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(54) **TOUCH FREE AUTOMATIC TYPE WATER SUPPLY DEVICE AND METHOD**

(57) A touch free automatic type water supply device 100 includes: a shell 110; first to third sensors 122a, 122b, 122c adapted to sense an external object and then generate first to third sensing signals, respectively, wherein the first sensor is adapted to sense the external object located in a front direction of the shell, only the second sensor is adapted to sense the external object located in a side direction of the shell, and only the third sensor is adapted to sense the external object located in

another side direction of the shell; an electronic control unit 120 adapted receiving the first to third sensing signals and then generating driving signals, respectively; and a flow control unit 150, wherein according to the driving signals the flow control unit controls whether water is supplied, whether the flow rate of the supplied water is changed, or whether the supplied water temperature is changed.

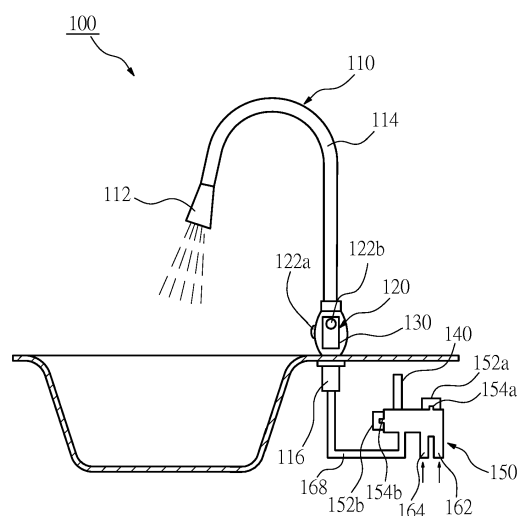


FIG. 1a

Description

Cross-Reference to Related Application

[0001] This application claims the benefit of Taiwan Patent Application No. 103131555, filed on September 12, 2014, which is hereby incorporated by reference for all purposes as if fully set forth herein.

BACKGROUND

Field of Invention

[0002] The present disclosure relates to a touch free automatic type water supply device and more particularly to a touch free automatic type water supply device, which controls whether water is supplied, whether the flow rate of the supplied water is changed, whether temperature of the supplied water is changed, or whether the supplied water is drained, by means of a touch free manner.

Related Art

[0003] In modern life, humans cannot but use water, and thus various water supply devices are related to the humans. For example, a touch free automatic type water supply device is not only used conveniently, but also avoid the contact pollution. Thus, the touch free automatic type water supply device can increase the hygiene function and further economize water. Accordingly, kitchen/bathroom apparatus makers do more research for the touch free automatic type water supply device.

[0004] Recently, a touch free automatic type faucet generally has a single work manner to control a switch of a solenoid valve of the touch free automatic type faucet by sheltering from an infrared ray sensor. In other words, when a hand appears, the water is supplied; and when the hand disappears, the water is not supplied. This work manner is suitable for a public place, but is not suitable for the place needs a long time use. For example, when a user needs to use the water in the sink for washing his face at home, i.e., the water is required to be supplied for a long time, it is necessary for the hand or an external object to continuously shelter from the infrared ray sensor for a long time until there is enough water in the sink. Thus, it is not convenient for the user, and the user cannot control the flow rate of the supplied water and regulate the ratio of cold water to hot water during the use.

[0005] Accordingly, a need remains for a touch free automatic type water supply device to solve the foregoing problems.

SUMMARY

[0006] The objective of the present disclosure is to provide a touch free automatic type water supply device, which controls whether water is supplied, whether the flow rate of the supplied water is changed, whether the

temperature of the supplied water is changed, or whether the supplied water is drained, by means of a touch free manner.

[0007] To achieve the foregoing objective, the present disclosure provides a touch free automatic type water supply device, comprising: a shell comprising a supply outlet, a flow channel and an inlet, wherein the supply outlet is communicated with the inlet through the flow channel; first to third sensors adapted to sense an external object and then generate first to third sensing signals, respectively, wherein the first sensor is adapted to sense the external object located in a front direction of the shell, only the second sensor is adapted to sense the external object located in a side direction of the shell, and only the third sensor is adapted to sense the external object located in another side direction of the shell; an electronic control unit electrically connected to the first to third sensors for receiving the first to third sensing signals and then generating driving signals, respectively; and a flow control unit communicated with the inlet of the shell, wherein according to the driving signals the flow control unit controls whether water of the touch free automatic type water supply device is supplied, whether the flow rate of the supplied water is changed, or whether the supplied water temperature is changed.

[0008] The touch free automatic type water supply device further comprises: a fourth sensor disposed on the shell or the main control circuit board for sensing an external object located in a top direction of the shell and then generating a fourth sensing signal, wherein the electronic control unit is electrically connected to the fourth sensor for receiving the fourth sensing signal and then generating a driving signal; and a drain unit communicated with a drainage outlet of a container, and controlling whether the container is drained according to the driving signal.

[0009] The touch free automatic type water supply device of the present disclosure controls whether water is supplied, whether the flow rate of the supplied water is changed, whether the temperature of the supplied water is changed, or whether the supplied water is drained, by means of a touch free manner. Specifically, the first sensor is adapted to sense the external object located in the front direction of the shell, only the second sensor is adapted to sense the external object located in the side direction of the shell, only the third sensor is adapted to sense the external object located in another side direction of the shell, and the fourth sensor is adapted to sense the external object located in the top direction of the shell, thereby controlling whether water is supplied, whether the flow rate of the supplied water is changed, whether the temperature of the supplied water is changed, or whether the supplied water is drained. The display panel of the main control circuit board of the electronic control unit of the present disclosure can display the flow rate and the temperature of the supplied water of the touch free automatic type water supply device.

[0010] To make the aforementioned and other objects,

features and advantages of the present disclosure clearer, detailed illustration is provided in the following with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

FIGS. 1a and 1b are left and right side plan schematic views of a touch free automatic type water supply device according to the first embodiment of the present disclosure, showing that the touch free automatic type water supply device is installed to a washbasin.

FIG. 2 is a block diagram of a main control circuit board according to an embodiment of the present disclosure.

FIG. 3 is a block diagram of an auxiliary control circuit board according to an embodiment of the present disclosure.

FIG. 4 is a left side plan schematic view of a touch free automatic type water supply device according to another embodiment of the present disclosure.

FIG. 5 is a cross-sectional view of a flow control unit according to an embodiment of the present disclosure.

FIGS. 6a to 6d are top views of a touch free automatic type water supply device according to an embodiment of the present disclosure, showing that a touch free automatic type water supply method includes four examples of this embodiment.

FIGS. 7a and 7b are left side plan schematic views of a touch free automatic type water supply device according to a further embodiment of the present disclosure, showing a drain unit controls whether a container is drained.

FIGS. 8a and 8b are left and right side plan schematic views of a touch free automatic type water supply device according to the second embodiment of the present disclosure.

FIGS. 9a and 9b are left side plan schematic views of a touch free automatic type water supply device according to the third embodiment of the present disclosure, showing a potable water control unit controls whether potable water is supplied.

DETAILED DESCRIPTION

[0012] The present disclosure will become more fully understood from the detailed description given herein below and the accompanying drawings which are given for illustration only, and thus are not limitative of the present disclosure.

[0013] FIGS. 1a and 1b are left and right side plan schematic views of a touch free automatic type water supply device 100 according to the first embodiment of the present disclosure, showing that the touch free automatic type water supply device is installed to a wash-

basin. Referring to FIGS. 1a and 1b, the touch free automatic type water supply device 100 includes a shell 110, first to third sensors 122a, 122b, 122c, an electronic control unit 120 and a flow control unit 150. The shell 110 includes a supply outlet 112, a flow channel 114 and an inlet 116, wherein the supply outlet 112 is communicated with the inlet 116 through the flow channel 114.

[0014] The electronic control unit 120 includes a main control circuit board 130 and an auxiliary control circuit board 140. The main control circuit board 130 can be disposed on the shell 110 or embedded into the shell 110, i.e., the main control circuit board 130 and the shell 110 can be integrated to a single component. The first to third sensors 122a, 122b, 122c can be disposed on the main control circuit board 130 or the shell 110 for sensing an external object (e.g., a hand) and then generating first to third sensing signals, respectively. The electronic control unit 120 is electrically connected to the first to third sensors 122a, 122b, 122c for receiving the first to third sensing signals and then generating driving signals, respectively. The first to third sensors 122a, 122b, 122c can be infrared sensors or microwave sensors.

[0015] In this embodiment, the first sensor 122a is disposed on the shell 110, the second sensor 122b is disposed on the main control circuit board 130, and the third sensor 122c is disposed on the main control circuit board 130. The first sensor 122a is adapted to sense the external object located in a front direction of the shell 110 (e.g., in the front direction of the main control circuit board 130 or adjacent to the supply outlet 112 of the shell 110); only the second sensor 122b is adapted to sense the external object located in a side direction of the shell 110 (e.g., in the right side direction of the main control circuit board 130); and, only the third sensor 122c is adapted to sense the external object located in another side direction of the shell 110 (e.g., in the left side direction of the main control circuit board 130).

[0016] FIG. 2 is a block diagram of a main control circuit board 130 according to an embodiment of the present disclosure. Referring to FIGS. 1a and 2, the main control circuit board 130 includes a first microprocessor 132 (e.g., semiconductor chip), which is electrically connected to the first to third sensors 122a, 122b, 122c and receives the first to third sensing signals and then generating control signals, respectively. The main control circuit board 130 further includes a display panel 134, which is electrically connected to the first microprocessor 132 for displaying the correlative information (e.g., the flow rate of the supplied water or the temperature of the supplied water) of the touch free automatic type water supply device 100. The main control circuit board 130 further includes a first power source 138 (e.g., battery) for providing electrical power to the main control circuit board 130.

[0017] FIG. 3 is a block diagram of an auxiliary control circuit board 140 according to an embodiment of the present disclosure. Referring to FIGS. 1a and 3, the aux-

iliary control circuit board 140 includes a second microprocessor 142 (e.g., semiconductor chip) adapted for receiving the control signals and then generating the driving signals, respectively. The auxiliary control circuit board 140 further includes a second power source 148 (e.g., battery) for providing electrical power to the auxiliary control circuit board 140.

[0018] Referring to FIGS. 2 and 3 again, the main control circuit board 130 further includes a transmitter 133, which is electrically connected to the first microprocessor 132 for transmitting the control signals. The auxiliary control circuit board 140 further includes a receiver 143, which is electrically connected to the second microprocessor 142 for receiving the control signals.

[0019] Referring to FIG. 4, in another embodiment, the electronic control unit 120 further includes a signal connecting line 124 for electrically connecting the main control circuit board 130 to the auxiliary control circuit board 140, whereby the main control circuit board 130 and the auxiliary control circuit board 140 are integrated to a single component. At this time, the signal connecting line 124 can be acted for transmitting and receiving the control signals (i.e., the signal connecting line 124 replaces the transmitter 133 of the main control circuit board 130 and the receiver 143 of the auxiliary control circuit board 140). Also, the signal connecting line 124 can be acted for providing electrical power to the auxiliary control circuit board 140 (i.e., the signal connecting line 124 replaces the second power source 148 of the auxiliary control circuit board 140, and thus the first power source 138 of the main control circuit board 130 can provide electrical power to the auxiliary control circuit board 140 via the signal connecting line 124).

[0020] FIG. 5 is a cross-sectional view of a flow control unit 150 according to an embodiment of the present disclosure. Referring to FIGS. 1a, 3 and 5, the flow control unit 150 includes a valve core body 160, at least one driving unit and at least one valve set, and further includes a cold water inlet 162, a hot water inlet 164, a mix flow channel 166 and a mix flow outlet 168, wherein the mix flow outlet 168 is communicated with the cold water inlet 162 and the hot water inlet 164 through the mix flow channel 166.

[0021] In this embodiment, two driving units 152a, 152b (e.g., motors) are electrically connected to the second microprocessor 142. Two valve sets 154a, 154b are disposed in the valve core body 160, and are physically connected to the mix flow channel 166. The driving units 152a, 152b drive the valve sets 154a, 154b according to the driving signals, whereby the mixed water from cold water and hot water enters into the inlet 116 of the shell 110 so as to control whether water is supplied, whether the flow rate of the supplied water is changed, or whether the supplied water temperature is changed. Briefly, the flow control unit 150 is communicated with the inlet 116 of the shell 110, and according to the driving signals the flow control unit 150 controls whether the water of the touch free automatic type water supply device 100 is sup-

plied, whether the flow rate of the supplied water is changed, or whether the supplied water temperature is changed. The auxiliary control circuit board 140 further includes a temperature sensor 145 (shown in FIG. 3) for measuring the temperature of the mix flow outlet 168.

[0022] For example, the valve set 154a can be a valve core made of metal. The valve core made of metal includes a screw nut, a control rod and a throttling plate. The screw nut can be screwed and mounted to the valve core body 160 for mounting a lower portion of the control rod and the throttling plate in the valve core body 160. The control rod is physically connected to the throttling plate, and the lower portion of the control rod includes a chamber, which has apertures. The throttling plate includes two tadpole shaped apertures, which are corresponding to the cold water inlet 162 and the hot water inlet 164 respectively. When the control rod rotates the throttling plate, the overlapping area between one of the two tadpole shaped apertures and the cold water inlet 162 and the overlapping area between the other one of the two tadpole shaped apertures and the hot water inlet 164 can be adjusted (i.e., the ratio of the cold water of the cold water inlet 162 to the hot water of the hot water inlet 164 into the chamber of the valve set 154a can be adjusted). Then, the mixed water in the chamber enters the mix flow channel 166 through the apertures of the chamber. Thus, the valve set 154a is adapted to control whether water is supplied or whether the supplied water temperature is changed.

[0023] For example, the valve set 154b can also be a valve core made of metal, and a structure of the valve set 154b is substantially the same as that of the valve set 154a. The valve core made of metal includes a screw nut, a control rod and a throttling plate. The screw nut is adapted for mounting a lower portion of the control rod and the throttling plate in the valve core body 160. A tadpole shaped aperture of the throttling plate is corresponding to the other end of the mix flow channel 166. When the control rod rotates the throttling plate, the overlapping area between the two tadpole shaped aperture and the mix flow channel 166 can be adjusted (i.e., the flow rate of the mixed water of the mix flow channel 166 into the chamber of the valve set 154b can be adjusted). Then, the mixed water in the chamber enters the mix flow outlet 168 through the apertures of the chamber. Thus, the valve set 154b is adapted to control whether water is supplied and whether the flow rate of the supplied water is changed.

[0024] A touch free automatic type water supply method includes the following examples of this embodiment:

[0025] The first example of this embodiment is an ON/OFF control mode: Referring to FIG. 6a, when the first sensor 122a senses an appearance of the external object (e.g., a hand 104), the first sensing signal is an open signal, whereby the water of the touch free automatic type water supply device 100 is supplied; and when the first sensor 122a senses a disappearance of the external object, the first sensing signal is a closed signal,

whereby the water of the touch free automatic type water supply device 100 is not supplied. For example, the first microprocessor 132 receives the open signal or the closed signal, and then generates a control signal. The second microprocessor 142 receives the control signal, and then generates a driving signal. The driving unit 152b drives the valve set 154b according to the driving signal, so as to control whether the water of the touch free automatic type water supply device 100 is supplied.

[0026] The second example of this embodiment is also an ON/OFF control mode: Referring to FIG. 6b, when only the second sensor 122b senses a first appearance and a first disappearance of the external object (e.g., a hand 104) within a first time (e.g., two seconds), the second sensing signal is an open signal, whereby the water of the touch free automatic type water supply device 100 is supplied; and when only the second sensor 122b senses a second appearance and a second disappearance of the external object within the first time (e.g., two seconds), the second sensing signal is a closed signal, whereby the water of the touch free automatic type water supply device 100 is not supplied. For example, the first microprocessor 132 receives the open signal or the closed signal, and then generates a control signal. The second microprocessor 142 receives the control signal, and then generates a driving signal. The driving unit 152b drives the valve set 154b according to the driving signal, so as to control whether the water of the touch free automatic type water supply device 100 is supplied.

[0027] The third example of this embodiment is a Flow control mode. Referring to FIG. 6c, when the water of the touch free automatic type water supply device 100 is supplied continuously (e.g., the touch free automatic type water supply device 100 supplies the water in the water supply status of the ON/OFF control mode of the first or second example of this embodiment) and only the second sensor 122b senses an appearance of the external object (e.g., a hand 104) beyond a second time (e.g., three seconds can be preset), the second sensing signal is a flow increasing signal or a flow decreasing signal, whereby the flow rate of the supplied water of the touch free automatic type water supply device 100 is increased or decreased gradually, wherein the second time is longer than the first time so as to prevent the touch free automatic type water supply device 100 from being kept in the water supply status of the ON/OFF control mode of the second example; and when the flow rate of the supplied water of the touch free automatic type water supply device 100 is increased or decreased gradually and only the second sensor 122b senses a disappearance of the external object beyond the second time, the second sensing signal is a flow keeping signal, whereby the flow rate of the supplied water of the touch free automatic type water supply device 100 is kept. For example, the first microprocessor 132 receives the flow increasing signal, the flow decreasing signal or the flow keeping signal, and then generates a control signal. The second microprocessor 142 receives the control signal, and then generates

a driving signal. The driving unit 152b drives the valve set 154b according to the driving signal, so as to control the flow rate of the supplied water of the touch free automatic type water supply device 100.

[0028] A flow increasing mode or a flow decreasing mode of the supplied water of the touch free automatic type water supply device 100 indicates that: a plurality setting values are preset, the flow rate of the supplied water of the touch free automatic type water supply device 100 is increased gradually from a lowest setting value to a highest setting value and then is decreased gradually from the highest setting value to the lowest setting value, repetitiously. For example, the first, second, third, fourth and fifth setting values are preset, the flow rate of the supplied water of the touch free automatic type water supply device 100 is increased gradually from the first, second, third and fourth setting values to the fifth setting value and then is decreased gradually from the fifth, fourth, third and second setting values to the first setting value, repetitiously. For example, the first setting value is preset to 10 liter/minute, and the flow rate difference between two setting values is 2 liters/minute, i.e., the first setting value is the lowest setting value which is preset to 10 liters/minute, and the fifth setting value is the highest setting value which is preset to 18 liters/minute.

[0029] The fourth example of this embodiment is a temperature control mode. Referring to FIG. 6d, when the water of the touch free automatic type water supply device 100 is supplied continuously (e.g., the touch free automatic type water supply device 100 supplies the water in the water supply status of the ON/OFF control mode of the first or second example of this embodiment) and only the third sensor 122c senses an appearance of the external object (e.g., a hand 104) beyond a third time (e.g., three seconds can be preset), the third sensing signal is a temperature increasing signal or a temperature decreasing signal, whereby a temperature of the supplied water of the touch free automatic type water supply device 100 is increased or decreased gradually; and when the temperature of the supplied water of the touch free automatic type water supply device 100 is increased or decreased gradually and only the third sensor 122c senses a disappearance of the external object beyond the third time, the third sensing signal is a temperature keeping signal, whereby the temperature of the supplied water of the touch free automatic type water supply device 100 is kept. For example, the first microprocessor 132 receives the temperature increasing signal, the temperature decreasing signal or the temperature keeping signal, and then generates a control signal. The second microprocessor 142 receives the control signal, and then generates a driving signal. The driving unit 152a drives the valve set 154a according to the driving signal, so as to control the temperature of the supplied water of the touch free automatic type water supply device 100.

[0030] A temperature increasing mode or a temperature decreasing mode of the supplied water of the touch free automatic type water supply device 100 indicates

that: a plurality setting values are preset, the temperature of the supplied water of the touch free automatic type water supply device 100 is increased gradually from a lowest setting value to a highest setting value and then is decreased gradually from the highest setting value to the lowest setting value, repetitiously. For example, the first, second, third, fourth and fifth setting values are pre-set, the temperature of the supplied water of the touch free automatic type water supply device 100 is increased gradually from the first, second, third and fourth setting values to the fifth setting value and then is decreased gradually from the fifth, fourth, third and second setting values to the first setting value, repetitiously. For example, the first setting value is preset to 25 degrees centigrade, and the temperature difference between two setting values is 5 degrees centigrade, i.e., the first setting value is the lowest setting value which is preset to 25 degrees centigrade, and the fifth setting value is the highest setting value which is preset to 45 degrees centigrade.

[0031] According to the temperature control mode in the fourth example of this embodiment, when the water of the touch free automatic type water supply device 100 start to supply in the current use, the temperature of the supplied water of the touch free automatic type water supply device 100 must be increased gradually from the lowest setting value (e.g., 25 degrees), so as to prevent the temperature of the supplied water of the touch free automatic type water supply device 100 from being high in the previous use.

[0032] Referring to FIGS. 7a and 7b, in a further embodiment, the touch free automatic type water supply device 100 further includes a fourth sensor 122d and a drain unit 180. The fourth sensor 122d can be disposed on the shell 110 or the main control circuit board 130 for sensing an external object (e.g., a hand 104) located in a top direction of the shell 110 (i.e., above the main control circuit board 130) and then generating a fourth sensing signal. The electronic control unit 120 is electrically connected to the fourth sensor 122d (e.g., the fourth sensor 122d which is electrically connected to the first microprocessor 132 of the main control circuit board 130 is the same as the first to third sensors 122a, 122b, 122c which are electrically connected to the first microprocessor 132 of the main control circuit board 130 shown in FIG. 2) for receiving the fourth sensing signal and then generating a driving signal. The drain unit 180 is communicated with a drainage outlet 108 of a container 106 (e.g., a wash-basin), and controls whether the container 106 is drained according to the driving signal. The fourth sensor 122d can be an infrared sensor or a microwave sensor.

[0033] The drain unit 180 includes a transmission 184, a stopper 182 and a driver 186. The driver 186 is electrically connected to the second microprocessor 142 of the auxiliary control circuit board 140 through a signal connection line (not shown). For example, the stopper 182 can be screwed to a front end of the transmission 184, e.g., an inner thread of the stopper 182 is screwed

to an outer thread of the front end of the transmission 184. The driver 186 is mechanically connected to the transmission 184 by means of a helical thread. A rotary motion of the driver 186 is transformed to a linear motion of the transmission 184 by means of the helical thread having a function of a lipstick that the rotary motion can be transformed to the linear motion.

[0034] A touch free automatic type drain step includes the following example of this embodiment: Referring to FIG. 7a, when the fourth sensor 122d senses an appearance of the external object, the fourth sensing signal is an open signal, whereby the container 106 is drained; and referring to FIG. 7b when the fourth sensor 122d senses a disappearance of the external object beyond a predetermined time (e.g., 1 minute), the fourth sensing signal is a closed signal, whereby the container 106 is not drained. For example, the first microprocessor 132 receives the open signal or the closed signal, and then generates a control signal. The second microprocessor 142 receives the control signal, and then generates a driving signal. The driver 186 drives the transmission 184 and the stopper 182 according to the driving signal, so as to control whether the container 106 is drained. The drain unit 180 of the present disclosure can keep closing the drainage outlet 108 of the container 106 so as to avoid the leakage of smelly gas under the drain unit 180.

[0035] The touch free automatic type water supply device of the present disclosure controls whether water is supplied, whether the flow rate of the supplied water is changed, whether the temperature of the supplied water is changed, or whether the supplied water is drained, by means of a touch free manner. Specifically, the first sensor is adapted to sense the external object located in the front direction of the shell, only the second sensor is adapted to sense the external object located in the side direction of the shell, only the third sensor is adapted to sense the external object located in another side direction of the shell, and the fourth sensor is adapted to sense the external object located in the top direction of the shell, thereby controlling whether water is supplied, whether the flow rate of the supplied water is changed, whether the temperature of the supplied water is changed, or whether the supplied water is drained. The display panel of the main control circuit board of the electronic control unit of the present disclosure can display the flow rate and the temperature of the supplied water of the touch free automatic type water supply device.

[0036] FIGS. 8a and 8b are left and right side plan schematic views of a touch free automatic type water supply device 100' according to the second embodiment of the present disclosure. Referring to FIGS. 8a and 8b, the touch free automatic type water supply device 100' includes a shell 110, an electronic control unit 120' and a flow control unit 150. The touch free automatic type water supply device 100' of the second embodiment is similar to the touch free automatic type water supply device 100 of the first embodiment, and the similar elements have been designated by similar reference numbers. The

differences between the touch free automatic type water supply device 100' of the second embodiment and the touch free automatic type water supply device 100 of the first embodiment is that: the main control circuit board 130' of the touch free automatic type water supply device 100' in the second embodiment is not disposed on the shell 110 or embedded into the shell 110, i.e., the main control circuit board 130' and the shell 110 are distributed into two components independently.

[0037] In this embodiment, the first to fourth sensors 122a, 122b, 122c, 122d are disposed on the main control circuit board 130', and are adapted to sense an external object (e.g., a hand) located and then generating the first to fourth sensing signals, respectively. The first sensor 122a is disposed on the main control circuit board 130', and thus the first sensor 122a cannot be far from the supply outlet 112 of the shell 110, thereby avoiding a sensing failure when the first sensor 122a senses the external object located under the supply outlet 112 of the shell; only the second sensor 122b (shown in FIG. 8a) is adapted to sense the external object located in the side direction of the main control circuit board 130' (e.g., in the right side direction of the shell 110); only the third sensor 122c (shown in FIG. 8b) is adapted to sense the external object located in the other side direction of the main control circuit board 130' (e.g., in the left side direction of the shell 110); and the fourth sensor 122d is adapted to sense the external object located in the top direction of the main control circuit board 130' (e.g., in the top direction of the shell 110).

[0038] The main control circuit board 130' and the shell 110 are distributed into two components independently, and thus the main control circuit board 130' can be mounted to a suitable position or moved at any time according to the necessity of a user, so as to have the convenience.

[0039] FIGS. 9a and 9b are left side plan schematic views of a touch free automatic type water supply device 100" according to the third embodiment of the present disclosure, showing that the touch free automatic type water supply device 100" is installed to a washbasin. The touch free automatic type water supply device 100" of the third embodiment is similar to the touch free automatic type water supply device 100' of the second embodiment, and the similar elements have been designated by similar reference numbers. Referring to FIGS. 9a and 9b, the differences between the touch free automatic type water supply device 100" of the third embodiment and the touch free automatic type water supply device 100' of the second embodiment is that: the touch free automatic type water supply device 100" further includes a fifth sensor 122e and a potable water control unit 190. The shell 110" further includes another supply outlet 113, another flow channel 115 and another inlet 117, wherein the supply outlet 113 is communicated with the inlet 117 through the flow channel 115. An end of the potable water control unit 190 is communicated with the inlet 117 of the shell 110", and the other end of the potable water control unit 190 is communicated with a potable water source 191

(e.g., RO (reverse osmosis) water source).

[0040] The fifth sensor 122e can be disposed on the main control circuit board 130 or the shell 110" for sensing an external object (e.g., a hand 104) located in a top direction of the main control circuit board 130" and then generating a fifth sensing signal. The electronic control unit 120" is electrically connected to the fifth sensor 122e (e.g., the fifth sensor 122e which is electrically connected to the first microprocessor 132 of the main control circuit board 130" is the same as the first to third sensors 122a, 122b, 122c which are electrically connected to the first microprocessor 132 of the main control circuit board 130 shown in FIG. 2) for receiving the fifth sensing signal and then generating a driving signal. The potable water control unit 190 is electrically connected to the second microprocessor 142 of the auxiliary control circuit board 140" through another signal connection line (not shown). The potable water control unit 190 is communicated with the inlet 117 of the shell 110", and controls whether the potable water is supplied according to the driving signal. The fifth sensor 122e can be an infrared sensor or a microwave sensor. The potable water control unit 190 can be a solenoid valve.

[0041] A touch free automatic type potable water supply step includes the following example of this embodiment: Referring to FIG. 9a, when the fifth sensor 122e senses an appearance of an external object (e.g., a hand 104), the fifth sensing signal is a potable water open signal, whereby the potable water of the touch free automatic type water supply device 100" is supplied; and referring to FIG. 9b, when the fifth sensor 122e senses a disappearance of the external object, the fifth sensing signal is a potable closed signal, whereby the potable water of the touch free automatic type water supply device 100" is not supplied. For example, the first microprocessor 132 receives the potable water open signal or the potable water closed signal, and then generates a control signal. The second microprocessor 142 receives the control signal, and then generates a driving signal. The potable water control unit 190 controls whether the potable water of the touch free automatic type water supply device 100" is supplied according to the driving signal.

[0042] IF the first to third sensors 122a, 122b, 122c and the flow control unit 150 of the touch free automatic type water supply device 100" of the present disclosure are adapted to controls whether city water is supplied, whether the flow rate of the supplied city water is changed or whether temperature of the supplied city water is changed, the fifth sensor 122e and the potable water control unit 190 of the present disclosure are adapted to controls whether the potable water is supplied. Thus, the touch free automatic type water supply device 100" of the present disclosure can control whether the city water and the potable are supplied respectively.

[0043] The foregoing is considered as illustrative only of the implementation manners or embodiments of the technical solutions adopted by the present disclosure to solve the problems and it's not desired to limit the scope

of the disclosure. Accordingly, all suitable modifications and equivalents may be resorted to, falling within the scope of the disclosure.

Claims

1. A touch free automatic type water supply device, comprising:

a shell comprising a supply outlet, a flow channel and an inlet, wherein the supply outlet is communicated with the inlet through the flow channel;

first to third sensors adapted to sense an external object and then generate first to third sensing signals, respectively, wherein the first sensor is adapted to sense the external object located in a front direction of the shell, only the second sensor is adapted to sense the external object located in a side direction of the shell, and only the third sensor is adapted to sense the external object located in another side direction of the shell;

an electronic control unit electrically connected to the first to third sensors for receiving the first to third sensing signals and then generating driving signals, respectively; and

a flow control unit communicated with the inlet of the shell, wherein according to the driving signals the flow control unit controls whether water of the touch free automatic type water supply device is supplied, whether the flow rate of the supplied water is changed, or whether the supplied water temperature is changed.

2. The touch free automatic type water supply device according to claim 1, wherein the electronic control unit comprises:

a main control circuit board comprising a first microprocessor, which is electrically connected to the first to third sensors and receives the first to third sensing signals and then generating control signals, respectively; and

an auxiliary control circuit board comprising a second microprocessor adapted for receiving the control signals and then generating the driving signals, respectively.

3. The touch free automatic type water supply device according to claim 2, wherein the main control circuit board and the auxiliary control circuit board are integrated to a single component.

4. The touch free automatic type water supply device according to claim 2, wherein the main control circuit board and the shell are integrated to a single com-

ponent.

5. The touch free automatic type water supply device according to claim 2, wherein the main control circuit board and the shell are distributed into two components independently.

6. The touch free automatic type water supply device according to claim 2, wherein the first to third sensors are disposed on the main control circuit board or the shell.

7. The touch free automatic type water supply device according to claim 1, wherein:

when the first sensor senses an appearance of the external object, the first sensing signal is an open signal, whereby the water of the touch free automatic type water supply device is supplied; and

when the first sensor senses a disappearance of the external object, the first sensing signal is a closed signal, whereby the water of the touch free automatic type water supply device is not supplied.

8. The touch free automatic type water supply device according to claim 7, wherein:

when only the second sensor senses a first appearance and a first disappearance of the external object within a first time, the second sensing signal is an open signal, whereby the water of the touch free automatic type water supply device is supplied; and

when only the second sensor senses a second appearance and a second disappearance of the external object within the first time, the second sensing signal is a closed signal, whereby the water of the touch free automatic type water supply device is not supplied.

9. The touch free automatic type water supply device according to claim 8, wherein:

when the water of the touch free automatic type water supply device is supplied continuously and only the second sensor senses an appearance of the external object beyond a second time, the second sensing signal is a flow increasing signal or a flow decreasing signal, whereby the flow rate of the supplied water of the touch free automatic type water supply device is increased or decreased gradually, wherein the second time is longer than the first time; and when the flow rate of the supplied water of the touch free automatic type water supply device is increased or decreased gradually and only

the second sensor senses a disappearance of the external object beyond the second time, the second sensing signal is a flow keeping signal, whereby the flow rate of the supplied water of the touch free automatic type water supply device is kept.

10. The touch free automatic type water supply device according to claim 9, wherein a flow increasing mode or a flow decreasing mode of the supplied water of the touch free automatic type water supply device indicates that: a plurality setting values are preset, the flow rate of the supplied water of the touch free automatic type water supply device is increased gradually from a lowest setting value to a highest setting value and then is decreased gradually from the highest setting value to the lowest setting value, repetitiously.

11. The touch free automatic type water supply device according to claim 8, wherein:

when the water of the touch free automatic type water supply device is supplied continuously and only the third sensor senses an appearance of the external object beyond a third time, the third sensing signal is a temperature increasing signal or a temperature decreasing signal, whereby a temperature of the supplied water of the touch free automatic type water supply device is increased or decreased gradually; and when the temperature of the supplied water of the touch free automatic type water supply device is increased or decreased gradually and only the third sensor senses a disappearance of the external object beyond the third time, the third sensing signal is a temperature keeping signal, whereby the temperature of the supplied water of the touch free automatic type water supply device is kept.

12. The touch free automatic type water supply device according to claim 11, wherein a temperature increasing mode or a temperature decreasing mode of the supplied water of the touch free automatic type water supply device indicates that: a plurality setting values are preset, the temperature of the supplied water of the touch free automatic type water supply device is increased gradually from a lowest setting value to a highest setting value and then is decreased gradually from the highest setting value to the lowest setting value, repetitiously.

13. The touch free automatic type water supply device according to claim 2, further comprising:

a fourth sensor disposed on the shell or the main control circuit board for sensing an external ob-

ject located in a top direction of the shell and then generating a fourth sensing signal, wherein the electronic control unit is electrically connected to the fourth sensor for receiving the fourth sensing signal and then generating a driving signal; and

a drain unit communicated with a drainage outlet of a container, and controlling whether the container is drained according to the driving signal.

14. The touch free automatic type water supply device according to claim 13, wherein:

when the fourth sensor senses an appearance of the external object, the fourth sensing signal is an open signal, whereby the container is drained; and

when the fourth sensor senses a disappearance of the external object beyond a predetermined time, the fourth sensing signal is a closed signal, whereby the container is not drained.

15. The touch free automatic type water supply device according to claim 2, wherein the main control circuit board further comprises a display panel, which is electrically connected to the first microprocessor for displaying the flow rate of the supplied water or the temperature of the supplied water.

16. The touch free automatic type water supply device according to claim 2, further comprising:

a fifth sensor disposed on the main control circuit board or the shell for sensing an external object located in a top direction of the main control circuit board and then generating a fifth sensing signal; and a potable water control unit communicated with the inlet of the shell, and controlling whether the potable water is supplied according to the driving signal.

17. The touch free automatic type water supply device according to claim 16, wherein:

when the fifth sensor senses an appearance of the external object, the fifth sensing signal is a potable water open signal, whereby the potable water of the touch free automatic type water supply device is supplied; and

when the fifth sensor senses a disappearance of the external object, the fifth sensing signal is a potable closed signal, whereby the potable water of the touch free automatic type water supply device is not supplied.

18. A touch free automatic type water supply method, comprising the following steps of:

providing a first sensor and a second sensor adapted to sense an external object and then generate a first sensing signal and a second sensing signal, respectively;
 when the first sensor senses an appearance of the external object, the first sensing signal is an open signal, whereby the water of the touch free automatic type water supply device is supplied;
 when the first sensor senses a disappearance of the external object, the first sensing signal is a closed signal, whereby the water of the touch free automatic type water supply device is not supplied;
 when only the second sensor senses a first appearance and a first disappearance of the external object within a first time, the second sensing signal is an open signal, whereby the water of the touch free automatic type water supply device is supplied; and
 when only the second sensor senses a second appearance and a second disappearance of the external object within the first time, the second sensing signal is a closed signal, whereby the water of the touch free automatic type water supply device is not supplied.

19. The touch free automatic type water supply method according to claim 18, further comprising the following steps of:

when the water of the touch free automatic type water supply device is supplied continuously and only the second sensor senses an appearance of the external object beyond a second time, the second sensing signal is a flow increasing signal or a flow decreasing signal, whereby the flow rate of the supplied water of the touch free automatic type water supply device is increased or decreased gradually, wherein the second time is longer than the first time; and
 when the flow rate of the supplied water of the touch free automatic type is increased or decreased gradually and only the second sensor senses a disappearance of the external object beyond the second time, the second sensing signal is a flow keeping signal, whereby the flow rate of the supplied water of the touch free automatic type water supply device is kept.

20. The touch free automatic type water supply method according to claim 18, further comprising the following steps of:

providing a third sensor adapted to sense the external object and then generate a third sensing signal;
 when the water of the touch free automatic type water supply device is supplied continuously

and only the third sensor senses an appearance of the external object beyond a third time, the third sensing signal is a temperature increasing signal or a temperature decreasing signal, whereby a temperature of the supplied water of the touch free automatic type water supply device is increased or decreased gradually; and
 when the temperature of the supplied water of the touch free automatic type water supply device is increased or decreased gradually and only the third sensor senses a disappearance of the external object beyond the third time, the third sensing signal is a temperature keeping signal, whereby the temperature of the supplied water of the touch free automatic type water supply device is kept.

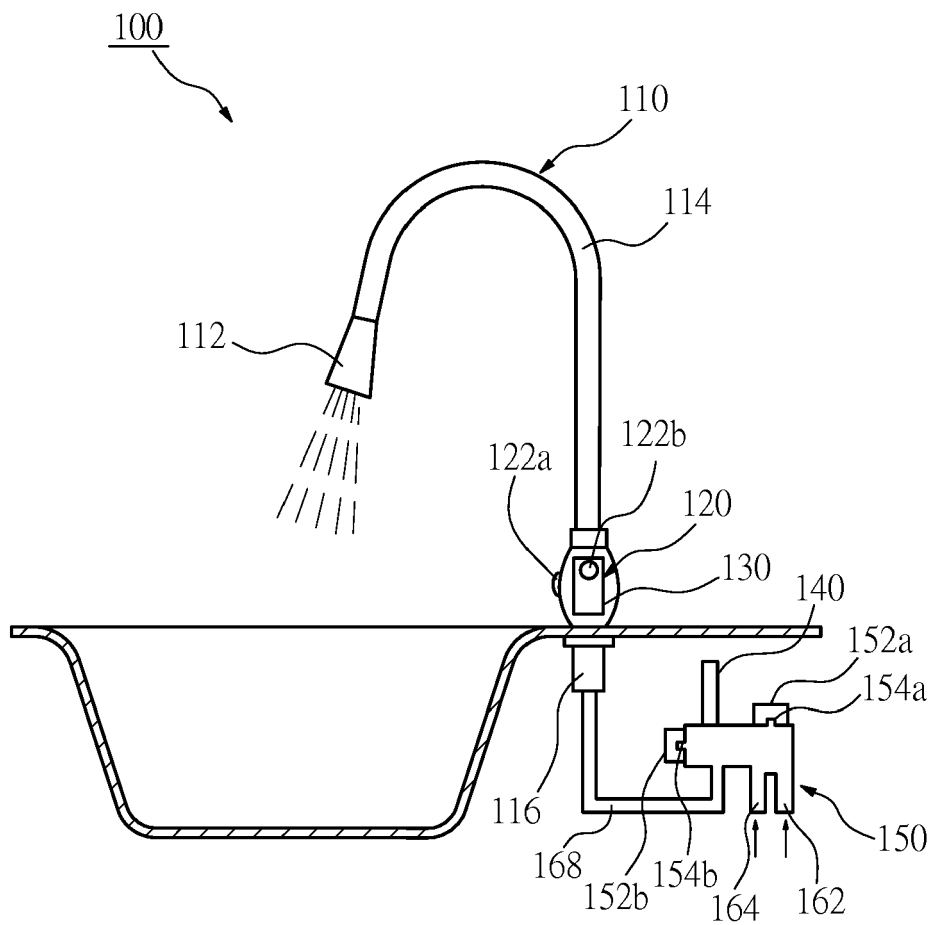


FIG. 1a

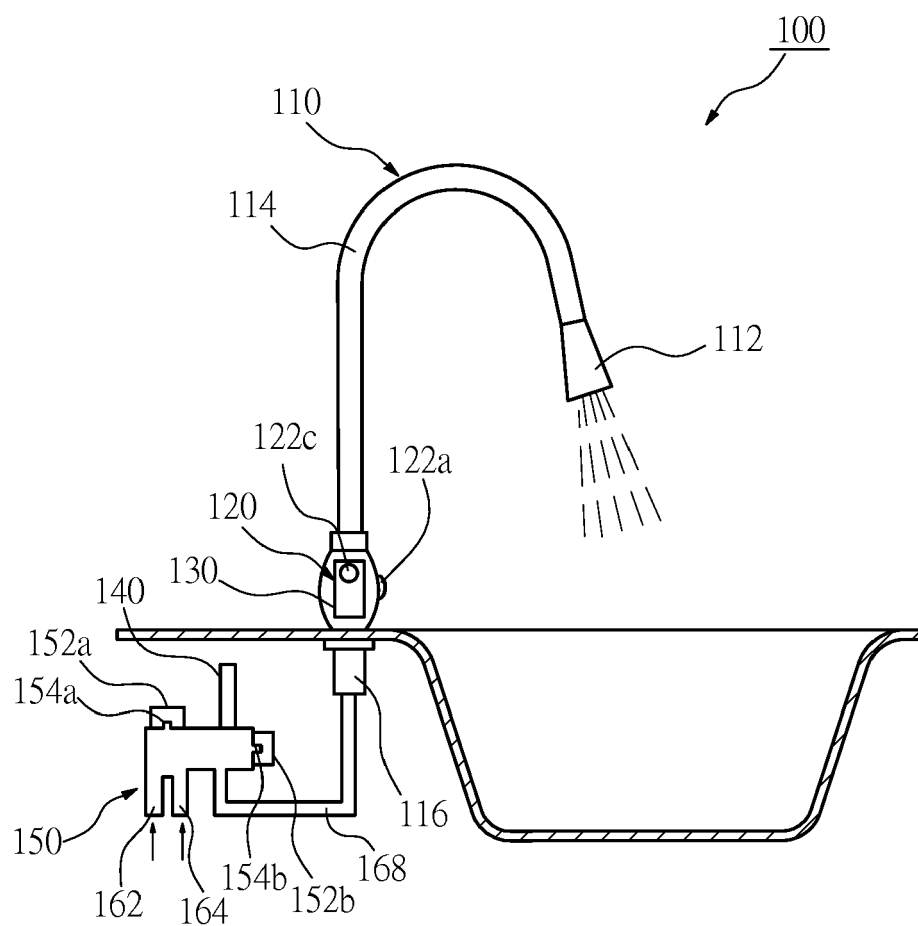


FIG. 1b

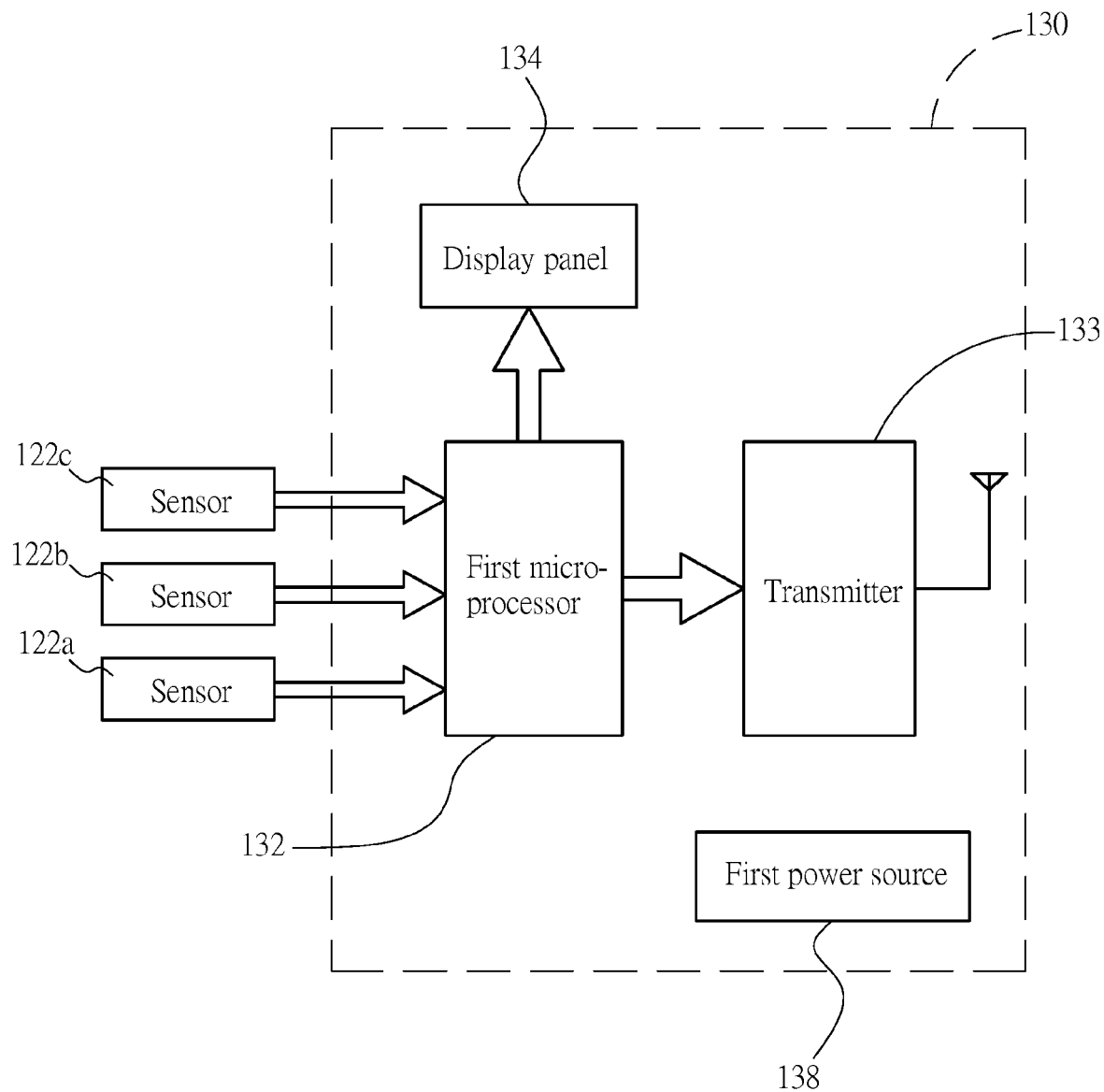


FIG. 2

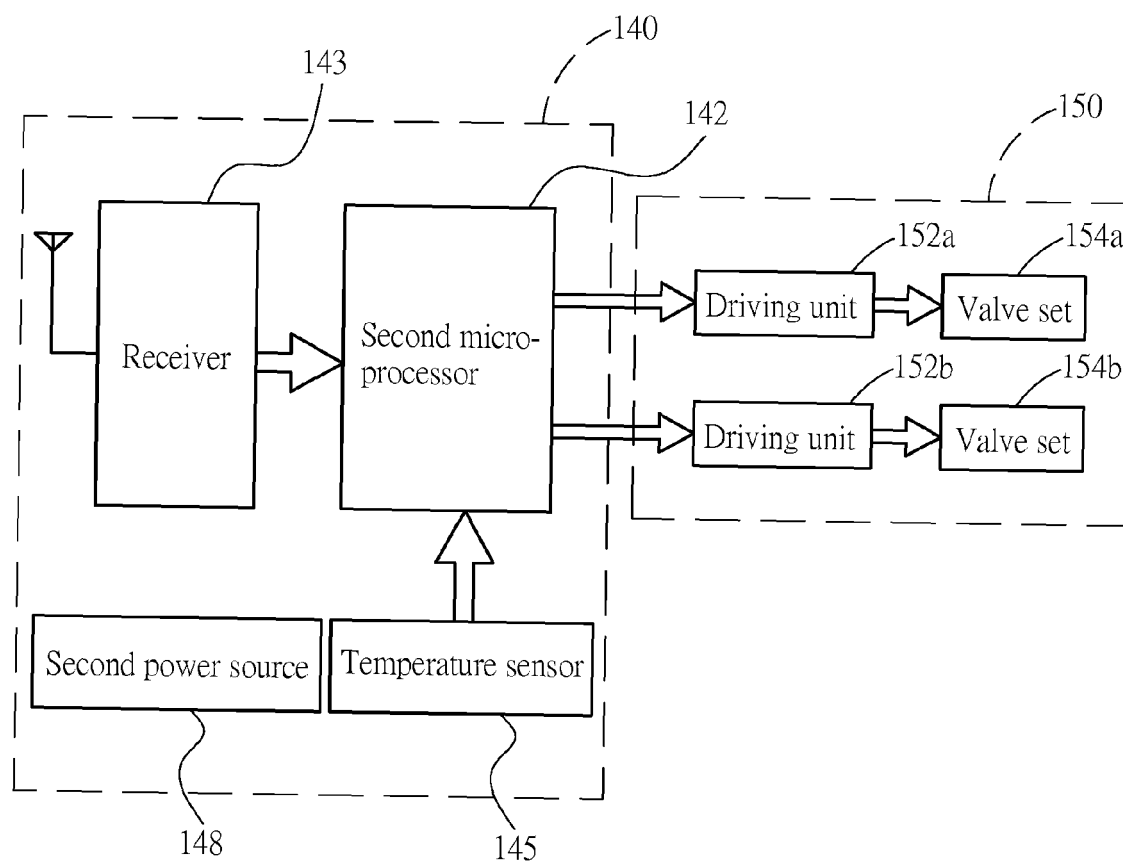


FIG. 3

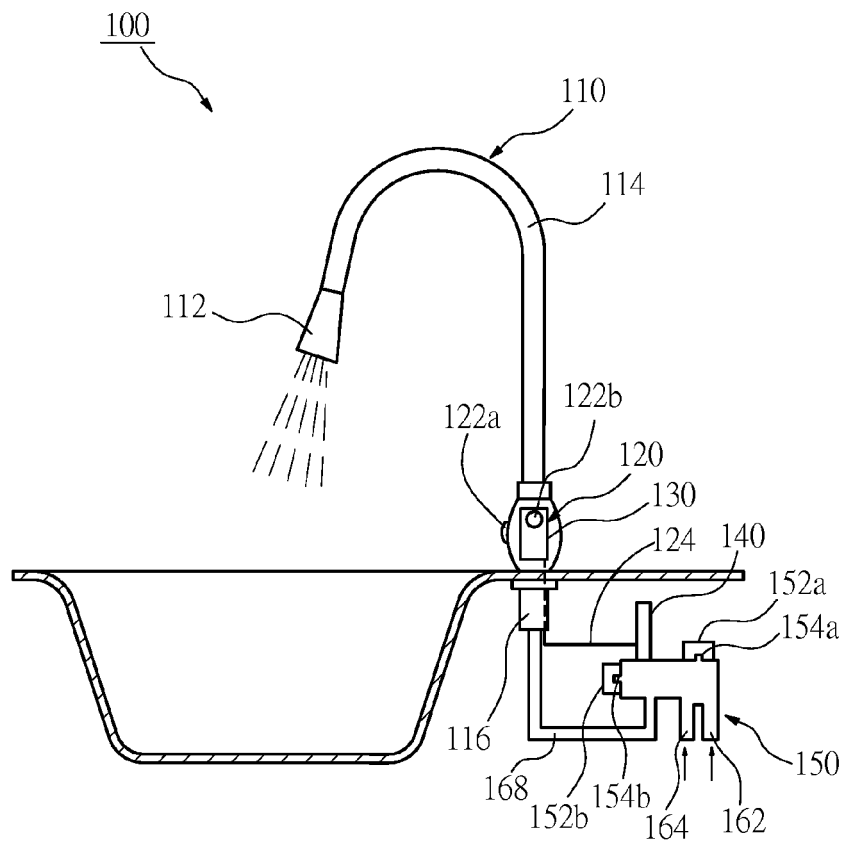


FIG. 4

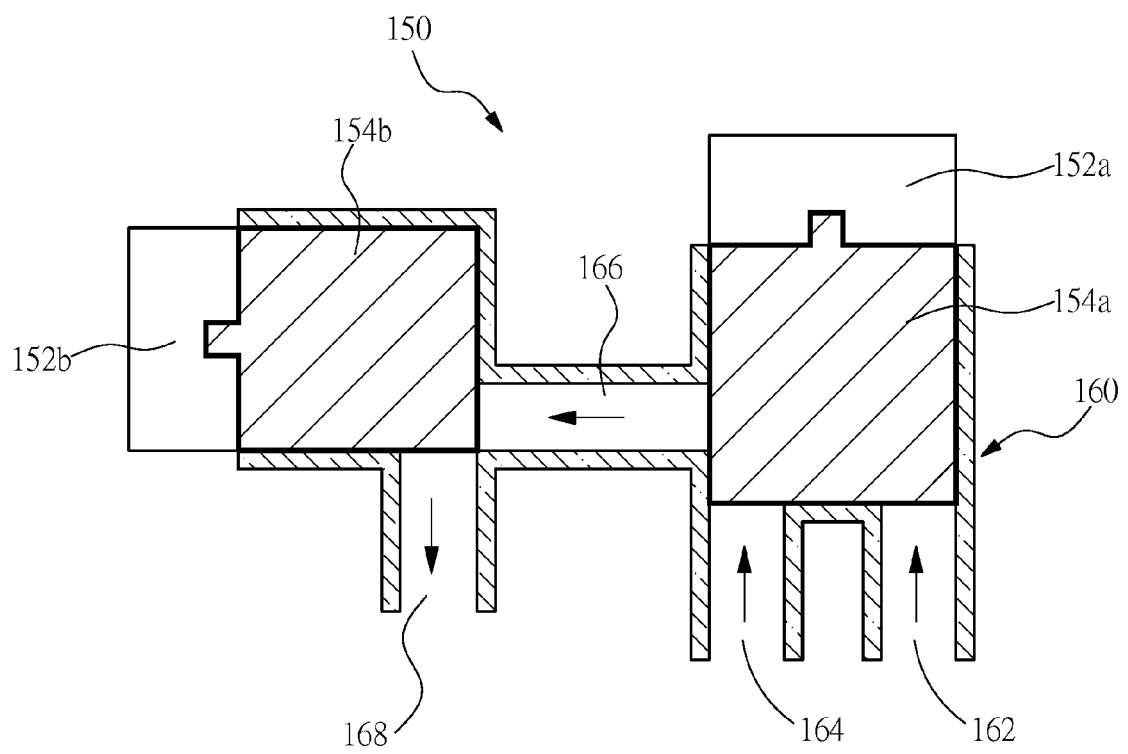


FIG. 5

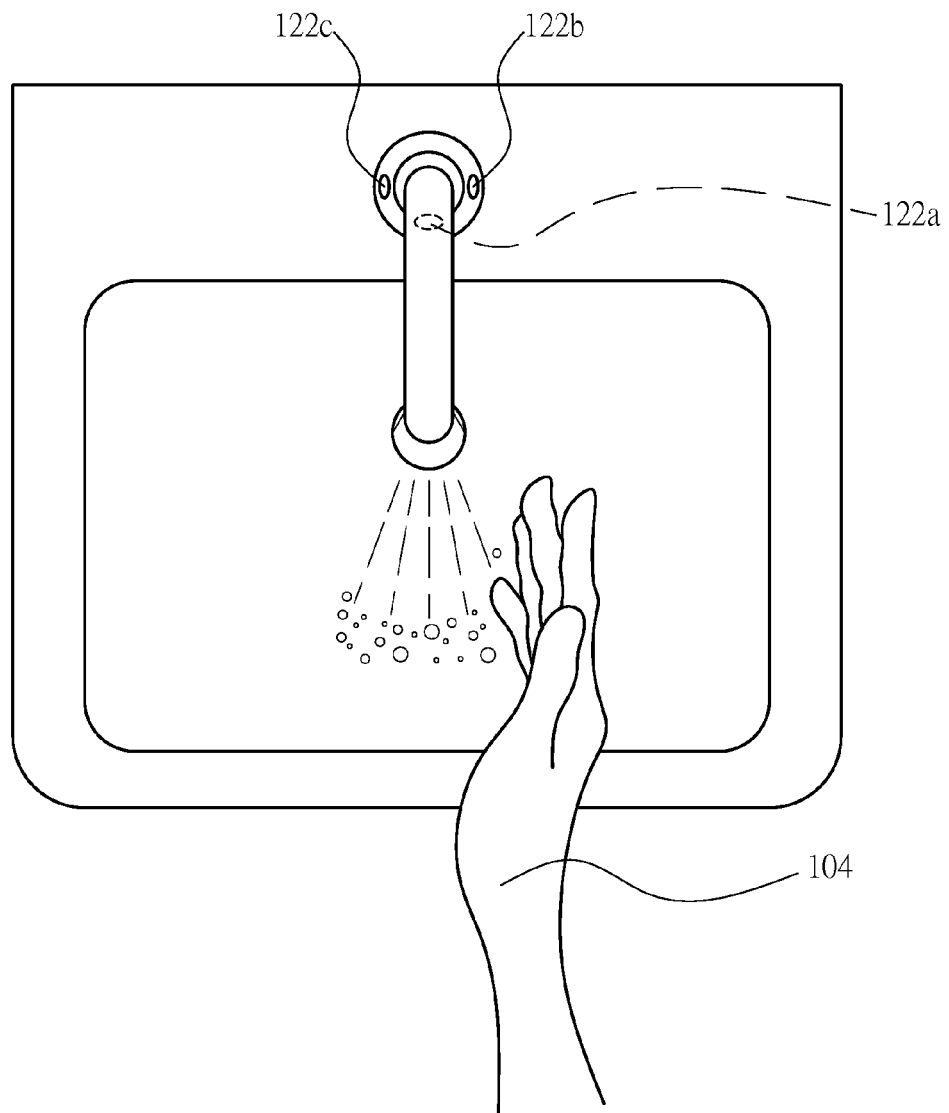


FIG. 6a

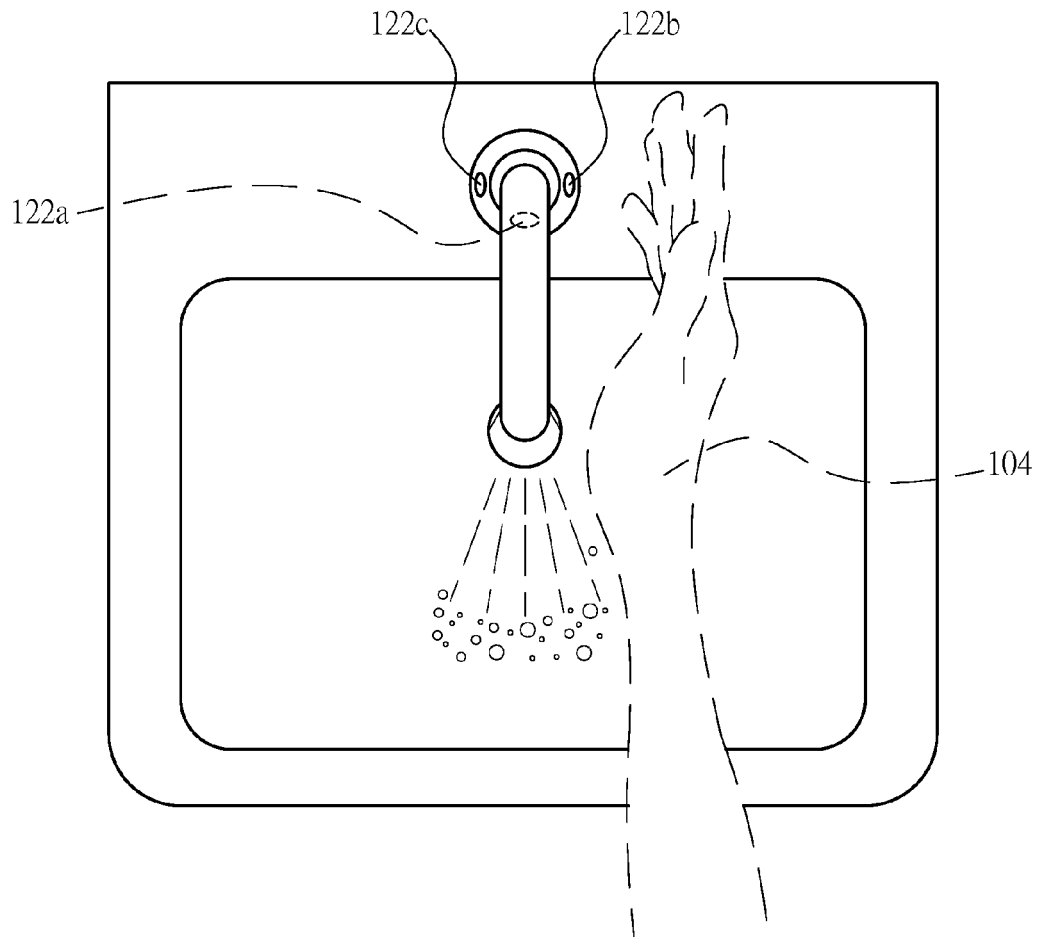


FIG. 6b

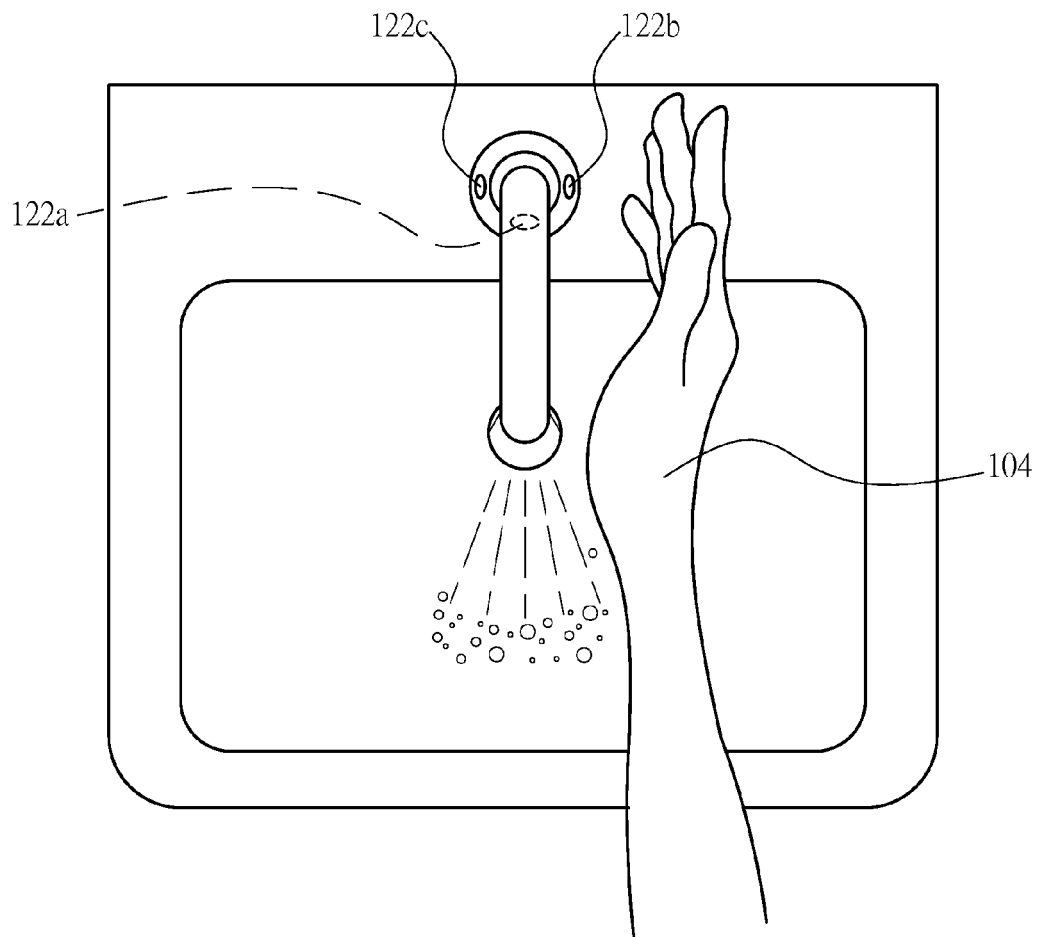


FIG. 6c

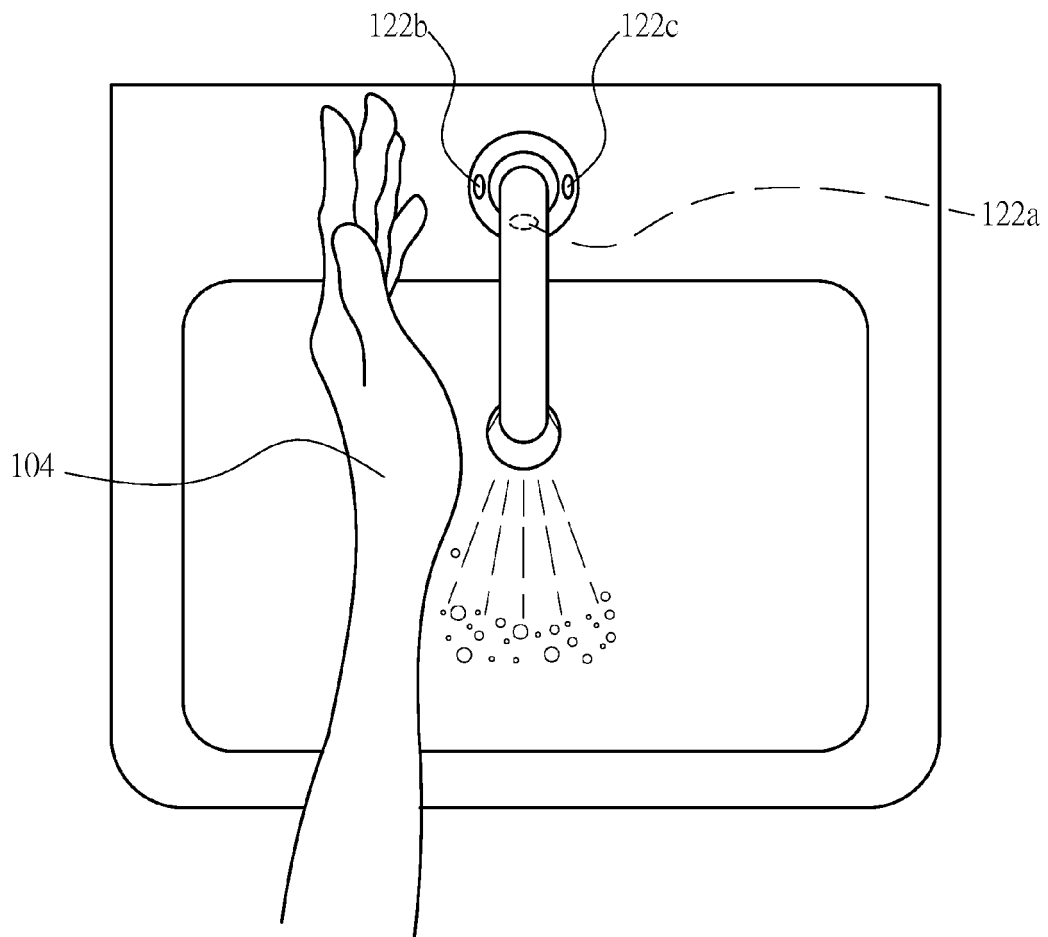


FIG. 6d

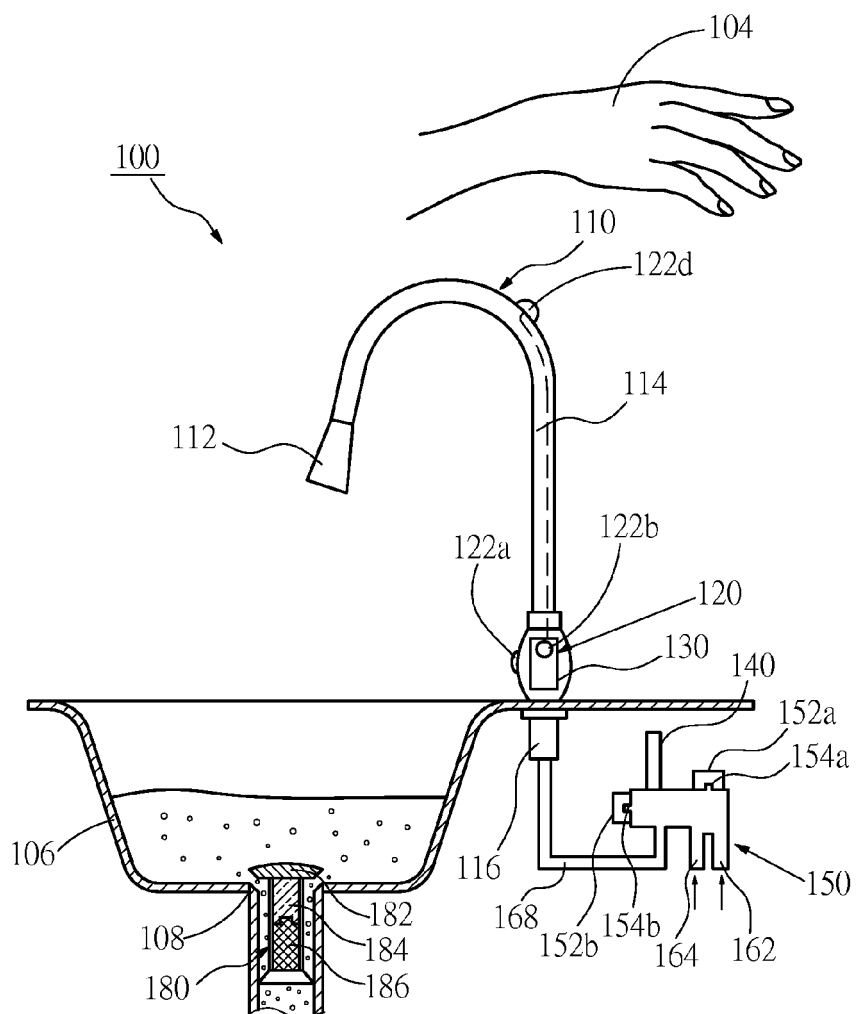


FIG. 7a

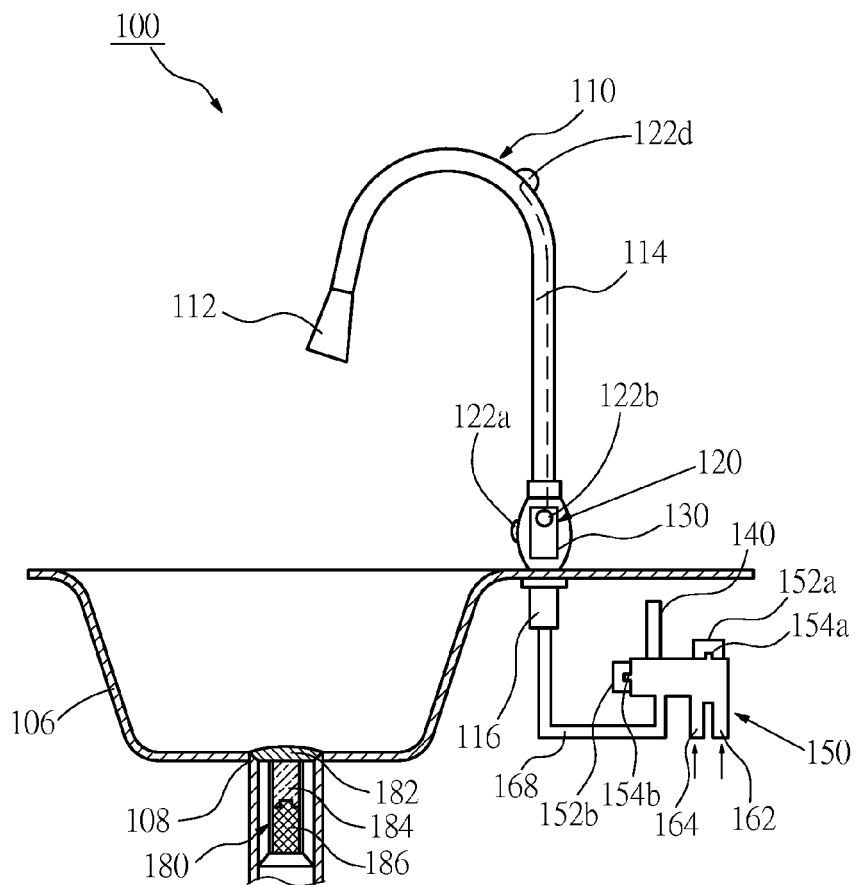


FIG. 7b

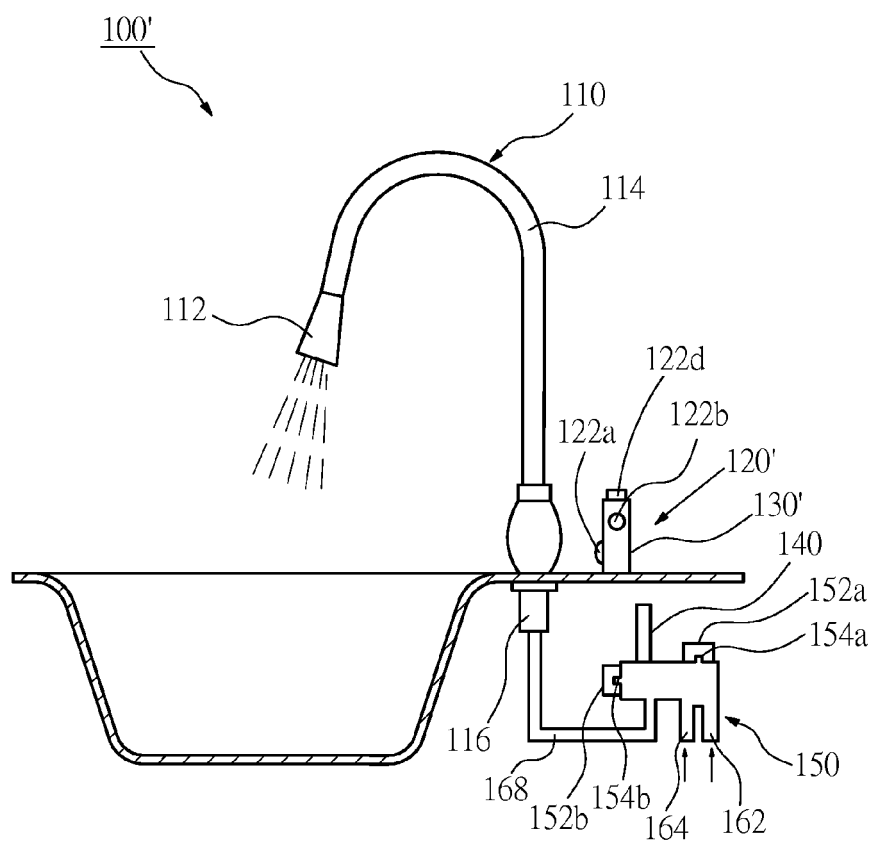


FIG. 8a

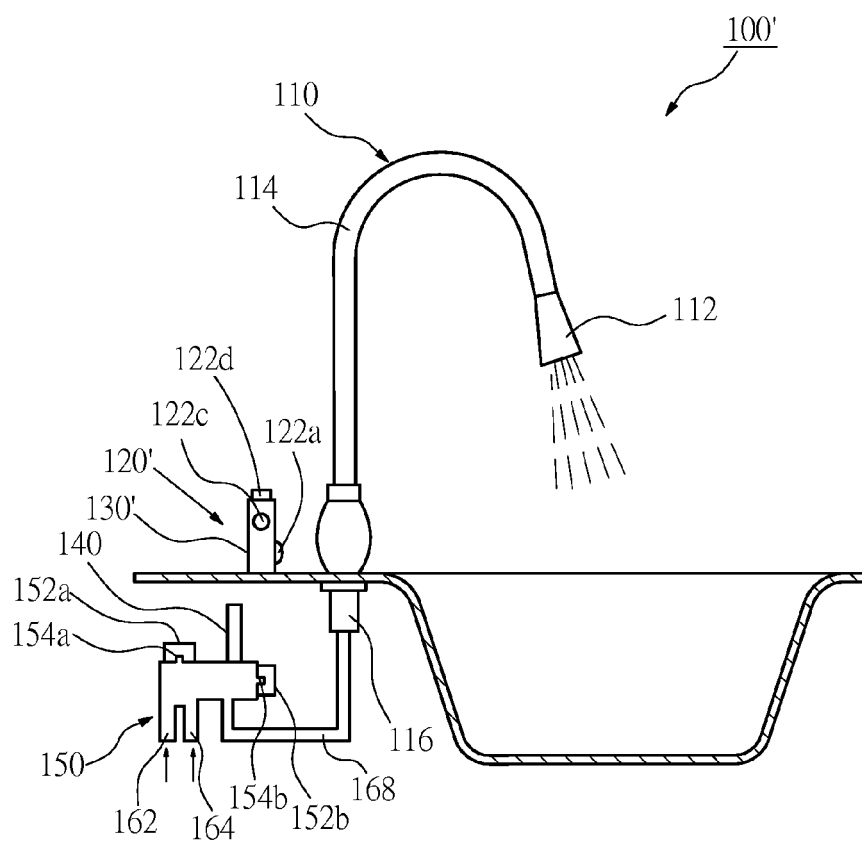


FIG. 8b

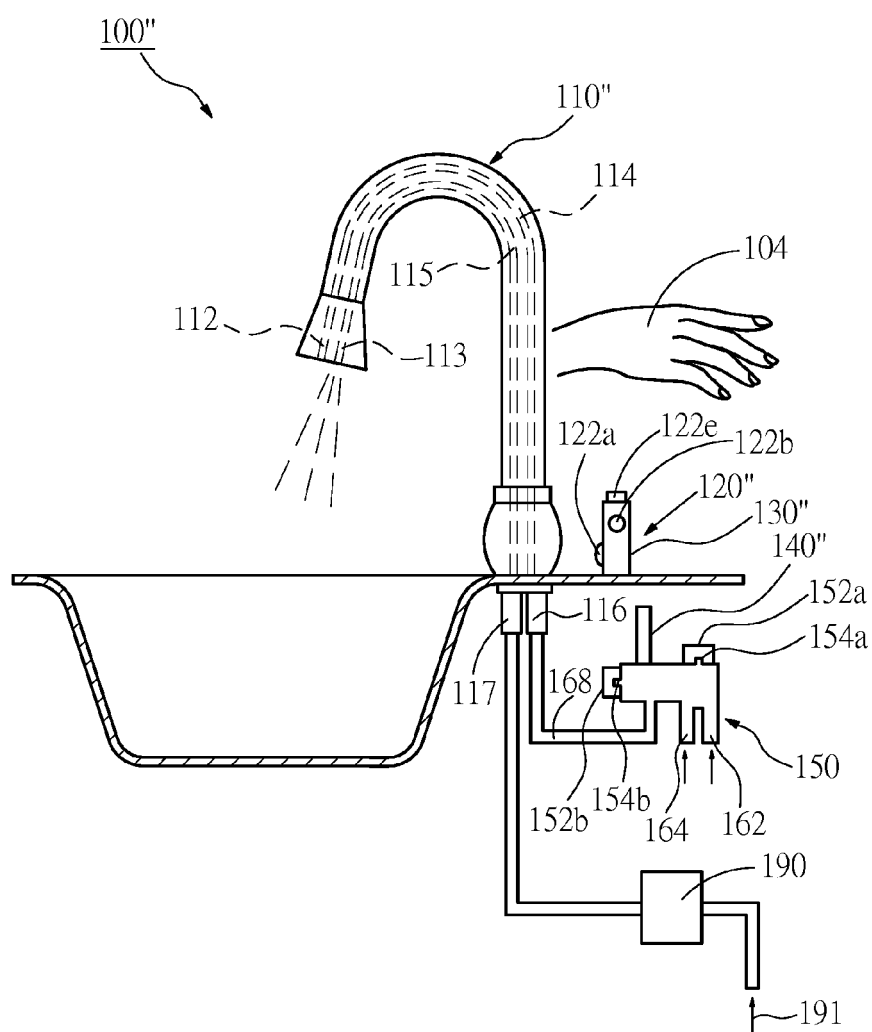


FIG. 9a

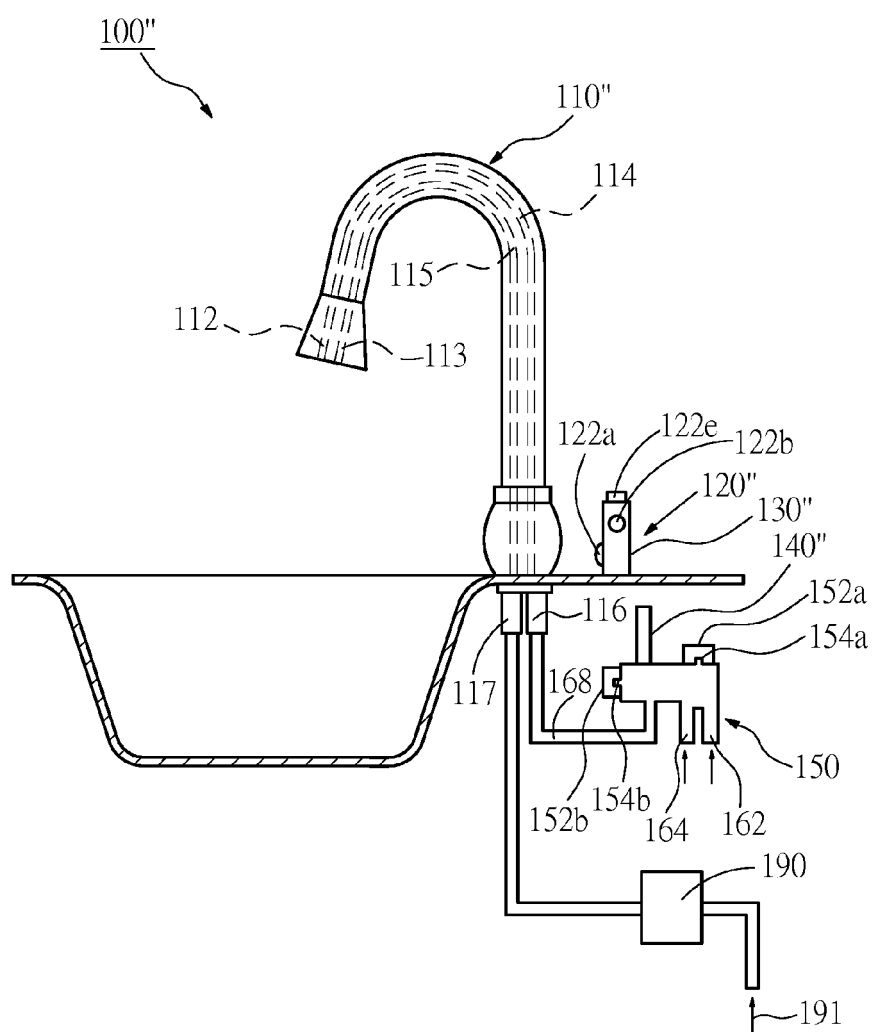


FIG. 9b



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Application Number
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A	* paragraphs [0052], [0053], [0063], [0066] - [0071], [0076] *	2-4	
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