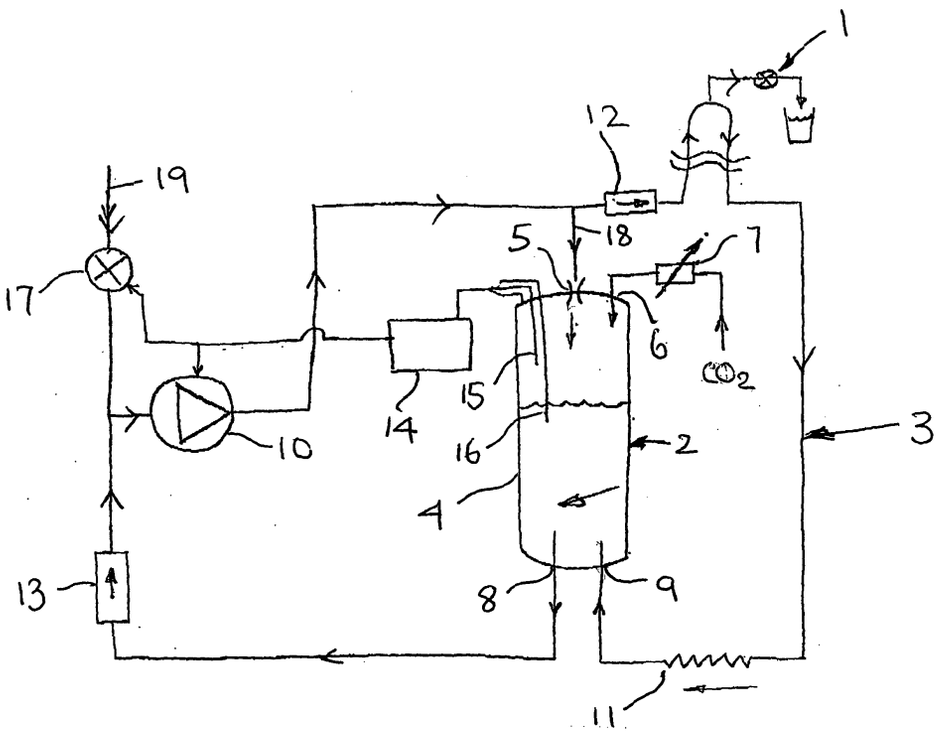


FIGURE 1

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Description

[0001] This invention relates to a beverage dispense system. More especially the invention relates to a beverage dispense system for dispensing carbonated beverages and in particular, but not exclusively, for dispensing carbonated water with or without additional flavouring.

[0002] According to a first aspect of the present invention there is provided a beverage dispense system comprising a dispense head for carbonated beverage, a carbonator unit for carbonating the beverage, a beverage re-circulation loop connecting the carbonator unit to the dispense head, a pump for re-circulating beverage in the re-circulation loop in a first mode of operation, and a control unit for switching between the first mode of operation and a second mode of operation for connecting the carbonator unit to a source of uncarbonated beverage.

[0003] Preferably, the control unit is responsive to the fluid level in the carbonator unit to select the first mode at an upper or maximum fluid level and the second mode at a lower or minimum level. For example, the control unit may be connected to a level sensor for detecting the upper and lower fluid levels in the carbonator unit.

[0004] With this arrangement, beverage is circulated in the re-circulation loop allowing beverage to be dispensed from the dispense head until the level of beverage in the carbonator unit drops to the lower level at which point the source of uncarbonated beverage is connected to the carbonator unit to re-fill the carbonator unit. The source of uncarbonated beverage is disconnected when the level of beverage reaches the upper level and beverage is circulated in the re-circulation loop.. In this way, the fluid level is maintained between the upper and lower levels in the carbonator unit. The arrangement may also permit beverage to be dispensed while the carbonator unit is being re-filled.

[0005] Preferably, the carbonator unit carbonates the uncarbonated beverage added to the carbonator unit in the second mode of operation. For example, the carbonator unit may have an inlet connected to a source of carbonating gas that carbonates the uncarbonated beverage added to the carbonator. In one arrangement, the inlet for the uncarbonated beverage includes a venturi for entraining the carbonating gas to carbonate the beverage as it is added to the carbonator unit.

[0006] Advantageously, the pump is a twin speed pump having high and low speeds of operation and the control unit switches the pump between the low speed in the first mode of operation and the high speed in the second mode of operation. In this way the flow rate and/or pressure of uncarbonated beverage is boosted when filling the carbonator unit in the second mode of operation. The higher flow rate and/or pressure reduces the time to fill the carbonator unit and may assist the carbonation process within the carbonator unit. For example, the pump may provide a flow rate of around 2 litres/minute at a pressure of approximately 2 bar in the first mode of operation and a flow rate of around 5 litres/minute at a pressure of approximately 11 bar in the second mode of operation. The carbonated beverage may be carbonated water and the uncarbonated beverage may be still water, for example mains water.

[0007] Preferably, valve means is provided for controlling the source of uncarbonated beverage in the first and second modes of operation. The valve means may isolate the source of uncarbonated beverage from the re-circulation loop when the pump is running at low speed in the first mode of operation and carbonated beverage is circulating in the re-circulation loop and connect the source of uncarbonated beverage to the re-circulation loop when the pump is running at high speed in the second mode of operation and uncarbonated beverage is flowing to the carbonator unit to replace carbonated beverage dispensed from the dispense head. For example, the re-fill valve means may comprise a solenoid valve in a supply line for the uncarbonated beverage that is opened and closed by the control unit in response to the fluid level in the carbonator unit.

[0008] Advantageously, valve means is provided for controlling flow of beverage in the re-circulation loop in the first and second modes of operation. The valve means may allow carbonated beverage to circulate around the loop in the first mode of operation and restrict flow of uncarbonated beverage around the loop in the second mode of operation. In this way, the re-circulation loop does not contain a large volume of uncarbonated beverage when the carbonated unit has been re-filled.

[0009] In one arrangement, the re-circulation valve means is responsive to the pump speed. For example, when the pump is running at low speed in the first mode of operation, the valve means may be biased to the open position and, when the pump is running at high speed in the second mode of operation, the biasing is overcome by the fluid pressure to move the valve means to the closed position.

[0010] In another arrangement, the re-circulation valve means is responsive to the control unit. For example, the re-circulation valve means may be at least one solenoid valve and the control unit switches the solenoid valve(s) between the open position when the pump is running at low speed in the first mode of operation and the closed position when the pump is running at high speed in the second mode of operation.

[0011] Advantageously, the re-circulation loop includes means for cooling the beverage for dispense of chilled carbonated beverages having a desired dispense temperature and to prevent the beverage warming up between dispenses to any appreciable extent. For example, the cooling means may be a heat exchanger, thermoelectric device, ice bank cooler or any other suitable cooler.

[0012] Preferably, the cooling means is provided in the re-circulation loop upstream of the carbonator unit to cool carbonated beverage flowing to the carbonator

unit in the first mode of operation. The cooling means may also be arranged to cool uncarbonated beverage flowing to the carbonator in the second mode of operation. Alternatively or additionally, separate cooling means may be provided for cooling the uncarbonated beverage flowing to the carbonator unit in the second mode of operation.

[0013] In one arrangement, the carbonator unit has separate inlets for circulating beverage in the re-circulation loop in the first mode of operation and for adding beverage to the carbonator unit in the second mode of operation. For example, the inlets may be connected to the re-circulation loop such that fluid flowing in the re-circulation loop by-passes the re-fill inlet in the first mode of operation and is connected to the re-fill inlet in the second mode of operation. The re-fill inlet may provide a higher resistance to fluid flow so that the fluid flow by-passes the re-fill inlet when the pump is running at low speed in the first mode of operation and diverts to the re-fill inlet in the second mode of operation. In this way, the carbonator unit carbonates uncarbonated beverage added to the carbonator unit in the second mode of operation when the pump is running at high speed and carbonated beverage returned to the carbonator unit in the first mode of operation when the pump is running at low speed is not further carbonated to any appreciable extent.

[0014] In another arrangement, the carbonator unit has a common inlet for circulating beverage in the re-circulation loop in the first mode of operation and for adding beverage to the carbonator unit in the second mode of operation. The inlet may be arranged so that carbonation is responsive to the flow rate and/or pressure of the beverage. In this way, the carbonator unit carbonates uncarbonated beverage added to the carbonator unit in the second mode of operation when the pump is running at high speed and carbonated beverage returned to the carbonator unit in the first mode of operation when the pump is running at low speed is not further carbonated to any appreciable extent.

[0015] According to a second aspect of the invention, there is provided a beverage dispense system comprising a dispense head for dispensing a carbonated beverage in a first mode of operation, a carbonator unit for carbonating the beverage in a second mode of operation, and means for connecting the carbonator unit to the dispense head in the first mode of operation and to a source of uncarbonated beverage in the second mode of operation.

[0016] Preferably, carbonator unit has a first inlet connected to a loop including the dispense head for circulating beverage between the carbonator unit and the dispense head and a second inlet connected to the source of uncarbonated beverage via a part of the loop.

[0017] Advantageously, the dispense head is connected to the carbonator unit in both modes of operation allowing beverage to be dispensed both when circulating beverage in the re-circulation loop and when re-filling the carbonator unit.

[0018] According to a third aspect of the invention, there is provided a method of dispensing a carbonated beverage comprising circulating carbonated beverage in a re-circulation loop in a first mode of operation in which carbonated beverage can be dispensed via a dispense head connected to the loop, and carbonating uncarbonated beverage in a carbonator connected to the loop in a second mode of operation.

[0019] Preferably the first and second modes of operation are activated in response to the level of beverage in the carbonator. For example, the second mode may be activated when the level falls to a lower or minimum level at which uncarbonated beverage is added to the carbonator and the first mode is activated when the level reaches an upper or maximum level. In a preferred arrangement, carbonated beverage may be dispensed in both modes of operation.

[0020] According to a fourth aspect of the invention, there is provided a beverage dispense system comprising a pump operable to circulate carbonated beverage around a loop including a cooling unit, a carbonator unit, and a dispense head, the carbonator unit having a first inlet for carbonated beverage circulating in the loop and a second inlet for replacing carbonated beverage dispensed from the dispense head.

[0021] Advantageously, a source of uncarbonated beverage is connected to the second inlet, and the uncarbonated beverage is carbonated in the carbonator unit for circulating in the loop to the dispense head.

[0022] Preferably, the source of uncarbonated beverage is connected to the second inlet via the loop and the pump is arranged upstream of the carbonator unit.

[0023] Advantageously, the pump is a two-speed pump which is operable at a first speed when circulating carbonated beverage in the loop and a second speed, higher than the first speed, when the source of uncarbonated beverage is connected to the loop. Alternatively, the pump may be a single speed pump.

[0024] Preferably, the loop includes a cooler for cooling carbonated beverage flowing around the loop. The pump may be provided between the first inlet and the cooler. Alternatively, the pump may be provided between the second inlet and the cooler such that uncarbonated beverage flowing to the carbonator unit is also cooled by the cooler.

[0025] Preferably, the carbonator unit is connected to a source of carbonating gas for carbonating the uncarbonated beverage and the second inlet is preferably adapted for carbonating the uncarbonated beverage flowing into the carbonator unit. For example, carbonating gas in the carbonator unit may be entrained in the flow of uncarbonated beverage admitted to the carbonator unit for carbonating the incoming uncarbonated beverage.

[0026] Preferably, the re-circulation loop includes a plurality of dispense heads and the carbonator unit may be connected to a plurality of re-circulation loops each

provided with one or more dispense heads.

[0027] The invention will now be described in more detail by way of example only with reference to the accompanying drawings wherein:

Figure 1 is a schematic illustration of a beverage dispense system according to a first embodiment of the invention;

Figure 2 is a part sectional view of a valve employed in the system of Figure 1;

Figure 3 is a schematic illustration of a beverage dispense system according to a second embodiment of the invention; and

Figure 4 is a schematic illustration of a beverage dispense system according to a third embodiment of the invention.

[0028] Referring first to Figure 1 of the drawings, a beverage dispense system according to a first embodiment of the invention is depicted comprising a dispense head 1 connected to a carbonator unit 2 by a flow line in the form of a re-circulation loop 3.

[0029] The carbonator unit 2 comprises a tank 4 having a water inlet 5 and a gas inlet 6 at the upper end. In this embodiment the gas is carbon dioxide supplied to the inlet 6 under pressure, say about 5 bar, via a regulator 7. It will be understood however that other gases may be employed, for example nitrogen, and the term 'carbonation' is to be construed accordingly.

[0030] The tank 4 also has an outlet 8 at the lower end connected to the delivery side of the recirculation loop 3 and an inlet 9 at the lower end connected to the return side of the recirculation loop 3.

[0031] The recirculation loop 3 includes a pump 10, a cooler 11 and two valves 12,13. The cooler 11 may be of any suitable type, for example a heat exchanger, a thermoelectric device or ice bank cooler, for maintaining the temperature of beverage re-circulated in the loop 3 at the desired dispense temperature.

[0032] The level of water in the carbonator tank 4 is maintained between upper and lower levels by an electronic control unit 14, for example a programmable microprocessor, responsive to probes 15,16 arranged to detect the upper and lower water levels in the tank 4.

[0033] The control unit 14 controls the speed of the pump 10 and an on/off solenoid valve 17 for adding still water to the carbonator tank 4 in response to the detected water levels in the carbonator tank 4. The incoming water may optionally be pre-cooled, before or after the solenoid valve 17.

[0034] The water inlet 5 is connected to the delivery side of the recirculation loop 3 via a flow line 18 between the outlet of pump 10 and the valve 12. A flow line 19 from a source (not shown) of still water is connected to the recirculation loop 3 via the solenoid valve 17 between the pump inlet and the valve 13. The water source may be mains water at say 3 bar.

[0035] Each valve 12,13 is similar and, as best shown in Figure 2, comprises a valve member 20 biased away from a valve seat 21 by a spring 22. The valve member 20 is slidable in a bore 23 between valve inlet 24 and valve outlet 25. The valve member 20 is provided with guide flutes 26 that define flow channels 27 with the wall of the bore 23. As shown, the flow channels 27 taper such that the cross-sectional area of the flow channels 27 reduces in the direction of flow.

[0036] The pump 10 can be switched between high and low speeds of operation. At the low speed of operation, the biasing of the spring 22 exceeds the pressure of the water acting on the valve member 20 and the valve member 20 adopts an equilibrium position at which the valves 12,13 are open. At the high speed of operation, the pressure of the water acting on the valve member 20 exceeds the biasing of the spring 22 and moves the valve member 20 to engage the valve seat 21 closing the valves 12,13.

[0037] Operation of the beverage dispense system will now be described starting from the condition shown in Figure 1 in which the carbonator tank 4 contains water that has been carbonated on being admitted to the tank 4 via inlet 5 and the level of carbonated water in the carbonator tank 4 is between the upper and lower levels set by the probes 15,16.

[0038] In this condition, the control unit 14 closes the solenoid valve 17 and switches the pump 10 to run at low speed. As a result, valves 12,13 are open and carbonated water from the tank 4 is circulated around the loop 3 and can be drawn off and dispensed via dispense head 1 as desired.

[0039] The dispense head 1 may dispense carbonated water with or without additional flavouring, for example the dispense head may include connections to one or more syrup lines (not shown) for dispensing a mixture of carbonated water and syrup according to user selection.

[0040] The water level in the tank 4 falls as carbonated water is dispensed from the dispense head 1. When the dispense head 1 is closed, the carbonated water is continuously circulated around the loop 3 and returned to the tank 4 via the cooler 11.

[0041] In this way, the carbonated water is maintained at the desired dispense temperature and the carbonation level is maintained by returning the circulating flow to the tank 4 for mixing with carbonated water in the tank 4 under the pressure of carbon dioxide above the water within the tank 4. Carbon dioxide admitted to the carbonator unit 2 via inlet 6 is maintained at a sufficient pressure within the carbonator unit 2 to prevent carbon dioxide coming out of solution to any appreciable extent so as to maintain the carbonation level of the carbonated water in the carbonator unit 2.

[0042] In this mode of operation, the inlet 5 provides a greater resistance to flow than the valves 12,13 and

the water circulates around the loop 3 in preference to flowing into the tank 4 through the inlet 5..

[0043] When the water level in the tank 4 falls to the level of the lower probe 16, a signal is transmitted to the control unit 14. The control unit 14 responds to switch pump 10 to run at high speed and open solenoid valve 17.

[0044] The increased flow causes valves 12,13 to close and still water is admitted to the tank 4 via inlet 5 and carbonated by mixing with carbon dioxide within the tank 4. For example, the inlet 5 may provide a restricted orifice or nozzle through which the incoming water is admitted under high pressure to form a mist or spray that promotes carbonation with carbon dioxide admitted via inlet 6. Other devices such as a venturi can be employed in the inlet 5 for carbonating the incoming still water.

[0045] When the water level in the tank 4 reaches the upper level set by probe 15, a signal is sent to the control unit 14. The control unit 14 responds to switch pump 10 to run at low speed and close solenoid valve 17. Valves 12,13 re-open and carbonated water from tank 4 is again circulated around the loop 3 and can be dispensed from dispense head 1 on demand. The pump may be stopped for a short period of time when changing from high to low speeds to allow fluid pressures to equalise on either side of the valve members 20 to assist re-opening of the valves 12,13.

[0046] Although the valves 12,13 operate automatically in response to change in pressure caused by change in pump speed, it will be understood that one or both valves 12,13 could be replaced by valves operable by the control unit 14 in similar manner to the valve 17 according to the mode of operation determined by the water level in the tank 4.

[0047] While the tank 4 is re-filling, the dispense head 1 remains connected to the tank 4 via the part of the loop 3 between the dispense head 1 and inlet 9 and the pressure of carbon dioxide in the tank 4 is such that the flow in this part of the loop 3 can be reversed on opening the dispense head 1 to allow carbonated beverage to be dispensed. In this way, operation of the system to dispense carbonated beverage is not interrupted when re-filling the tank 4.

[0048] Referring now to Figure 3, a beverage dispense system according to a second embodiment of the invention is shown. For convenience, like reference numerals in the series 100 are used to indicate parts corresponding to the first embodiment.

[0049] In this embodiment, beverage re-circulation loop 103 includes a dispense head 101, a carbonator unit 102, a twin-speed pump 110, a cooler 111 and an on/off solenoid valve 150.

[0050] A flow line 119 from a source (not shown) of still water, for example mains water, is connected to the re-circulation loop 103 via an on/off solenoid valve 117 between the valve 150 and the inlet side of the pump 110. The valves 117, 150 are conveniently housed in a manifold 151 with appropriate connections to the recirculation loop 103 and flow line 119. In a modification (not shown), a single three-way valve may be employed in place of the separate valves 117,150 to provide the same flow control in the first and second modes of operation.

[0051] The pump 110 can be switched between high and low speeds of operation in response to the water level in the carbonator unit 102. When the water level falls to the minimum level detected by sensor 116, control unit 114 closes solenoid valve 150, opens solenoid valve 117 to connect the source of still water to the re-circulation loop 103 and switches pump 110 to run at high speed.

[0052] In this mode of operation, still water flows via the pump 110 and cooler 111 to the carbonator unit 102 and is introduced via inlet 105 to re-fill the carbonator unit 102. In this embodiment, the inlet 105 is in the form of a "J" tube 152 provided with a venturi (not shown). When the pump 110 is running at high speed, the flow rate and pressure of the water introduced to the carbonator unit 102 is boosted and is carbonated by entraining carbon dioxide contained in the carbonator unit 102.

[0053] When the water level reaches the maximum level detected by sensor 115, control unit 114 closes solenoid valve 117 to isolate the source of the still water from the recirculation loop, opens solenoid valve 150 and switches pump 110 to run at low speed.

[0054] In this mode of operation, carbonated water is circulated in the re-circulation loop 103 and can be drawn off at the dispense head 101 with or without additional flavouring such as syrup as desired. When the pump 110 is running at low speed, the flow rate and pressure of the water returning to the carbonator unit 102 via inlet 105 is reduced and carbon dioxide in the carbonator unit 102 is not entrained to any significant amount.

[0055] Carbonated water can be drawn off at the dispense head 101 until the water level in the carbonator unit 102 drops to the minimum level at which the control unit 114 closes valve 150, opens valve 117 and switches the pump 110 to run at high speed again to re-fill the carbonator unit 102 as described above. As previously described, the pressure of carbon dioxide in tank 104 may be such that carbonated beverage can flow from the tank 104 to the dispense head 101 so that dispense of carbonated beverage is not interrupted during re-filling of the carbonator unit 102.

[0056] In this embodiment, the carbonator unit 102 has a common inlet 105 both for re-circulating water in the re-circulation loop 103 and for re-filling the carbonator unit 102.

[0057] As shown, the carbonator unit 102, pump 110 and control unit 114 are provided in a common housing 153 with appropriate connections for the re-circulation loop 103 and supply of carbonating gas. The manifold 151 may be incorporated in the housing 153 if desired.

[0058] Referring now to Figure 4, a beverage dispense system according to a third embodiment of the

invention is shown. For convenience, like reference numerals in the series 200 are used to indicate parts corresponding to the first and second embodiments.

[0059] In this embodiment, beverage re-circulation loop 203 includes a dispense head 201, a carbonator unit 202, a twin-speed pump 210, a cooler 211, and on-off solenoid valves 260, 261.

[0060] The water inlet 205 is connected to the return side of the re-circulation loop 203 via a flow line 218 between the outlet of pump 210 and the on/off solenoid valve 261.

[0061] As in the previous embodiments, the pump 210 is switched between high and low speeds according to the level of water in the carbonator unit 202 and is operable at low speed to circulate water in the re-circulation loop 203 and at high speed to re-fill the carbonator unit 202.

[0062] The on/off valves 260,261 are open and the on/off valve 217 is closed when water is circulated in the circulation loop 203 for dispense from the dispense head 201 with or without additional flavouring such as a syrup.

[0063] Return flow of water from the dispense head 201 to the carbonator unit 202 by-passes the inlet 205 which provides a greater resistance to flow than the inlet 209 at the bottom of the carbonator unit 202.

[0064] When the carbonator unit 202 is re-filled, valves 260,261 are closed and valve 217 is open to connect the source of still water to the re-circulation loop 203. A single three-way valve may be employed in place of the separate solenoid valves 217,260 as described in the previous embodiment.

[0065] The pump 210 is switched to operate at high speed boosting the flow and pressure of the water delivered to the carbonator unit 202 via the inlet 205 where it is carbonated as described previously. The pressure of carbon dioxide in tank 204 may be such that carbonated beverage can flow from the tank 204 to the dispense head 201 so that dispense of carbonated beverage is not interrupted during re-filling of the carbonator unit 202.

[0066] As will now be appreciated, the invention provides a beverage dispense system having a pump operable at low speeds in a dispense mode of operation for circulating carbonated beverage in a loop provided with at least one dispense head and at high speed in a carbonation mode of operation for adding water to the carbonator unit to replace water that has been dispensed. Dispense of carbonated beverage may also be permitted in the carbonation mode of operation.

[0067] In this way, one pump can be employed for both the beverage dispense and carbonation modes of operation of the system. The pump may be of any type capable of withstanding the pressure, temperature and acidity levels of the water and typically employs a food grade material for parts that contact the water.

[0068] Although the invention has been described for carbonating still water that is then dispensed with or without additional flavouring from the dispense head, it will be understood that the invention can be applied to other liquids.

[0069] Moreover, it will be appreciated that the re-circulation loop may be connected to a plurality of dispense heads provided at different points of dispense in, for example, a bar or the like. The dispense head(s) may be connected to the loop via an additional short flow line or the loop may pass through the dispense head(s). Alternatively, or additionally, the carbonator unit may be connected to a plurality of re-circulation loops each provided with one or more dispense heads.

[0070] Other modifications and improvements will be apparent to those skilled in the art and the invention is deemed to include any of the features described herein separately or in combination with any other feature.

Claims

1. A beverage dispense system comprising a dispense head for carbonated beverage, a carbonator unit for carbonating the beverage, a beverage re-circulation loop connecting the carbonator unit to the dispense head, a pump for re-circulating beverage in the re-circulation loop in a first mode of operation, and a control unit for switching between the first mode of operation and a second mode of operation for connecting the carbonator unit to a source of uncarbonated beverage.

2. A beverage dispense system according to claim 1 wherein, the control unit is responsive to the fluid level in the carbonator unit to select the first mode at an upper or maximum fluid level and the second mode at a lower or minimum level, for example the control unit is connected to a level sensor for detecting the upper and lower fluid levels in the carbonator unit.

3. A beverage dispense system according to any one of the preceding claims wherein, the carbonator unit carbonates the uncarbonated beverage added to the carbonator unit in the second mode of operation, for example the carbonator unit has an inlet connected to a source of carbonating gas that carbonates the uncarbonated beverage added to the carbonator, for example the inlet for the uncarbonated beverage includes a venturi for entraining the carbonating gas to carbonate the beverage as it is added to the carbonator unit.

4. A beverage dispense system according to any one of the preceding claims wherein the pump is a twin speed pump having high and low speeds of operation and the control unit switches the pump between the low speed in the first mode of operation and the high speed in the second mode of operation.

5. A beverage dispense system according to claim 4 wherein, the re-circulation loop includes valve means for controlling beverage flow around the loop, and the valve means is preferably open when the pump is running at low speed in the first mode of operation for circulating beverage in the re-circulation loop and closed when the pump is running at high speed in the second mode of operation for adding beverage to the carbonator unit.

6. A beverage dispense system according to claim 5 wherein, the valve means is an electrically operable valve and the control unit switches the valve means between the open position when the pump is running at low speed in the first mode of operation and the closed position when the pump is running at high speed in the second mode of operation.

7. A beverage dispense system according to any one of the preceding claims wherein, the re-circulation loop includes means for cooling the beverage, for example the cooling means may be arranged to cool carbonated beverage flowing to or from the carbonator unit in the first mode of operation and/or for cooling uncarbonated beverage flowing to the carbonator unit in the second mode of operation.

8. A beverage dispense system according to any one of the preceding claims wherein, the carbonator unit has separate inlets for circulating beverage in the re-circulation loop in the first mode of operation and for adding beverage to the carbonator unit in the second mode of operation.

9. A beverage dispense system according to claim 8 wherein the re-fill inlet for adding beverage to the carbonator unit is connected to the re-circulation loop such that the re-circulation loop connects the source of uncarbonated beverage to the re-fill inlet in the second mode of operation and by-passes the re-fill inlet in the first mode of operation.

10. A beverage dispense system according to any one of claims 1 to 7 wherein, the carbonator unit has a common inlet for circulating beverage in the re-circulation loop in the first mode of operation and for adding beverage to the carbonator unit in the second mode of operation, and the inlet is preferably arranged so that carbonation is responsive to the flow rate and/or pressure of the beverage, for example the flow rate and/or pressure of the beverage may be increased in the second mode of operation such that carbonating gas within the carbonator unit is entrained by the beverage flowing into the carbonator unit to carbonate the beverage.

11. A beverage dispense system according to any one of the preceding claims wherein carbonated beverage can be dispensed from the dispense head in both modes of operation

12. A method of dispensing a carbonated beverage comprising providing a re-circulation loop including a carbonator, a cooler, a dispense head and a pump, circulating carbonated beverage in the re-circulation loop in a first mode of operation in which carbonated beverage can be dispensed via the dispense head, and connecting a source of uncarbonated beverage to the re-circulation loop in a second mode of operation in which carbonated water drawn off from the dispense head is replaced by uncarbonated water delivered to the carbonator where it is carbonated.

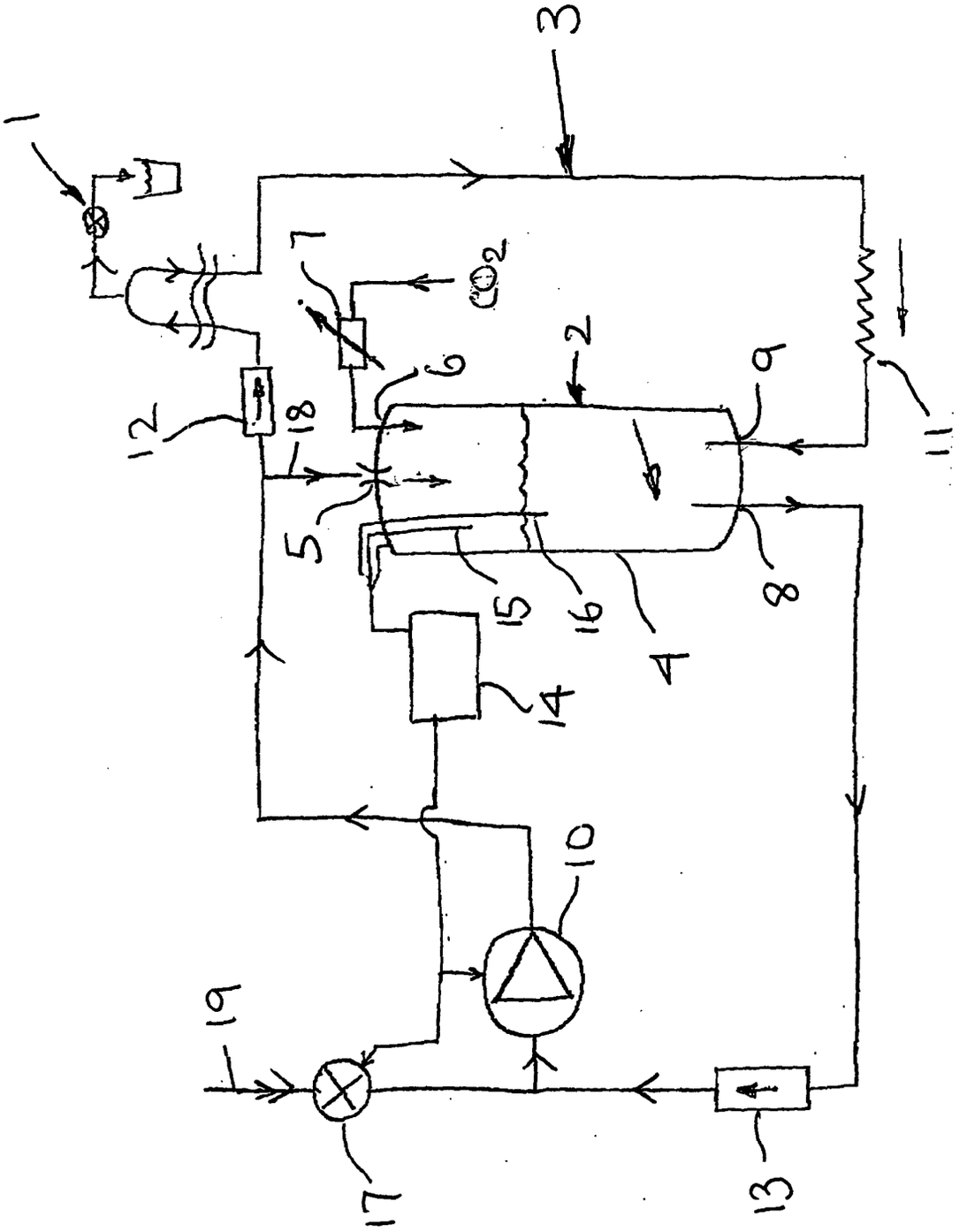


FIGURE 1

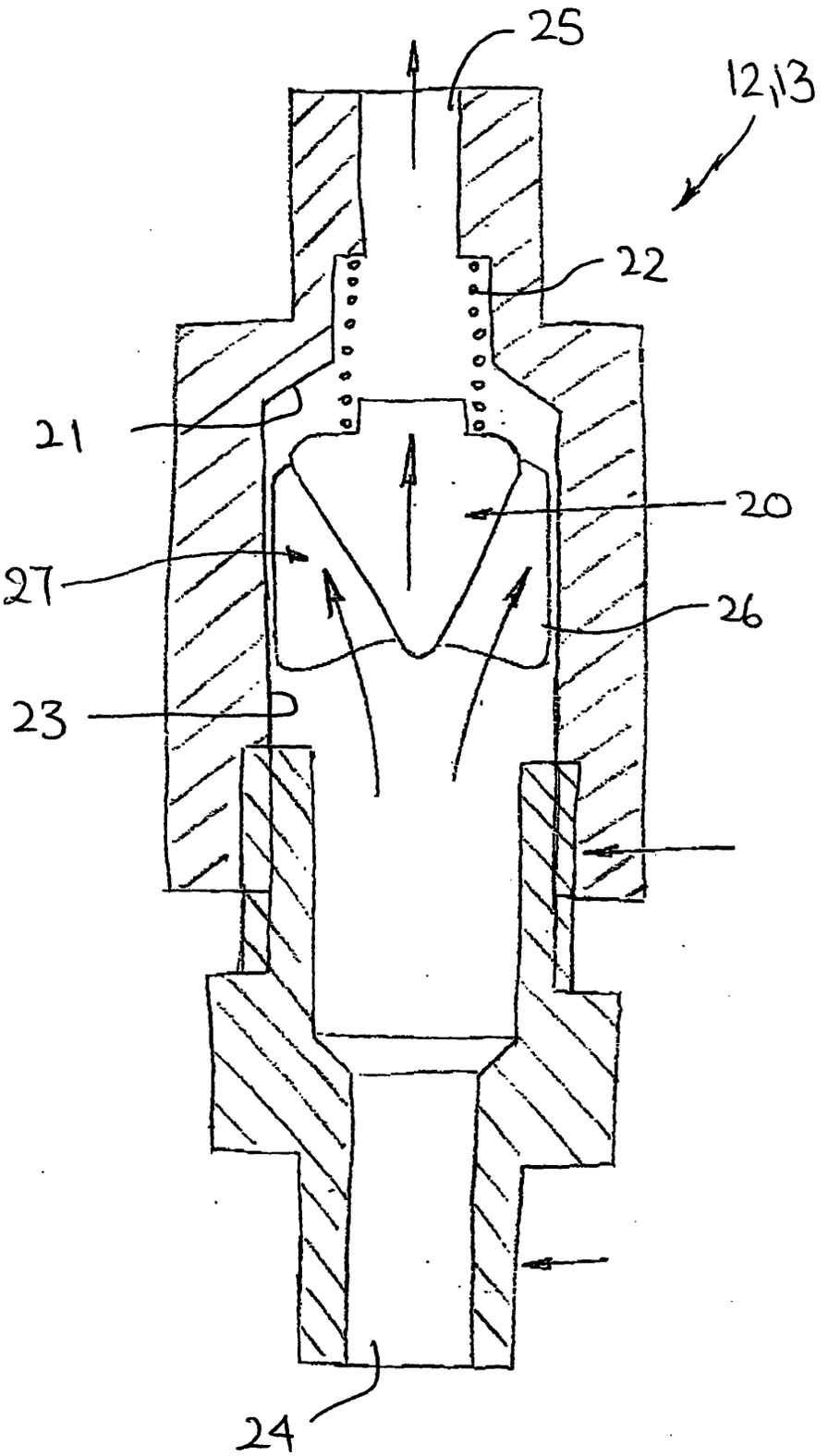


FIGURE 2

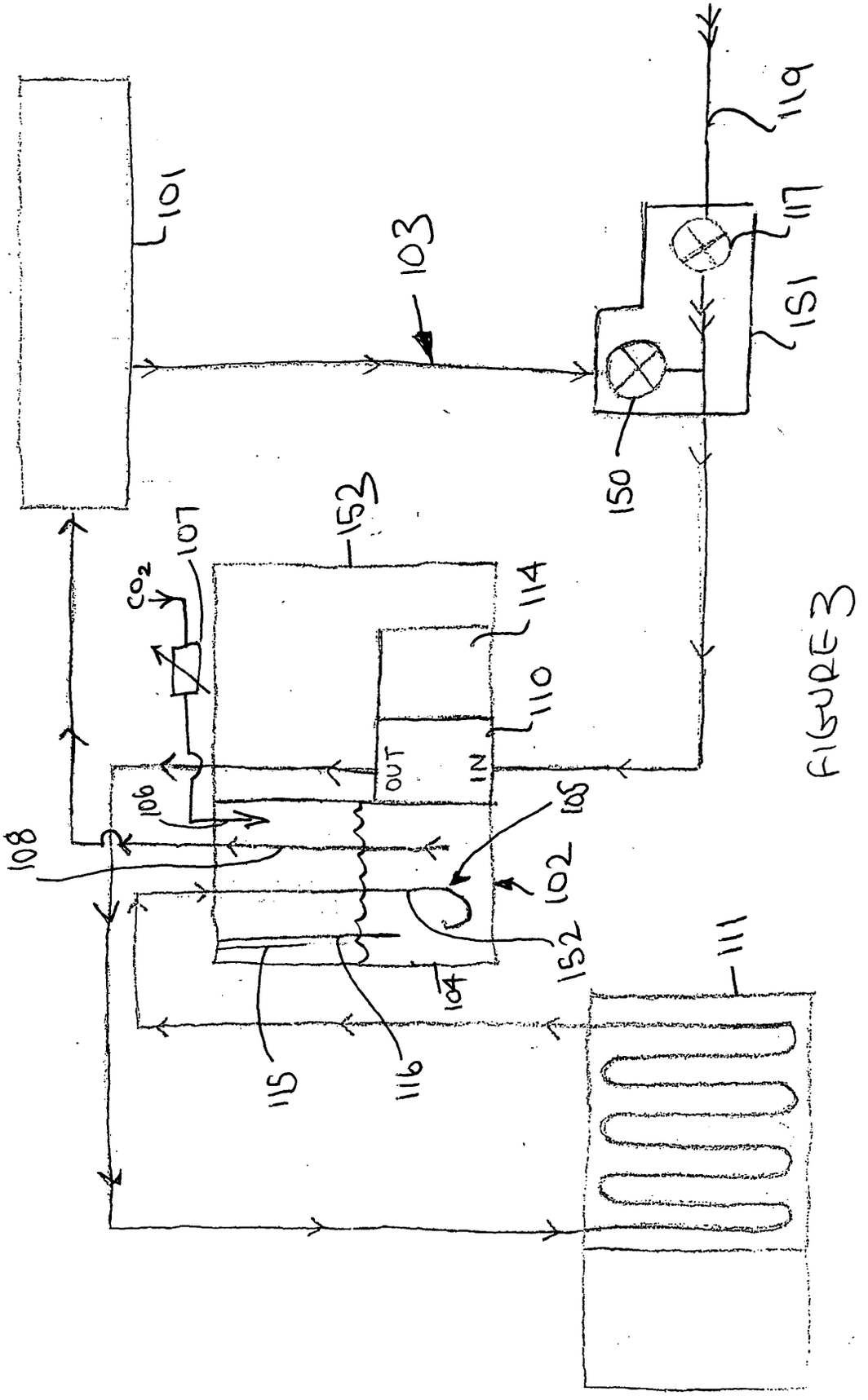

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FIGURE 3

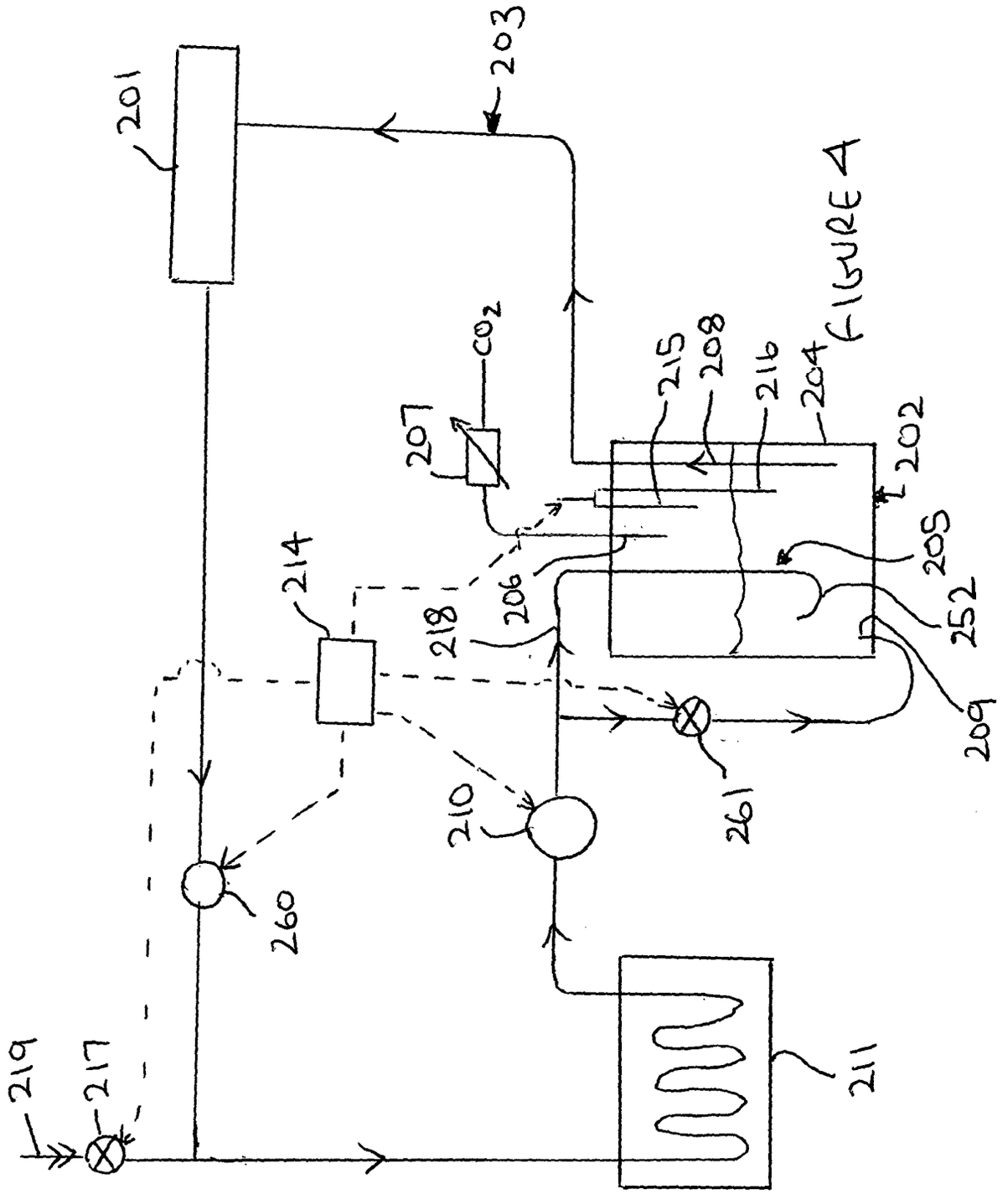

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FIGURE 4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 25 3996

DOCUMENTS CONSIDERED TO BE RELEVANT

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P,X	EP 1 364 909 A (WHITLENGE DRINK EQUIPMENT LTD) 26 November 2003 (2003-11-26) * paragraphs [0029] - [0037], [0041], [0042]; figures 1,2 *	1,3,7,8, 10	
X	US 4 793 515 A (GREEN THOMAS S ET AL) 27 December 1988 (1988-12-27) * column 3, line 3 - column 5, line 8; figures 1,2 *	1-3,7, 10-12	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	11 October 2004	Desittere, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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