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(54) **BEVERAGE DISPENSER, CONTROLLER AND CONTROL SYSTEM**

(57) Aspects of the present invention relate to a control system (30) for controlling a beverage dispenser (10) having a first sensory mode and a second sensory mode. The control system has a sensor (28) configured to detect if a handle (22) of the dispenser (10) has been moved from a closed position to an open position and to control a sensor output mode in dependence thereon. The beverage dispenser controller (30) is configured to identify the sensor output mode and outputs a signal to cause the beverage dispenser (10) to change from operating in the first sensory mode to operating in the second sensory mode based on the identified mode. A two-wire interface (32) connects the sensor and the beverage dispenser controller. The sensor (28) is a tilt sensor having a +volt terminal and a 0 volt terminal. The sensor (28) has a first sensor output mode in which there is a positive continuous voltage at the +volt terminal and a second sensor output mode in which there is a pulsed positive voltage at the +volt terminal.

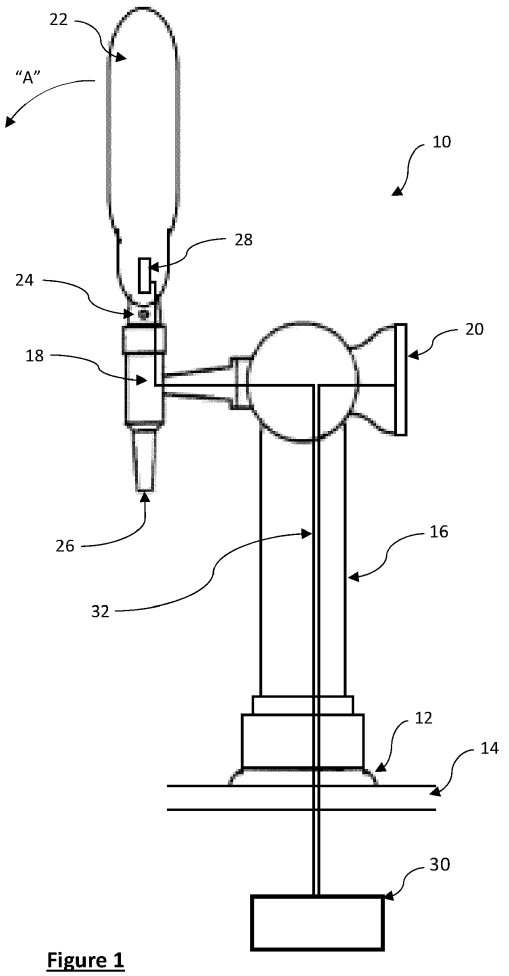

Figure 1

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to a beverage dispenser and systems therefor. Aspects of the invention relate to a beverage dispenser controller, a beverage sensor, and a control system.

BACKGROUND

[0002] It is known to provide beverage dispensers that have a customer facing element, such as a visual display, that changes when a beverage is being poured.

[0003] Pouring of a beverage is normally determined by measuring a beverage flow in a beverage line by a sensor that extends into the fluid flow. This is not feasible in all circumstances, for example where it is required to pass cleaning fluid containing particles or small pieces of foam, referred to as a pellet cleaner, through the line. These pellets can become stuck on such flow sensors and block the line.

[0004] It is an aim of the present invention to address one or more of the disadvantages associated with the prior art.

SUMMARY OF THE INVENTION

[0005] Aspects and embodiments of the invention provide a beverage dispenser controller, a control system for a beverage dispenser and a beverage dispenser, as claimed in the appended claims.

[0006] According to one aspect of the invention there is provided a beverage dispenser controller for a beverage dispenser having a first sensory mode and a second sensory mode, said first and second sensory modes being different, the beverage dispenser controller comprising one or more electronic controllers configured to: identify the voltage at a +volt output terminal thereof; output a signal to a beverage dispenser to cause it to operate in the first sensory mode if the voltage at the +volt output terminal is identified as a first voltage; output a signal to a beverage dispenser to cause it to operate in the second sensory mode if the voltage at the +volt output terminal is identified as a second voltage, said second voltage being lower than said first voltage; and wherein the beverage dispenser controller identifies a constant low voltage as the second voltage and identifies a pulsed voltage at the +volt output terminal as the second voltage.

[0007] It is an advantage of the beverage dispenser controller of the invention that it can be utilised with two different types of sensors, a standard inline flow sensor as described above, and the sensor as used in the control system described hereinbelow. This gives the advantage that the controller is backwardly compatible with systems having the known type of flow sensor as well, i.e. it will perform in the same manner irrespective of which type of sensor it is connected to.

[0008] According to another aspect of the invention there is provided a control system for controlling a beverage dispenser having a first sensory mode and a second sensory mode. The control system comprises a sensor configured to detect if a handle of the dispenser has been moved from a closed position to an open position, and to control a sensor output mode in dependence thereon, and a beverage dispenser controller configured to identify the sensor output mode and operative to output a control signal to cause the beverage dispenser to change from operating in the first sensory mode to operating in the second sensory mode in dependence on the identified sensor output mode. A two-wire interface is provided between the sensor and the beverage dispenser controller. The sensor comprises a tilt sensor having a +volt terminal and a 0 volt terminal. The sensor has a first sensor output mode in which there is a positive continuous voltage at the +volt terminal and a second sensor output mode in which there is a pulsed positive voltage at the +volt terminal. The beverage dispenser controller may be as described above.

[0009] Preferably the beverage dispenser controller performs a debounce operation on the +volt terminal and identifies a pulsed positive signal as a 0V or low volt signal. It will be understood that the term pulsed positive signal refers to a positive signal whose value changes, either to 0V or to a different positive volt than its steady state voltage.

[0010] Preferably the beverage dispenser controller comprises a +volt resistive terminal and a 0V terminal, and the 2-wire interface is connected thereto.

[0011] A system of the invention therefore provides a control system that avoids the use of flow intrusive flow sensing methods to change between sensory modes, yet which is backwards compatible so as to also be able to operate to receive a signal from a system already having a flow sensor of the known type. It will be appreciated that, as used herein the term "flow sensor" is used to also mean "flow switch", i.e., a device that changes its output signal in response to a flow, or lack thereof, of a fluid past it.

[0012] In one arrangement the sensor comprises: a sensor electronic circuit having a sensor input terminal for connection to the +volt terminal, a sensor output terminal for connection to the 0 volt terminal, an accelerometer, a sensor microcontroller, and a capacitor, said capacitor being charged by the +volt terminal. An inlet switch may be provided between the sensor input terminal and a positive side of the capacitor, and an outlet switch may be provided between the sensor input terminal and the sensor output terminal. Preferably, in this arrangement, when the sensor is tilted past a threshold angle the sensor microcontroller causes the switches to periodically cycle between a first configuration in which the inlet switch is in a closed position and the outlet switch is in an open position, and a second configuration in which the inlet switch is in an open position and the outlet switch is in a closed position such that the voltage at the

sensor output terminal periodically drops to zero, or substantially zero.

[0013] Preferably when the sensor angle is less than the threshold angle the switches are in the first configuration. In this manner the capacitor is charged when the sensor is not tilted past the threshold angle (i.e. when the switches are in the first configuration), and when the switches are inverted as a result of the threshold angle being reached, or passed, (i.e. the switches are in the second configuration), discharge current from the capacitor powers the sensor microcontroller while the sensor microcontroller is disconnected from the sensor inlet terminal.

[0014] The duration of the second configuration is preferably less than 10ms. This enables the discharge current from the capacitor to power the sensor microcontroller for the duration of the second configuration.

[0015] Preferably, when the sensor is tilted past the threshold angle, within each periodic cycle the duration of the first configuration exceeds the duration of the second configuration. This ensures that the charge time of the capacitor exceeds the discharge time. The duration of the first configuration may be in excess of 50ms, or in excess of 70ms. Optionally the first period of the cycle may be 80ms and the duration of the second configuration may be 8ms.

[0016] Optionally, when the sensor is tilted past the threshold angle the frequency of the periodic cycle or the duration of the first and/or second configuration within each cycle is varied in dependence on the tilt angle. Optionally, when the sensor is tilted past a further threshold angle, the frequency of the of the periodic cycle, or the duration of the first or second configuration within each cycle is changed. The further threshold angle may be an angle which is greater than the threshold angle, or may be an angle in an angle in an opposite direction from the threshold angle (relative to the closed position). In this manner different positions of the handle may be determined, for example a closed position, a slow pour position and a fast pour position may be determined, of a closed position a normal dispense position and a creamer dispense position may be determined.

[0017] In one embodiment of the invention the control system may further comprise a calibration means for the sensor, the calibration means configured to detect an external influence thereon and to set the current position of the sensor to a zero-tilt refence position in dependence thereon. This has the benefit that exact alignment of the sensor on the handle is not required, and that the same system may be utilised in beverage dispensers where the closed, i.e. not dispensing, position of the handle is orientated at different angles.

[0018] The external influence may be a magnetic field and the sensor electronic circuit may further comprise one of a reed swich, a hall effect sensor or a MEMS magnetic field sensor for detecting the magnetic field. Preferably the calibration means sets the current position of the sensor to a zero-tilt refence position when the external influence has been detected, optionally for a time period exceeding a threshold value. It will be appreciated that the calibration means may be a software function within the sensor microcontroller.

[0019] According to a further aspect of the invention there is provided a beverage dispenser having: a handle to start or stop a flow of beverage; a sensory interface operable in a first sensory mode and a second sensory mode; and a beverage dispenser controller, or a control system, as described above.

[0020] The sensory interface may comprise a display. The first sensory mode may be a first visual display output and the second mode may be a second, different, visual display output. Alternatively, or in addition, the sensory interface may be a speaker. An audible output of the speaker may be different in the first sensory mode and the second sensory mode. In this manner a visual output of the dispenser or a sound generated by the dispenser may be varied when a beverage is being dispensed.

[0021] Within the scope of this application, it is expressly intended that the various aspects, embodiments, examples and alternatives set out in the preceding paragraphs, in the claims and/or in the following description and drawings, and in particular the individual features thereof, may be taken independently or in any combination. That is, all embodiments and/or features of any embodiment can be combined in any way and/or combination, unless such features are incompatible. The applicant reserves the right to change any originally filed claim or file any new claim accordingly, including the right to amend any originally filed claim to depend from and/or incorporate any feature of any other claim although not originally claimed in that manner.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] One or more embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 shows a representation of a beverage dispenser of the invention;

Figure 2 shows a schematic diagram of a control system of the invention;

Figure 3 shows a schematic diagram of a first embodiment of a sensor used in the invention; and

Figure 4 shows a schematic diagram of a second embodiment of the sensor used in the invention.

DETAILED DESCRIPTION

[0023] A beverage dispenser 10 in accordance with an embodiment of the present invention is described herein with reference to the accompanying Figure 1. The beverage dispenser depicted is typical of a countertop draft

beverage font, often found in a bar, and which is used for dispensing draft beer or cider. It will be appreciated that the present invention is not limited to this type of beverage dispenser and is equally applicable to dispensers of differing designs and for use with other beverages.

[0024] The dispenser 10 has a base 12 by which it is attached to a countertop 14, either by clamping or other means of connection, for example screwing or bolting. A column 16 extends generally upwards form the base and supports a tap 18 through which, in use, the beverage is dispensed. In a font of the design depicted the tap 18 would normally be located to extend towards the service side of the counter 14. On the other side of the column 16, and usually facing towards the customer side of the counter 14, is a sensory interface 20.

[0025] The sensory interface 20 is intended to provide sensory information to a customer and in the example shown comprises a display. The display may be an electronic display, i.e. a screen, on which visual imagery is shown. Alternatively, it may be a representation of a beverage, for example a liquid with bubbles passing therethrough. Other types of visual displays will be apparent. In addition, or alternatively, other types of sensory interface 20 may be used. In one example the font may include an audible output, such as a speaker for transmitting sound. In another example the sensory interface may comprise a lighting arrangement in or on the font that changes, e.g. in brightness, colour and/or sequence, in dependence on the sensory mode. Although depicted at the top of the column 16 and facing away from the tap 18, it will be appreciated that the sensory interface 20 may be positioned elsewhere on the dispenser 10 and in any orientation.

[0026] The dispenser 10 has a tap handle 22 which is rotatable about a pivot 24 as depicted by arrow "A". When in the vertical position, as depicted, the tap 18 is closed and no beverage is dispensed. When the tap handle 22 is rotated in the direction shown by arrow "A", the tap 18 opens and beverage is dispensed from the end 26 of the tap 18. The tap handle 22 includes a tilt sensor 28, which is described in more detail below. When the tap handle 22 has been rotated the tilt sensor 28 detects the rotation and changes an output mode of the sensor. In this manner the tilt sensor 28 detects if a tap handle 22 of the dispenser has been moved from a closed position to an open position. The tilt sensor 28 is connected to a beverage dispenser controller 30 by a two-wire cable 32. The beverage dispenser controller 30 identifies the change in the sensor output mode and is operative to change the output of the sensory interface 20 from operating in the first sensory mode to operating in the second sensory mode in dependence thereon. As such the sensory interface 20 changes operating mode when a beverage is being dispensed, based on movement of the tap handle 22. It will be appreciated that the angle by which the tap handle 22 needs to be rotated to open the tap 18 is a matter of design choice. Some known taps, for example, require a tilt angle of 15 degrees, whereas some other known taps require a tilt angle of 90 degrees. It will be appreciated that the tap 18 described herein is given as an example only and the invention is equally applicable to other tap designs, irrespective of the required tilt angle to open the tap 18. In addition, although the tap handle 22 in the example embodiment is shown as being substantially vertical when closed, it will be appreciated that the tap could have any initial position, for example the invention is equally applicable to taps having a horizontal or inclined angle tap handle position when closed.

[0027] The first and second sensory modes are different from each other and may be any suitable modes. For example, where the sensory interface is a screen the image on the screen may change. For example, a picture on the screen may change, the colours of an image may change, or an image may become animated in a different manner. Where the sensory interface 20 provides a visual representation of a beverage, the visual representation may be changed to give the impression that the beverage is flowing, for example a speed or volume of bubbles flowing in the visual representation may be changed. Other changes in the sensory mode such as alternative visual changes and/or changes in audible output will be understood by the skilled person.

[0028] Referring now to Figure 2 a schematic diagram of a control system of the invention is shown. A beverage dispenser controller 30 is connected to a tilt sensor 28 by a two-wire interface 34A, 34B that is attached to a +V terminal 36 and a 0V terminal 38 of the beverage dispenser controller. The tilt sensor 28 has a +V terminal 40 and a 0V terminal 42, to which the two-wire interface connects. Within the beverage dispenser controller 30, the +V terminal 36 is connected to a low voltage power supply via a series resistor 44, and to an input terminal of a microcontroller 46. The low power voltage supply in the example embodiment is in the range of 3V-3.6V, for example a nominal supply voltage of 3.3V, and the resistor is a 470-ohm resistor, but it will be appreciated other low voltage power supplies and resistors may be used. The microcontroller 46 identifies the output mode of the tilt sensor 28 and controls the sensory mode of the sensory interface 20 in dependence thereon. Depending on the sensory interface 20 used, the output 47 from the microcontroller 46 may pass through a sensory interface controller 48 that controls the operation of the sensory interface 20. Although the sensory interface controller 48 is depicted as a separate controller it may optionally be integrated into beverage dispenser controller 30 or into the sensory interface 20. If, for example, the sensory interface 20 is a display screen, the output 47 of the beverage dispenser controller may go to a graphics controller and switch between a first graphic or animation being displayed on the screen and a second graphic or animation being displayed on the screen.

[0029] Referring also now to Figure 3, a schematic of a tilt sensor 28 used in the invention is shown. The tilt sensor 28 has a small circuit board having a +V terminal

40, a 0V terminal 42, a sensor microcontroller 52, an accelerometer 54, a capacitor 58, an inlet switch 60, and an outlet switch 62. The accelerometer 54 is a 3-axis MEMS accelerometer, however it will be appreciated that alternatively other accelerometers, for example a 2-axis accelerometer, may be used.

[0030] The sensor microcontroller 52 communicates with, or receives signals from, the accelerometer 54, and determines if the accelerometer has been tilted from its rest position, which is its position when the tap handle 22 is in the fully closed position, by an angle of more than or equal to a predetermined open threshold limit. The open threshold limit is an angle which is indicative that that the tap 18 is open, i.e. beverage is being dispensed. The open threshold limit may be different for different designs of tap 18 as, depending on the exact tap design, the tap handle 22 angle at which the beverage dispenses may vary. In one example the open threshold limit may be 10 degrees. The sensor microcontroller 52 outputs signals to the inlet switch 60 and to the outlet switch 62. When the tap handle 22 is in its rest position, i.e. the tap handle 22 is not moved past the open threshold limit, the inlet switch 60 is in a closed position and the outlet switch is in an open position. In this configuration power is provided to the sensor microcontroller 52 and the accelerometer 54 from the +V terminal of the sensor. In this configuration power is also provided to the +V side of the capacitor causing it to store charge. The inlet switch 60 may be a normally closed switch so that when the dispenser is not in use, i.e. when the tap handle 22 is not tilted past the open threshold limit, no power is consumed to maintain it in the closed state. The outlet switch 62 may be a normally open switch so that when the dispenser is not in use, i.e. when the tap handle 22 is not tilted past the open threshold limit, no power is consumed to maintain it in the open position. As a beverage dispenser is generally idle for significantly longer than it is in use this minimises power consumption between beverages being dispensed. In this configuration the microcontroller 46 will detect a constant positive voltage at +V terminal 36. The microcontroller 46 interprets the constant positive voltage at +V terminal 36 as indicative that the sensory interface 20 is to be operative in a first sensory mode.

[0031] When the sensor microcontroller 52 determines that the accelerometer 54 has been tilted beyond the open threshold limit, it outputs pulsed signals to the inlet switch 60 and the outlet swich 62 to simultaneously change their states back and forth, i.e. to cycle, 180 degrees out of phase with each other, between their open and closed positions. Therefore, when the tap handle 22 is detected as being tilted to or past the open threshold limit the sensor microcontroller 52 causes the switches to periodically cycle between a first configuration in which the inlet switch is in a closed position and the outlet switch is in an open position, and a second configuration in which the inlet switch is in an open position and the outlet switch is in a closed position.

[0032] When the inlet switch 60 opens and the outlet switch 62 closes, a short is created between the sensor +V terminal 40 and the sensor 0V terminal 42, and the sensor microcontroller 52 and accelerometer 54 are isolated from the +V terminal 40. While isolated, the capacitor 58 discharges current to the sensor microcontroller 52 and the accelerometer 54 to power them until the sensor microcontroller 52 reverts the states of the inlet switch 60 to the closed position and the outlet switch 62 to the open position, where once again the sensor microcontroller 52 and the accelerometer 54 receive power from the +V terminal 40, and the capacitor is recharged. The sensor microcontroller 52 continues to control the states of the switches 60, 62 back and forth until it detects that the accelerometer 54 is tilted at an angle equal to or less than a closed threshold limit, upon which it returns the inlet switch 60 to its (normally) closed position and returns the outlet switch 62 to its (normally) open position. The closed threshold limit may be the same angle as the open threshold limit, however preferably the closed threshold limit is less than the open threshold limit, for example the closed threshold limit may be 2 degrees, or as much as 5 degrees, less than the open threshold limit. This provides a tilt hysteresis and prevents the sensory interface 20, which may be a display screen, flickering between the first sensory mode and the second sensory mode if the tap handle 22 is retained in a position at or very close to the open threshold limit.

[0033] The sensor microcontroller 52 controls the periodic cycling of the inlet switch 60 and the outlet switch 62 such that the switches are maintained in their first configuration for a longer period of time than they are maintained in their second configuration, i.e. the duration of the first configuration in each cycle period exceeds the duration of the second configuration. The duration of the second configuration within the periodic cycle may be limited to a period of less than 10ms and the duration of the first configuration may be in excess of 50ms. In an example embodiment the switches are maintained in their second configuration for 8ms of a cycle time of 80ms, however it will be appreciated other timings may be used. The short duration of the second configuration ensures that the capacitor 58 does not fully discharge prior to the sensor microcontroller 52 reverting the switches 60, 62 to the first configuration, and the longer duration of the first configuration ensures that the capacitor 58 has sufficient time to charge prior to the next cycle.

[0034] The result of the periodic cycling of the switches when the tap handle 22 is detected as being tilted to, or past, the open threshold limit is that the tilt sensor 28 is shorted to 0V so that when the switches 60, 62 are in their second configuration the voltage sensed by the microcontroller 46 at the +V terminal 36 is periodically reduced to 0, so that a pulsed signal is detected. The tilt sensor 28 therefore has a first sensor output mode in which there is a positive continuous voltage at the +volt terminal and a second sensor output mode in which there is a pulsed positive voltage at the +volt terminal.

[0035] The microcontroller 46 is configured, either via

hardware, firmware or software, to perform a debounce operation on the signal it receives from the +V terminal 36. The microcontroller 46 then identifies a pulsed positive signal as a 0V or low volt signal. In this manner the microcontroller 46 can distinguish between a non-dispensing state of the dispenser (when the tap handle 22 has not been tilted past the open threshold limit) by identifying a +V high signal at the +V controller terminal 36, and a dispensing state of the dispenser 10 (when the tap handle 22 has been tilted past the open threshold limit) by identifying a 0V or low volt signal from the pulsed 0V.

[0036] As described above, the microcontroller 46 identifies the output mode of the tilt sensor 28 and controls the sensory mode of the sensory interface 20 in dependence thereon, i.e. the output 47 from the microcontroller 46 changes the sensory mode of the sensory interface 20 dependant on the tap handle 22 angle as determined by the tilt sensor 28.

[0037] In one embodiment the sensor microcontroller 52 determines if the accelerometer 54 has been tilted past a fast dispense threshold angle, which is a further threshold angle being greater than the open threshold angle. When it is detected that the accelerometer 54 has been tilted past the fast dispense threshold angle, the frequency of the of the periodic cycle, or the duration of the first or second configuration within each cycle is changed. The microcontroller 46 performs processing on the signal, e.g. a debounce operation, in a manner that differentiates between the pulsed voltage associated with the open threshold angle and the pulsed voltage associated with the fast dispense threshold angle. For example, the microcontroller 46 may identify the pulsed voltage associated with the open threshold angle as a 0V signal and identify the pulsed voltage associated with the fast dispense threshold angle as a low V signal. In this manner three states of the tilt sensor 28 can be determined. In this embodiment the microcontroller 46 controls the sensory interface 20 between a first sensory mode, a second sensory mode and a third sensory mode, in dependence on the three sensor states. Signal debounce processes are known to those skilled in the art and accordingly are not described further herein.

[0038] Referring now to Figure 4 a second embodiment of the tilt sensor 28a is shown. This embodiment is identical to that shown in Figure 3 and operates as described hereinabove, except that it has the additional features described below. The tilt sensor 28a additionally has a calibration means 64 that is configured to detect an external influence thereon. The calibration means 64 is connected to the sensor microcontroller 52 which detects the presence of the external influence and sets the current position of the sensor to a zero-tilt refence position in dependence thereon. In the example embodiment the calibration means 64 is a hall effect sensor which detects a magnetic field. It will be appreciated that a magnetic field may be detected by other types of sensors such as a reed swich or a MEMS magnetic field sensor. The sensor microcontroller 52 detects the presence of the magnetic field, based on the output from the hall effect sensor and, when the magnetic field has been detected for a time period that exceeds a threshold time period, sets the current tilt angle to the zero-tilt reference position. The threshold time period may be in the range of a few seconds. Optionally a visual indicator, for example a small light or LED 66 may be provided on the tilt sensor 28a. The sensor microcontroller 52 may be configured to cause the LED 66 to be illuminated, or to flash, when the threshold period has been exceeded. In this manner the operator knows that the zero-tilt reference position has been set and that they can remove the magnet. It will be appreciated that by "zero-tilt reference position" what is meant is the base position from which the tilt sensor 28a detects a tilt angle, and from which the open threshold angle must be exceeded. The calibration function has the benefits that the zero position can be quickly and easily set by an unskilled worker when the beverage dispenser is installed in situ, and where the installation position may not be vertical, or completely vertical. For example, if the tap handle 22 is in an orientation other than completely vertical, the calibration after installation allows the sensory mode of the sensory interface 20 to always change when the tap handle 22 has been moved through an intended angle, irrespective of the angle at which it was installed.

[0039] It will be appreciated that although the embodiment described above relates to a beverage dispenser with a tap handle 22 that moves in one direction from upright, beverage dispensers are known in which movement of the tap handle 22 in two or more directions from the zero-reference position will dispense a beverage. It will be appreciated that the tilt sensor 28, 28a described above may detect a tilt angle past the open threshold angle in any direction, i.e. the changing from the first sensory mode to the second sensory mode may be the result of the tap handle 22 having been moved past a threshold angle any direction. It will be appreciated that by using a 3-axis MEMS accelerometer the sensor microcontroller 52 can determine the tilt angle in any direction from a known starting point. It will be appreciated that for beverage dispensers that dispense a beverage when the tap handle 22 is moved in two opposite directions from a closed tap position, the tilt sensor 29 may be configured to detect a tilt angle past the open threshold position in either direction. It will also be appreciated that some known beverage fonts dispense in a different manner in dependence on the direction of tilt of the tap handle 22. In some embodiments the tap 18 may dispense beverage in a normal flow operation when the tap handle 22 is tilted in a first direction, e.g. towards the user, and dispense in a creaming action, in which the beverage is passed through a flow path designed to induce gas break out resulting in a froth or foam (often referred to as a "head" in beer products) being dispensed, when the tap handle 22 is tilted in the other direction (e.g. away from the user). In such an example the tilt sensor 28 may alter the output signal, as described hereinabove in relation to the fast

dispense threshold, so as to differentiate between a normal flow dispense and a creaming action dispense. In such an arrangement the microcontroller 46 can control the sensory interface 20 between the first sensory mode, the second sensory mode and a third sensory mode, in dependence on the detected state (tap closed, normal dispense and creaming action).

[0040] It will be appreciated that various changes and modifications can be made to the present invention without departing from the scope of the present application.

Claims

1. A beverage dispenser controller for a beverage dispenser having a first sensory mode and a second sensory mode, said first and second sensory modes being different, the beverage dispenser controller comprising one or more electronic controllers configured to:

   identify the voltage at a +volt output terminal thereof
   if the voltage at the +volt output terminal is identified as a first voltage to output a signal to a beverage dispenser to cause it to operate in the first sensory mode;
   if the voltage at the +volt output terminal is identified as a second voltage to output a signal to a beverage dispenser to cause it to operate in the second sensory mode, said second voltage being lower than said first voltage; wherein
   the beverage dispenser controller identifies a constant low voltage as the second voltage and identifies a pulsed voltage at the +volt output terminal as a low voltage.

2. A control system for controlling a beverage dispenser having a first sensory mode and a second sensory mode, the control system comprising:

   a sensor configured to detect if a handle of the dispenser has been moved from a closed position to an open position and to control a sensor output mode in dependence thereon;
   a beverage dispenser controller according to claim 1 the beverage dispenser controller configured to identify the sensor output mode and operative to output a control signal to cause the beverage dispenser to change from operating in the first sensory mode to operating in the second sensory mode in dependence thereon; and
   a two-wire interface between the sensor and the beverage dispenser controller; wherein:
   the sensor comprises a tilt sensor having a +volt terminal and a 0 volt terminal, the sensor having a first sensor output mode in which there is a positive continuous voltage at the +volt terminal and a second sensor output mode in which there is a pulsed positive voltage at the +volt terminal.

3. A beverage dispenser controller according to claim 1 or a control system according to claim 2, wherein the beverage dispenser controller is configured to perform a debounce operation on the +volt terminal and to identify a pulsed positive signal as a 0V or low volt signal.

4. A control system according to claim 2 or claim 3 wherein the beverage dispenser controller comprises a +volt resistive terminal and a 0V terminal, and wherein the 2-wire interface is connected thereto.

5. A control system according to any one of claims 2 to 4 wherein the sensor comprises: a sensor electronic circuit having a sensor input terminal for connection to the +volt terminal, a sensor output terminal for connection to the 0 volt terminal, an accelerometer, a sensor microcontroller, and a capacitor, said capacitor being charged by the +volt terminal.

6. A control system according to claim 5 wherein the sensor electronic circuit further comprises an inlet switch between the sensor input terminal and a positive side of the capacitor.

7. A control system according to claim 6 wherein the sensor electronic circuit further comprises an outlet switch between the sensor input terminal and the sensor output terminal.

8. A control system according to claim 7 wherein, when the sensor is tilted past a threshold angle the sensor microcontroller causes the switches to periodically cycle between a first configuration in which the inlet switch is in a closed position and the outlet switch is in an open position, and a second configuration in which the inlet switch is in an open position and the outlet switch is in a closed position such that the voltage at sensor inlet terminal periodically drops substantially to zero.

9. A control system according to claim 8 wherein:

   when the sensor angle is less than the threshold angle the switches are in the first configuration; and/or
   the duration of the second configuration is less than 10ms; and/or
   when the sensor is tilted past the threshold angle, the duration of the first configuration within each periodic cycle exceeds the duration of the second configuration; and/or
   when the sensor is tilted past the threshold angle the frequency of the periodic cycle, or the duration of the first and/or second configuration with-

in each cycle, is varied in dependence on the tilt angle; and/or
when the sensor is tilted past a second threshold angle, the frequency of the of the periodic cycle, or the duration of the first or second configuration within each cycle is changed, optionally the further threshold angle being greater than the threshold angle or in an opposite direction from the threshold angle or optionally the further threshold angle is an angle in an opposite direction from the threshold angle.

10. A control system according to any one of claims 2 to 9 further comprising calibration means for the sensor, the calibration means configured to detect an external influence thereon and to set a current position of the sensor to a zero-tilt refence position in dependence thereon.

11. A control system according to claim 10 wherein the external influence is a magnetic field.

12. A control system according to claim 11 and claim 5 wherein the sensor electronic circuit further comprises one of a reed swich, a hall effect sensor or a MEMS magnetic field sensor, for detecting said magnetic field.

13. A control system according to any one of claims 10 to 12 wherein the calibration means sets the current position of the sensor to a zero-tilt refence position when the external influence has been detected for a time period exceeding a threshold value.

14. A beverage dispenser having a handle to start or stop a flow of beverage, a sensory interface operable in a first sensory mode and a second sensory mode, and either a beverage dispenser controller according to claim 1 or a control system according to any one of claims 2 to 13.

15. A beverage dispenser according to claim 14 wherein:

the sensory interface comprises a display, the first sensory mode comprises a first visual display output, and the second mode comprises a second, different, visual display output; and/or
the sensory interface comprises a speaker, and an audible output of the speaker is different in the first sensory mode and the second sensory mode.

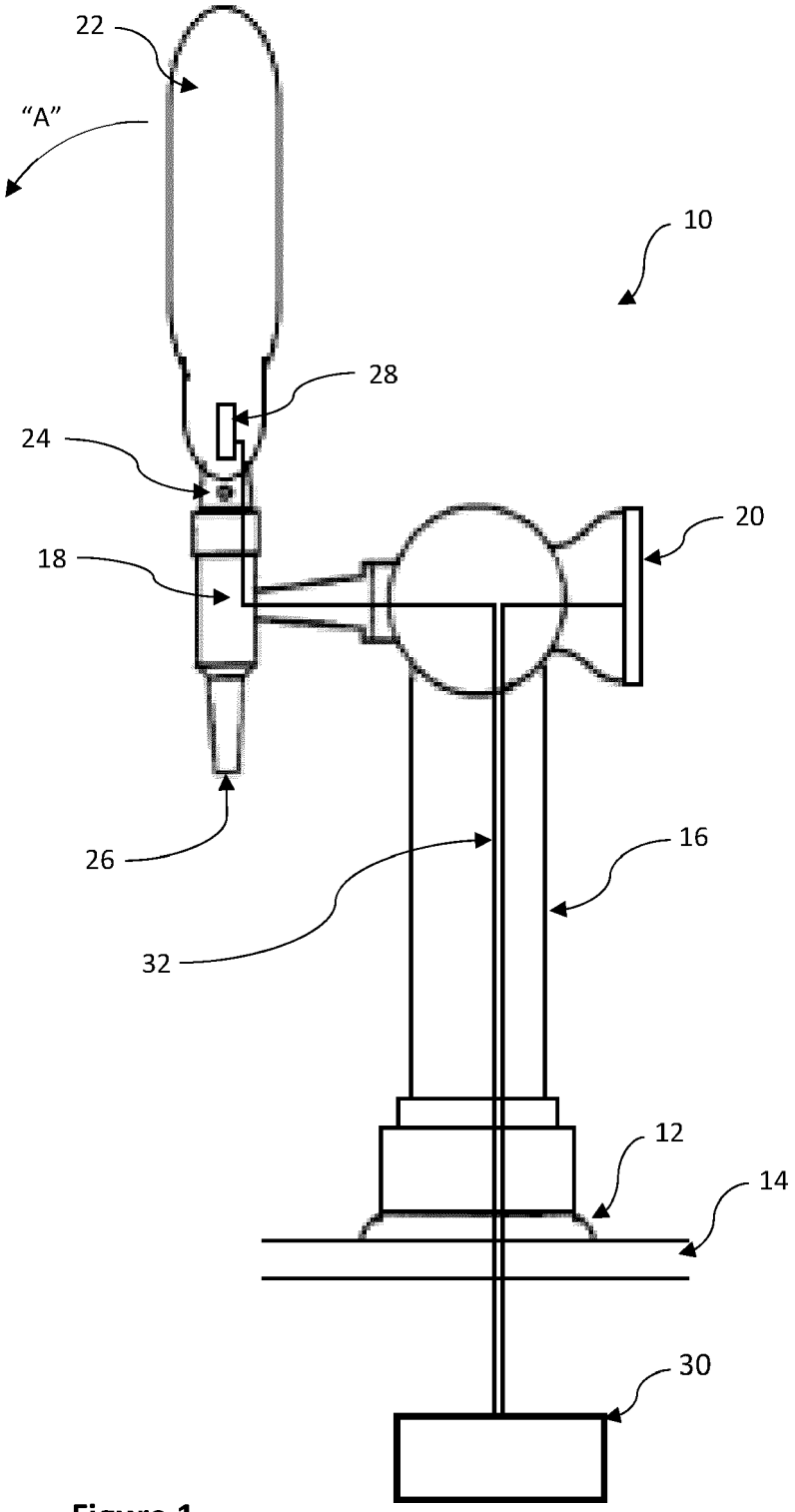

Figure 1

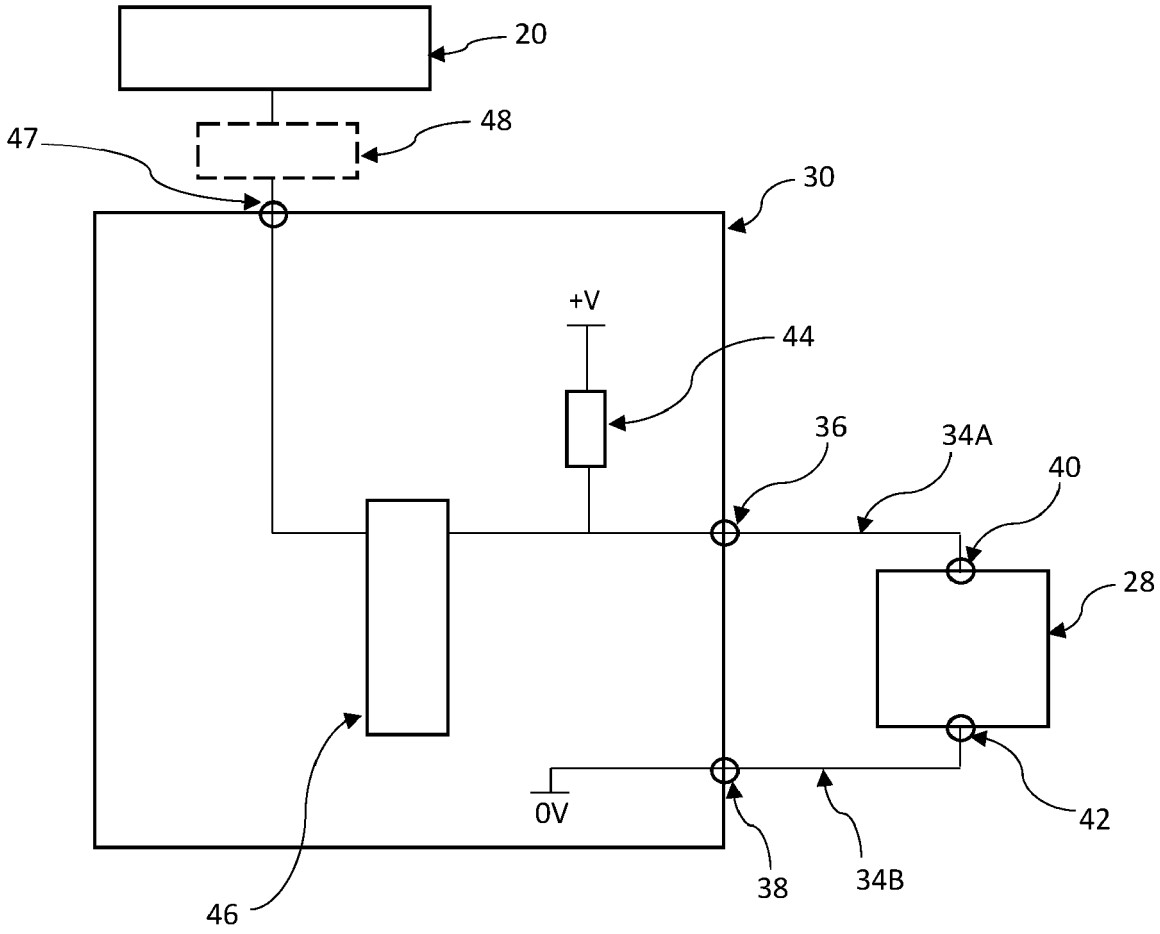

Figure 2

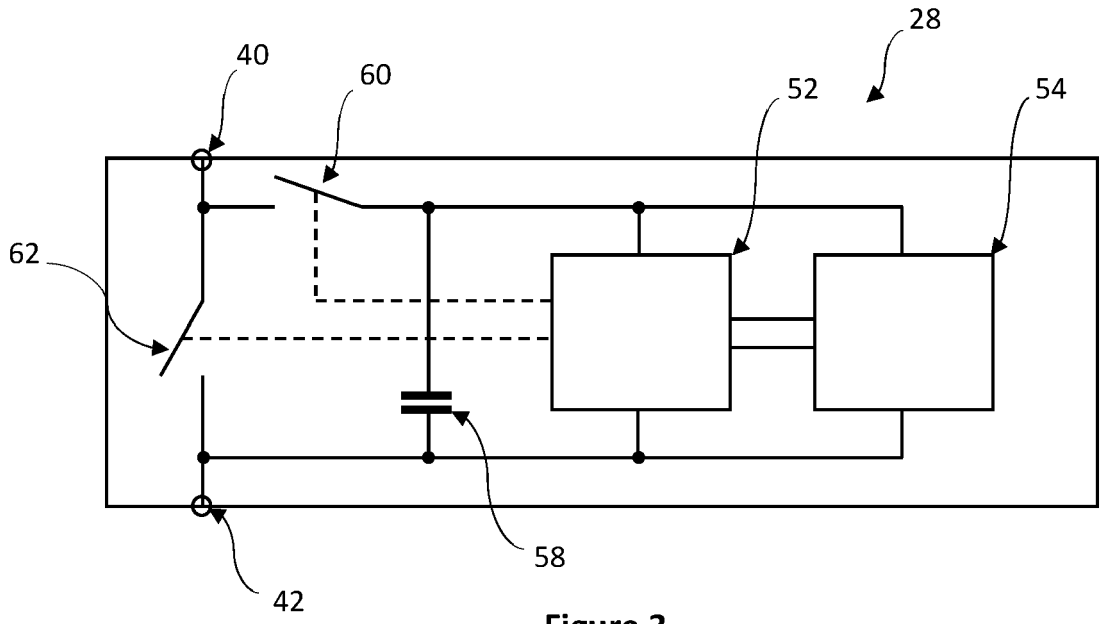

Figure 3

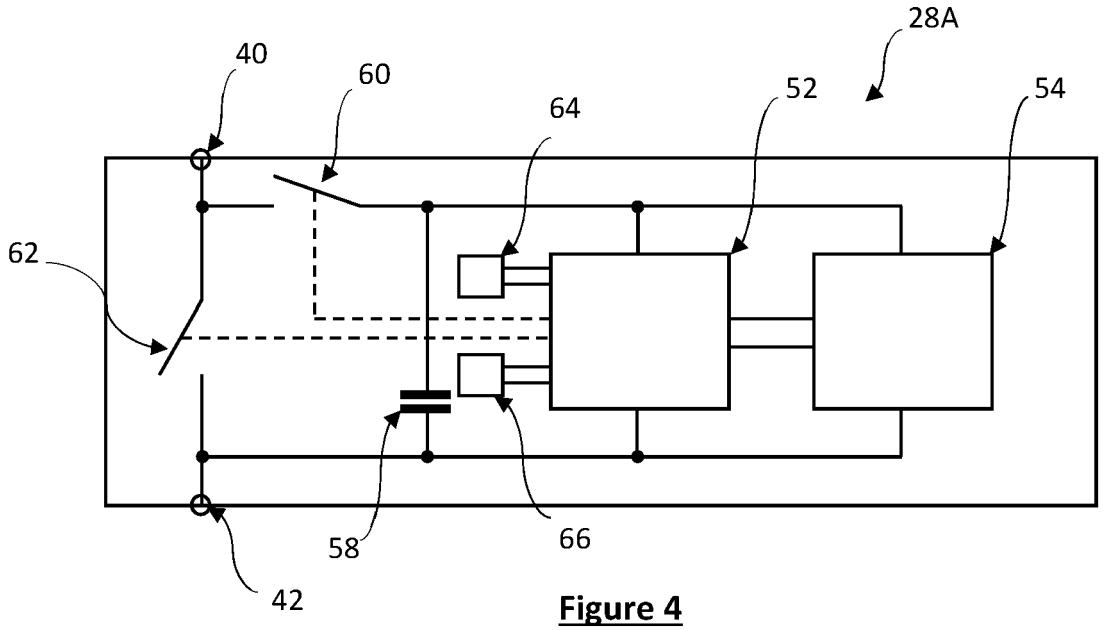

Figure 4

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EUROPEAN SEARCH REPORT

Application Number
EP 23 15 5235

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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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	3 July 2023	Schultz, Tom

CATEGORY OF CITED DOCUMENTS

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