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**AN ONLINE WATER QUALITY MONITOR**

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Abstract

The present invention relates to an online water quality monitor, which comprises a floating body, a base, an upper cover, a water guiding mechanism and a cleaning mechanism. The floating body is of a disc shape, the base is installed in the center of the floating body, and the upper cover is fixed on the upper surface of the floating body and is installed right above the base in a buckled manner. The inside of the base is provided with a signal acquisition slot and a signal processing slot. One side of the base is provided with an outfall. The inside of the base is provided with a drainage channel. The inside of the signal acquisition slot is provided with a sensing module, and the inside of the signal processing slot is provided with an online communication module; the water guiding mechanism and the cleaning mechanism are communicated with the water inlet of the said signal acquisition slot, and the outfall is communicated with the outlet of the signal acquisition slot through the drainage channel, which is provided with a one-way valve. Through the design of the water inlet and the flushing channels, the online water quality monitor improves the accuracy of data acquisition, and it has efficient data upload and convenient hardware expansion capabilities, so that the effective online water quality monitoring is further realized.

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DRAWINGS:

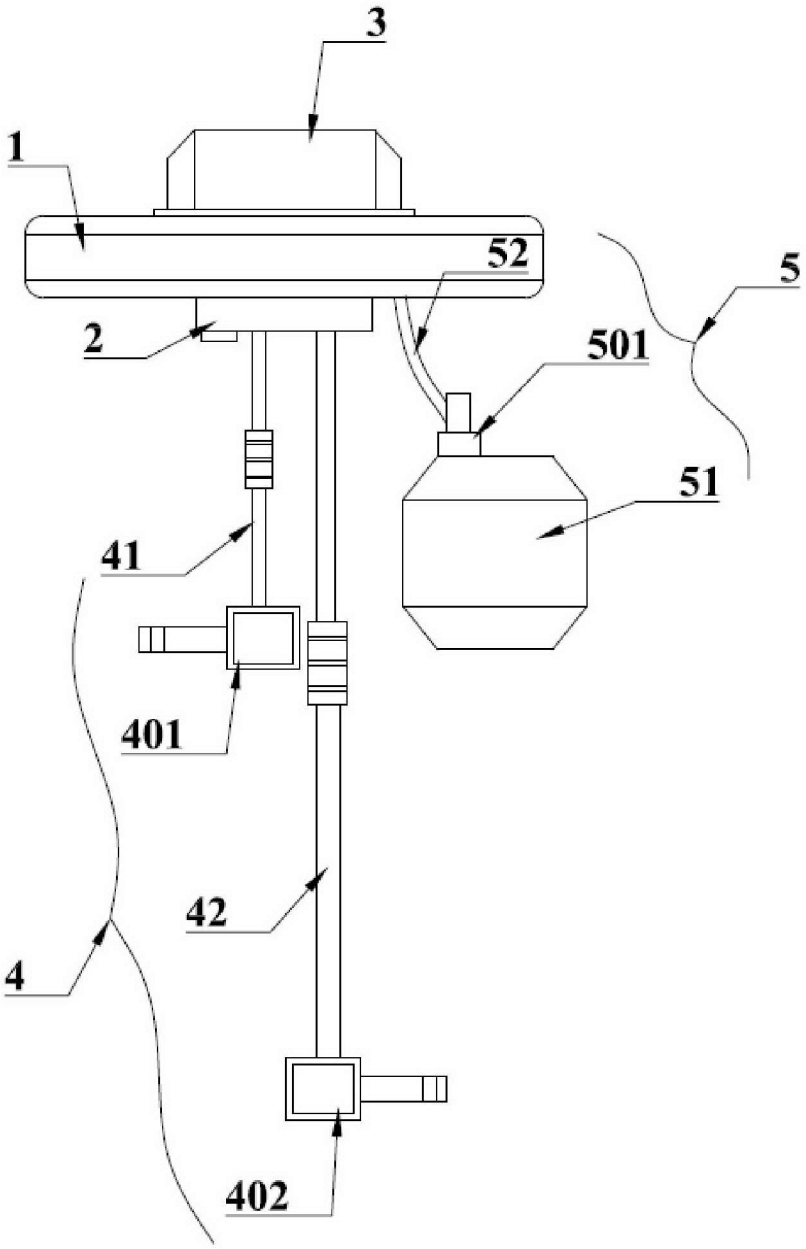


Fig. 1

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# AN ONLINE WATER QUALITY MONITOR

## BACKGROUND OF THE INVENTION

[0001] Technical Field

[0002] The present invention relates to the field of online water quality monitors, in particular to an online water quality monitor.

[0003] Description of Related Art

[0004] With the increasingly deterioration of the environment and the improvement of living quality, people pay more and more attention to water quality data. At present, water quality test equipment usually adopts the methods of chemical reaction, electrical sensing, etc. to carry out data acquisition. Among them, the electrical sensing method has the advantages of a fast response speed and multiple varieties in acquired substances, and it is gradually become the mainstream water quality measurement method. However, the existing electrical sensing test equipment has the defects of low data accuracy and large deviation due to the accumulated water pollution on the sensor surface, and it is difficult to achieve efficient and continuous online testing due to the weak data signal strength and a low transmission rate. In addition, the integrated design of its internal sensor makes it difficult for the instrument to carry out hardware expansion.

## BRIEF SUMMARY OF THE INVENTION

[0005] The technical problems to be solved by the present invention are that: The defects of low data accuracy and large deviation in the existing electrical sensing test equipment due to the influence from the accumulated water pollution on the sensor surface. The invention provides an online water quality monitor, which improves the data acquisition accuracy through the design of the inlet and the flushing channels. The design of the acquisition sensing and signal processing components makes the monitor have efficient data upload and convenient hardware expansion capabilities, so that effective online monitoring is further realized.

[0006] The online water quality monitor comprises a floating body, a base, an upper cover, a

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water guiding mechanism and a cleaning mechanism. The said floating body is of a disc shape, the said base is installed in the center of the floating body, and the said upper cover is fixed on the upper surface of the floating body and is installed right above the base in a buckled manner. Among them, the inside of the said base is provided with a signal acquisition slot and a signal processing slot. One side of the base is provided with an outfall. The inside of the base is provided with a drainage channel. The inside of the said signal acquisition slot is provided with a sensing module, and the inside of the signal processing slot is provided with an online communication module; the said water guiding mechanism and the cleaning mechanism are communicated with the water inlet of the said signal acquisition slot, and the said outfall is communicated with the outlet of the signal acquisition slot through the drainage channel, which is provided with a one-way valve. The complete monitor is positioned on the water surface to be monitored through the floating body. The water guiding mechanism is used for guiding water to be monitored into the signal acquisition slot for data acquisition by the sensing module. The cleaning mechanism is used for switching the water quality or flushing the sensing module at the stages of starting up and shutting down. The testing water and flushing water are drained out from the outfall through the drainage channel, so that the accumulated interference and the flowing water quality sensing are removed, and the water quality testing data accuracy is increased; the data signals acquired by the sensing module is transmitted to the communication module, and after the signal processing, they are continuously sent to the remote monitoring terminal, so that the continuous online monitoring is realized.

[0007] In order to achieve the comprehensive monitoring of water quality at multiple depths, the said water guiding mechanism comprises an upper water guiding pipe and a lower water guiding pipe. The lower ends of the said upper water guiding pipe and the lower water guiding pipe are respectively provided with an upper water pump and a lower water pump, and the upper ends of the upper water guiding pipe and the lower water guiding pipe are communicated with the said signal acquisition slot. The crossing-acquisition of water quality at different depths makes the test data have a larger coverage.

[0008] In order to realize the water quality switching of the sensing module at different depths and the cleaning of it at starting up and shutting down, the said cleaning mechanism comprises a cleaning water bag and a cleaning water conduit. The said cleaning water bag is provided with a cleaning pump, and the upper end of the said cleaning water conduit is communicated to the

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signal acquisition slot. So that the interference from the accumulated water on the acquisition data is further eliminated, and the accuracy of the acquisition data is improved.

[0009] In order to realize flexible adjustment of water quality acquisition at different depths, the said upper and the lower water guiding pipes are telescopic metal pipes, and the said cleaning water conduit is a polyethylene hose. The telescopic metal hose is formed by two segments of metal pipes in a socket manner, and a sealing rubber sleeve is used between the two to realize banding, positioning and the internal and external water sealing.

[0010] In order to achieve synchronous acquisition of multiple data, the said sensing module comprises a temperature sensor, a dissolved oxygen sensor, a pH sensor and an OPR sensor. The temperature sensor is used for acquiring water temperature, the dissolved oxygen sensor is used for obtaining the dissolved oxygen content in water, the pH sensor is used for getting the pH value of water quality, and the OPR sensor is used for acquiring comprehensive indicators of microorganisms, organic matters, inorganic matters, macro elements, and trace elements.

[0011] In order to achieve the comprehensive data processing and the online uploading, the said online communication module comprises a multi-channel signal acquisition module, a main control chip and a network module. The said temperature sensor, the dissolved oxygen sensor, the pH sensor, and the OPR sensor are connected to the input terminal of the said multi-channel signal acquisition module. The output terminal of the multi-channel signal acquisition module is connected with the input terminal of the said main control chip, the output terminal of the main control chip is connected with the upper water pump, the lower water pump, and the cleaning pump, and the said network module is connected with the main control chip. The said network module adopts a CAT14G chip module, which is in communication connection with the multi-channel signal acquisition module through the 485 protocol, so that the flexible expansion of newly added sensors is facilitated. The 4G chip module-CAT1 can carry out the wireless communication with the monitoring client and the cloud as well as the data uploading via the Internet.

[0012] The present invention relates to an online water quality monitor, which overcomes the

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defects of low data accuracy and large deviation in the existing electrical sensing test equipment due to the influence from the accumulated water pollution on the sensor surface. The online water quality monitor improves the data acquisition accuracy through the design of the inlet and the flushing channels. The design of the acquisition sensing and signal processing components makes the monitor have efficient data upload and convenient hardware expansion capabilities, so that effective online monitoring is further realized.

## BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0013] The following part is a further description to the online water quality monitor of the present invention in combination with the drawings:

[0014] Fig. 1 is a schematic diagram for the plane structure of the online water quality monitor;

[0015] Fig. 2 is a schematic diagram for the internal structure of the said base in the online water quality monitor;

[0016] Fig. 3 is a block diagram for the logical connection of the said sensing module and the line communication module in the online water quality monitor.

[0017] In the drawings:

[0018] 1 - Floating body, 2 - Base, 3 - Upper cover, 4 - Water guiding mechanism, 5 - Cleaning mechanism, 6 - Sensing module, 7 - Online communication module;

[0019] 21 - Signal acquisition slot, 22 - Signal processing slot, 23 - Outfall, 24 - Drainage channel; 41 - Upper water guiding pipe, 42 - Lower water guiding pipe; 51 - Cleaning water bag, 52 - Cleaning water conduit;

[0020] 204 - One-way valve; 401 - Upper pump, 402 - Lower pump; 501 - Cleaning pump.

## DETAILED DESCRIPTION OF THE INVENTION

[0021] Invention 1: As shown in Figures 1 and 2, the online water quality monitor comprises a

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floating body 1, a base 2, an upper cover 3, a water guiding mechanism 4 and a cleaning mechanism 5. The said floating body 1 is of a disc shape, the said base 2 is installed in the center of the floating body 1, and the said upper cover 3 is fixed on the upper surface of the floating body 1 and is installed right above the base 2 in a buckled manner. Among them, the inside of the said base 2 is provided with a signal acquisition slot 21 and a signal processing slot 22. One side of the base 2 is provided with an outfall 23. The inside of the base 2 is provided with a drainage channel 24. The inside of the said signal acquisition slot 21 is provided with a sensing module 6, and the inside of the signal processing slot 22 is provided with an online communication module 7; the said water guiding mechanism 4 and the cleaning mechanism 5 are communicated with the water inlet of the said signal acquisition slot 21, and the said outfall 23 is communicated with the outlet of the signal acquisition slot 21 through the drainage channel 24, and the said drainage channel 24 is provided with a one-way valve 204. The complete monitor is positioned on the water surface to be monitored through the floating body. The water guiding mechanism is used for guiding water to be monitored into the signal acquisition slot for data acquisition by the sensing module. The cleaning mechanism is used for switching the water quality or flushing the sensing module at the stages of starting up and shutting down. The testing water and flushing water are drained out from the outfall through the drainage channel, so that the accumulated interference and the flowing water quality sensing are removed, and the water quality testing data accuracy is increased; the data signals acquired by the sensing module is transmitted to the communication module, and after the signal processing, they are continuously sent to the remote monitoring terminal, so that the continuous online monitoring is realized.

[0022] Invention 2: In order to achieve the comprehensive monitoring of water quality at multiple depths, the said water guiding mechanism 4 of the online water quality monitor comprises an upper water guiding pipe 41 and a lower water guiding pipe 42. The lower ends of the said upper water guiding pipe 41 and the lower water guiding pipe 42 are respectively provided with an upper water pump 401 and a lower water pump 402, and the upper ends of the upper water guiding pipe 41 and the lower water guiding pipe 42 are communicated with the said signal acquisition slot 21. The crossing-acquisition of water quality at different depths makes the test data have a larger coverage. In order to realize the water quality switching of the sensing module at different depths and the cleaning of it at starting up and shutting down, the said cleaning mechanism 5 of the online water quality monitor comprises a cleaning water bag 51 and a cleaning water conduit 52. The said cleaning water bag 51 is provided with a cleaning pump 501, and the upper end of the said cleaning water conduit 52 is communicated to the signal

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acquisition slot 21. So that the interference from the accumulated water on the acquisition data is further eliminated, and the accuracy of the acquisition data is improved. The remaining structures and parts are as described in Invention 1, and they will not be described repeatedly.

[0023] Invention 3: In order to realize flexible adjustment of water quality acquisition at different depths, the said upper water guiding pipe 41 and the lower water guiding pipe 42 of the online water quality monitor are telescopic metal pipes, and the said cleaning water conduit 52 is a polyethylene hose. The telescopic metal hose is formed by two segments of metal pipes in a socket manner, and a sealing rubber sleeve is used between the two to realize banding, positioning and the internal and external water sealing. The remaining structures and parts are as described in Invention 1, and they will not be described repeatedly.

[0024] Invention 4: As shown in Fig. 3, in order to achieve synchronous acquisition of multiple data, the said sensing module 6 of the online water quality monitor comprises a temperature sensor, a dissolved oxygen sensor, a pH sensor and an OPR sensor. The temperature sensor is used for acquiring water temperature, the dissolved oxygen sensor is used for obtaining the dissolved oxygen content in water, the pH sensor is used for getting the pH value of water quality, and the OPR sensor is used for acquiring comprehensive indicators of microorganisms, organic matters, inorganic matters, macro elements, and trace elements. In order to achieve the comprehensive data processing and the online uploading, the said online communication module 7 of the online water quality monitor comprises a multi-channel signal acquisition module, a main control chip and a network module. The said temperature sensor, the dissolved oxygen sensor, the pH sensor, and the OPR sensor are connected to the input terminal of the said multi-channel signal acquisition module. The output terminal of the multi-channel signal acquisition module is connected with the input terminal of the said main control chip, the output terminal of the main control chip is connected with the said upper water pump 401, the lower water pump 402, and the cleaning pump 501, and the said network module is connected with the main control chip. The said network module adopts a CAT14G chip module, which is in communication connection with the multi-channel signal acquisition module through the 485 protocol, so that the flexible expansion of newly added sensors is facilitated. The 4G chip module-CAT1 can carry out the wireless communication with the monitoring client and the cloud as well as the data uploading via the Internet. The remaining structures and parts are as described in Invention 1, and they will not be described repeatedly.

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[0025] During running: The complete monitor is positioned on the water surface to be monitored through the floating body. The water guiding mechanism is used for guiding water to be monitored into the signal acquisition slot for data acquisition by the sensing module. The cleaning mechanism is used for switching the water quality or flushing the sensing module at the stages of starting up and shutting down. The testing water and flushing water are drained out from the outfall through the drainage channel, so that the accumulated interference and the flowing water quality sensing are removed, and the water quality testing data accuracy is increased; the data signals acquired by the sensing module is transmitted to the communication module, and after the signal processing, they are continuously sent to the remote monitoring terminal, so that the continuous online monitoring is realized.

[0026] The online water quality monitor overcomes the defects of low data accuracy and large deviation in the existing electrical sensing test equipment due to the influence from the accumulated water pollution on the sensor surface. The online water quality monitor improves the data acquisition accuracy through the design of the inlet and the flushing channels. The design of the acquisition sensing and signal processing components makes the monitor have efficient data upload and convenient hardware expansion capabilities, so that effective online monitoring is further realized.

[0027] It should be understood that although the present description is described in terms of the implementation, not every implementation includes only one separate technical solution, and such a description mode of the description is merely for the sake of clarity. A person skilled in the art should take the description as a whole, and the technical solutions in all the embodiments may be appropriately combined to form other implementations that can be understood by a person skilled in the art.

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What is claimed is:

1. An online water quality monitor comprising a floating body, a base, an upper cover, a water guiding mechanism and a cleaning mechanism, the floating body is of a disc shape, the said base is installed in the center of the floating body, and the said upper cover is fixed on the upper surface of the floating body and is installed right above the base in a buckled manner, among them, the inside of the said base is provided with a signal acquisition slot and a signal processing slot, one side of the base is provided with an outfall, the inside of the base is provided with a drainage channel, the inside of the said signal acquisition slot is provided with a sensing module, and the inside of the signal processing slot is provided with an online communication module; the said water guiding mechanism and the cleaning mechanism are communicated with the water inlet of the said signal acquisition slot, and the said outfall is communicated with the outlet of the signal acquisition slot through the drainage channel, which is provided with a one-way valve.

2. The online water quality monitor according to claim 1, the water guiding mechanism comprises an upper water guiding pipe and a lower water guiding pipe, the lower ends of the said upper water guiding pipe and the lower water guiding pipe are respectively provided with an upper water pump and a lower water pump, and the upper ends of the upper water guiding pipe and the lower water guiding pipe are communicated with the said signal acquisition slot.

3. The online water quality monitor according to claim 2, the said cleaning mechanism comprises a cleaning water bag and a cleaning water conduit, the cleaning water bag is provided with a cleaning pump, and the upper end of the said cleaning water conduit is communicated to the signal acquisition slot.

4. The online water quality monitor according to claim 3, the upper and the lower water guiding pipes are telescopic metal pipes, and the said cleaning water conduit is a polyethylene hose.

5. The online water quality monitor according to claim 1, the sensing module comprises a temperature sensor, a dissolved oxygen sensor, a pH sensor and an OPR sensor, the online communication module comprises a multi-channel signal acquisition module, a main control chip and a network module, the said temperature sensor, the dissolved oxygen sensor, the pH

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sensor, and the OPR sensor are connected to the input terminal of the said multi-channel signal acquisition module, the output terminal of the multi-channel signal acquisition module is connected with the input terminal of the said main control chip, the output terminal of the main control chip is connected with the upper water pump, the lower water pump, and the cleaning pump, and the said network module is connected with the main control chip.

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DRAWINGS:

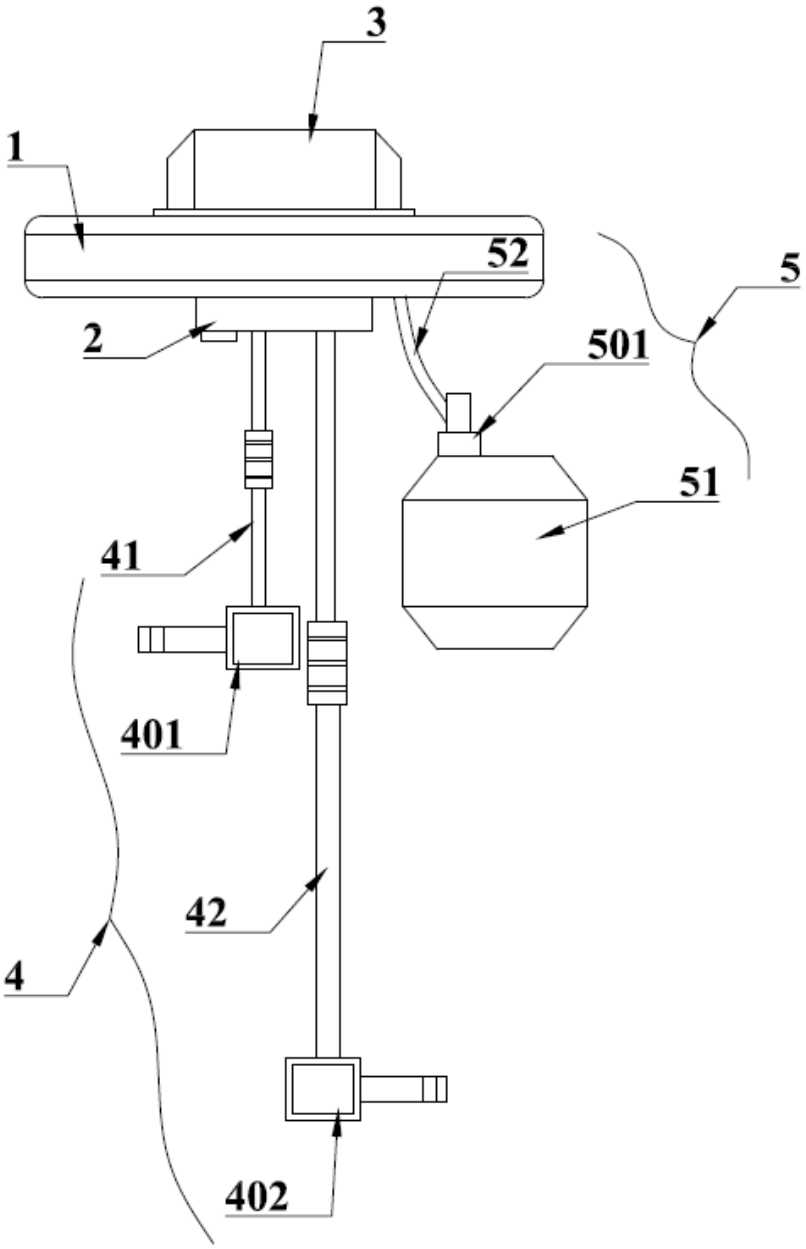


Fig. 1

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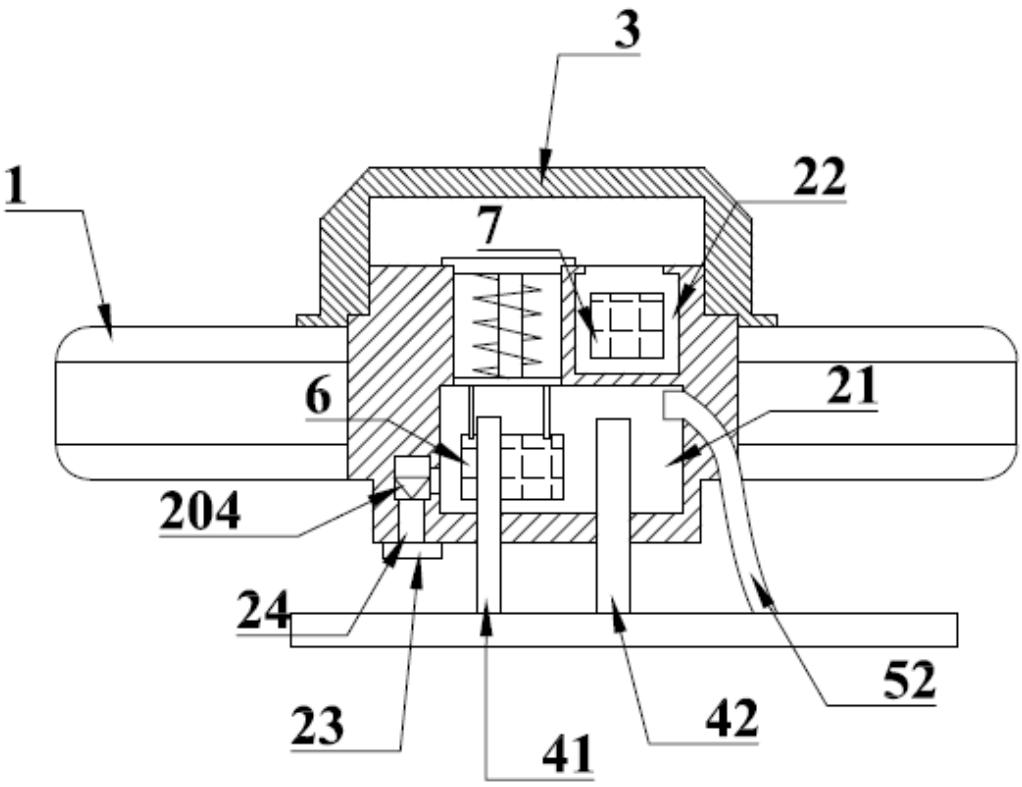


Fig. 2

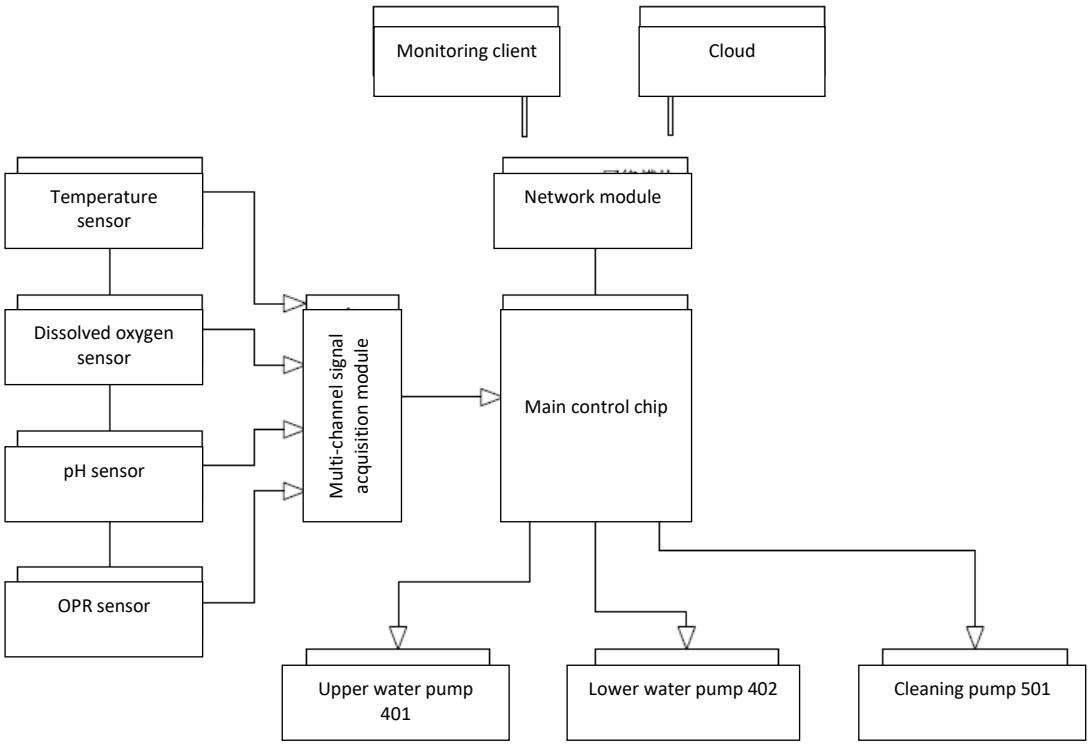


Fig. 3