

[54] **AUTOMATIC WATER-SUPPLY APPARATUS**
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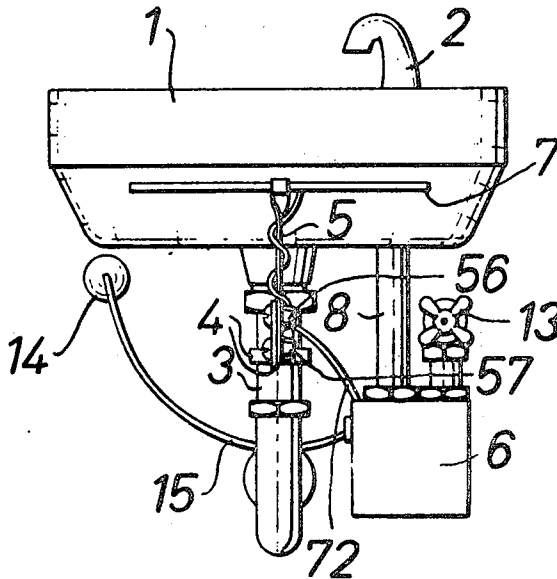
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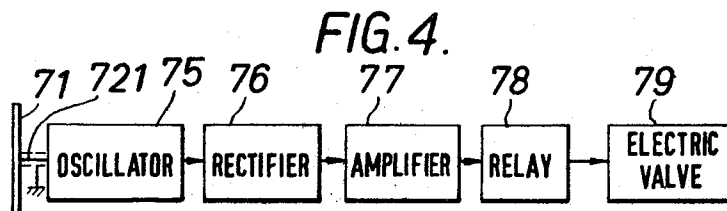
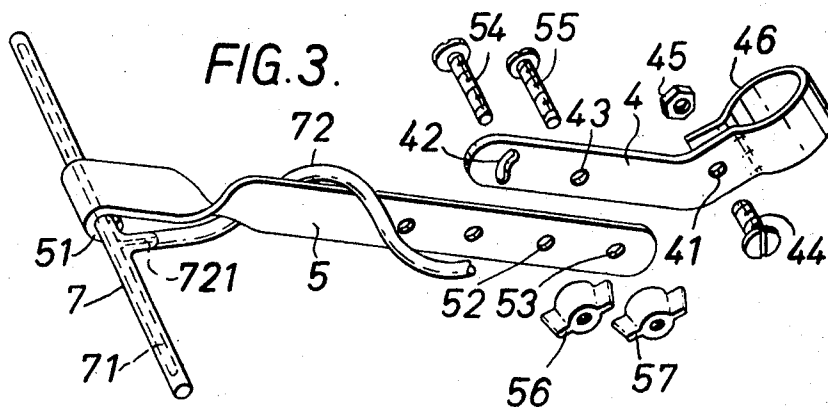
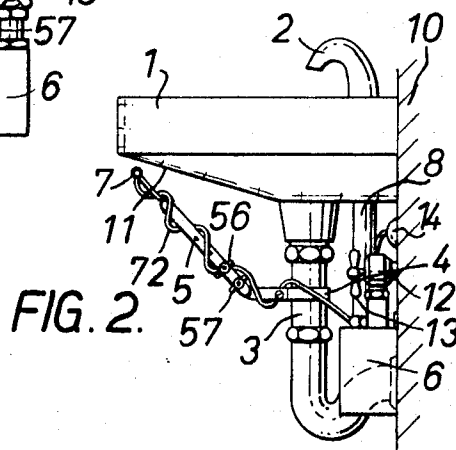
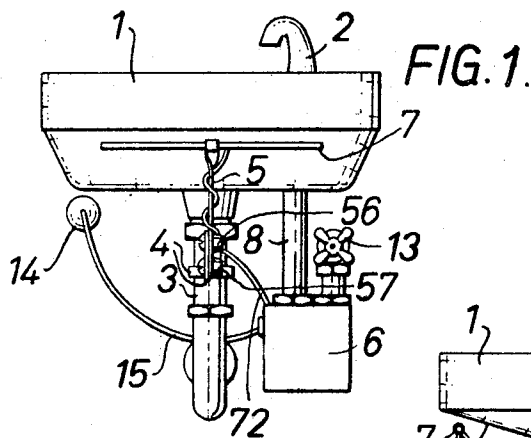
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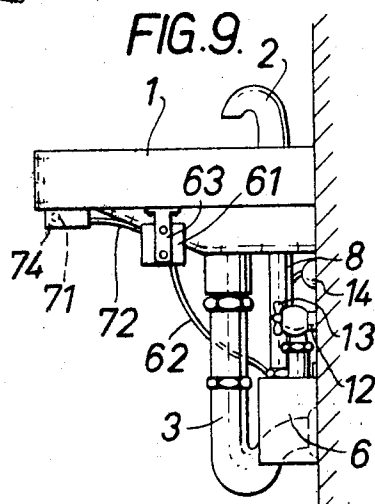
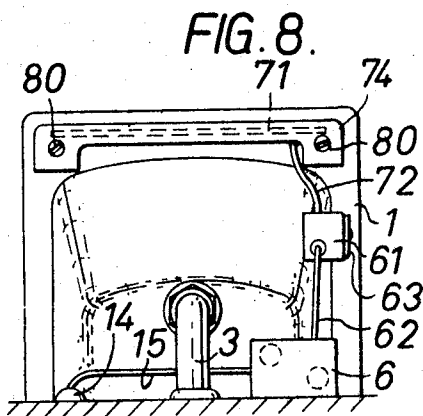
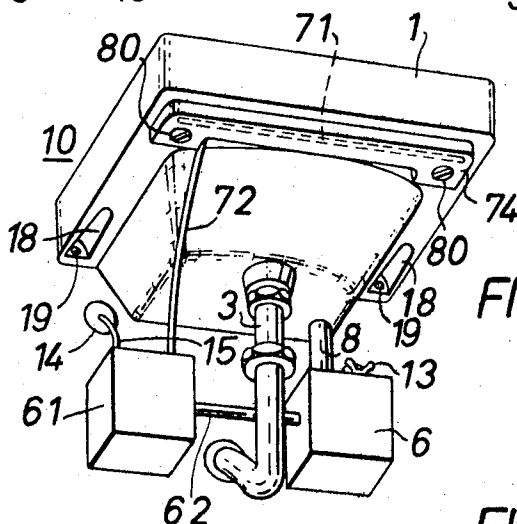
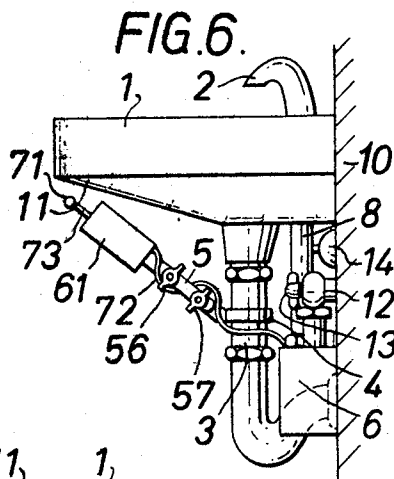
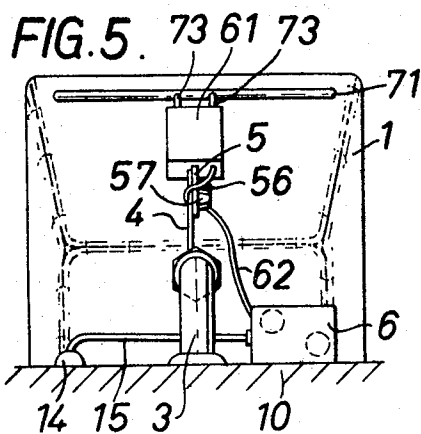
[57] **ABSTRACT**
A proximity detecting electrode for an electrically controllable faucet valve device is located under the front bottom of the basin in order to detect the proximity of a man approaching the basin. On account of the above location of the electrode, the sensitivity of detection is improved, evading a disturbance by water drops sticking in or around the basin. And moreover, as a result of the above improvement of the sensitivity, tolerance for the position of the electrode can be widened, making the assembly of the automatic water-supply apparatus easier even for a person not so versed in electronics.

13 Claims, 9 Drawing Figures





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AUTOMATIC WATER-SUPPLY APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to an improvement in automatic water-supply apparatus.

In automatic water-supply apparatuses in which an electric valve for controlling water is made to open when a human body nears, a proximity detecting electrode or antenna is conventionally located in the rear part of the basin, namely close to the wall on which the basin is fixed. In such apparatus, the user must stretch his hand or hands up to the farthest wall of the basin when he needs the water to run out from the faucet. Consequently, the water stops every time he moves his hands up, for instance, for washing his face, inconveniencing the face-washing action. Moreover, in the above conventional apparatus, high sensitivity in the proximity detection can hardly be obtained because the size of the electrode is limited by the narrow space available for placing the detecting electrode between the rear part of the basin and the wall.

SUMMARY OF THE INVENTION

This invention relates to an improvement in automatic water-supply apparatus which supplies water or hot water by sensitive detection of the proximity of a human body approaching the basin.

The automatic water-supply apparatus of the present invention comprises:

A basin made of electric insulating material and having at least one drain hole and at least one faucet, an electrically controllable valve for controlling the supply of water through said faucet, an electric circuit for controlling said valve, and a proximity detecting electrode which is located under the front bottom of the basin at a specified gap from the bottom face of the basin, and is connected to an input terminal of said electric circuit.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be more fully understood by reference to the following detailed description of specific embodiments taken in conjunction with the drawing, in which:

FIG. 1 is a front view of a first embodiment,

FIG. 2 is a side view of the arrangement of FIG. 1,

FIG. 3 is an enlarged perspective view of disassembled parts of the above apparatus,

FIG. 4 is a block diagram of an electric circuit for the above apparatus,

FIG. 5 is a bottom view of a second embodiment,

FIG. 6 is a side view of the arrangement of FIG. 5,

FIG. 7 is a perspective view seen from the lower front direction, of a third embodiment,

FIG. 8 is a bottom view of a fourth embodiment, and

FIG. 9 is a side view of the arrangement of FIG. 8.

In FIG. 1 and FIG. 2, a faucet 2 is provided on the top face of a basin 1 fixed to a wall 10, and a drain tube 3 is provided on the bottom of the basin 1. An electrically controllable valve provided in a box 6 is connected so as to control water from a supply tube 12 to a tube 8 leading to the faucet 2. Handle 13 is part of a manually controllable stop valve for manually controlling the water supply to the electrically controllable valve.

As seen in FIG. 3, a proximity detecting electrode 71 wrapped in an insulating sheath 7 is supported by curled end 51 of a holding rod 5. An embracing part 46 of a connecting member 4 is fixed to the drain tube 3 by tightly fastening a bolt 44 and a nut 45, and said holding rod 5 is connected to the connecting member 4 by means of bolts 54, 55 passing through holes 42, 43, 52, 53 and engaging nuts 56, 57. One end of an inner conductor 721 of a coaxial cable 72 is connected to said electrode 71, the other end of the inner conductor 721 is connected to an input terminal of an electric circuit provided in the box 6, and an outer conductor of the cable 72 is grounded by the end on the side of the electric circuit.

A connecting plug 14 of a power in-take cord 15 is connected to an electric plug socket on the wall 10. In the above construction, the electrode 71 is located under the front bottom of the basin 1, at a specified spacing from the bottom face 11 of the basin 1. The position of the electrode 71 can be easily adjusted by properly selecting holes in the holding rod 5 for connection with connecting member 4 and by rotating the rod 5 around the bolt 55 passing through the hole 43. The position of electrode 71 should be adjusted to have a specified spacing from the bottom face 11 of the basin 1, not to touch the moist bottom face 11 because such touching likely results in a decrease of Q of the electrode 71. Besides, the position of the electrode 71 should be adjusted in order to obtain the most suitable sensitivity for operation of the valve.

FIG. 4 illustrates a recommendable example of the electric circuit for use with the above apparatus. Upon proximity of a human body to the electrode 71, the oscillator 75, oscillates responding to an increase of capacity of the detecting electrode 71 connected to its input terminal. Rectifier 76 rectifies the output signal of the oscillator 75 and feeds the rectified signal to an amplifier 77. The amplifier 77, preferably a C-class amplifier, amplifies the input signal resulting from the proximity of the human body to the electrode 71, and operates a relay 78 with its amplified output, so as to open an electric valve 79 to allow the water to run out of the faucet 2.

As a consequence of positioning the proximity detecting electrode under the spacious front bottom of the basin, a high and constant Q is obtainable according to the present invention. And moreover, by positioning a sufficiently wide electrode under the front bottom of the basin where massive thigh parts of the human body are near, the change of capacity of electrode, hence, the sensitivity of proximity detection, can be greatly improved as compared to the detection of proximity of a hand or hands to a small detection electrode located in a narrow space behind the basin. The detecting electrode can be easily installed as well as adjusted in its location, because the holder rod for the electrode and its connecting member are installed in a wide space which is very accessible, ensuring precise installation, precise Q and precise capacity. On account of such precise Q and capacity, the apparatus can be immediately used without electrical adjustment upon installation, once adjusted in the manufacture.

Other embodiments of the present invention are illustrated in FIGS. 5 to 9. Throughout these figures, the same numerals designate corresponding parts as those described in connection with FIGS. 1 to 3.

In the second embodiment illustrated in FIG. 5 and FIG. 6, the proximity detecting electrode 71 is fixed to a box 61 containing the electric circuit by a pair of supporting rods 73 which serve also as lead-wires for the electrode. And the box 61 is supported by holding rod 5. A connecting cable 62 is provided between the box 61 containing the electric circuit and the box 6 containing the valve.

This example has an advantage that the length of a connection wire between the electrode 71 and the electric circuit can be kept in a designed constant short length even after adjustment of the location of the electrode, ensuring high and stable sensitivity.

In the third embodiment illustrated by FIG. 7, the proximity detecting electrode 71 is fixed at a specified spacing from the front bottom of the basin 1, in a container 74 made of an insulating material. Said container 74 is fixed on the front bottom of the basin 1 by, for instance, split spring head bolts 80. A coaxial connecting cable 72 connects the electrode 71 to the electric circuit contained in the box 61. Fixing bolts 19 are provided in hollows 18 of the basin 1 for fixing the basin 1 on the wall 10. This example has an advantage that the electrode is firmly fixed to the basin, and therefore, there is little fear of the electrode being damaged even by public use.

In the fourth embodiment illustrated by FIG. 8 and FIG. 9, the proximity detecting electrode 71 is fixed in a container 74 made of an insulating material in the same manner as is described with reference to FIG. 7. In this example, the box 61 containing the electric circuit is fixed under the front bottom of the basin 1 so as to shorten the connecting cable 72 between the electrode 71 and the electric circuit. Said box 61 is fixed underneath the basin 1 with fixing member 63 which is fixed to the basin 1 by, for instance, split spring head bolts.

What we claim is:

1. An automatic water-supply apparatus comprising:
 - a hand washing basin made of electric insulating material and having at least one drain hole and at least one faucet,
 - an electrically controllable valve for controlling the supply of water through said faucet,
 - an electric circuit for controlling said valve, and
 - a proximity detecting electrode which is located under the front bottom of the basin and is connected to an input terminal of said electric circuit, said electrode being an elongated bar extending substantially across the full width of the basin beneath the front bottom surface thereof and spaced therefrom at a position for responding to the thighs of a user.
2. An automatic water-supply apparatus of claim 1, wherein said proximity detecting electrode is supported by a holding means connected to said drain tube in a manner that the position of the electrode can be adjusted.
3. An automatic water-supply apparatus of claim 2,

wherein

said holding means comprises means for adjusting the position of the electrode.

4. An automatic water-supply apparatus of claim 2, wherein said electrode is insulated from said holding means.

5. An automatic water-supply apparatus of claim 2, wherein said electrode is covered by an insulating sheath.

6. An automatic water-supply apparatus of claim 1, wherein said electric circuit is located under the front bottom of the basin.

7. An automatic water-supply apparatus of claim 6, wherein said electrode is fixed to a box containing said electric circuit.

8. An automatic water-supply apparatus of claim 2, wherein said electric circuit is supported by said holding means.

9. An automatic water-supply apparatus of claim 1, wherein said proximity detecting electrode is supported in a container made of insulating material and fixed on the front bottom face of the basin.

10. An automatic water-supply apparatus of claim 1, wherein said electric circuit and said electrically controllable valve are contained in a common box.

11. An automatic water-supply apparatus of claim 1, wherein said electrode is connected to said electric circuit by an inner conductor of a coaxial cable, an outer conductor of which is grounded by the end on the side of said electric circuit.

12. A device for controlling the supply of water through a faucet mounted on the rear top portion of a basin comprising

means for detecting at the front bottom portion of the basin the presence or absence of a human body, and

means for regulating for the flow of water from the faucet in accordance with the detected presence or absence of a human body at the front of the basin irrespective of the proximity of the human body to the faucet, said regulating means including a proximity detecting electrode in the form of an elongated bar extending substantially across the full width of the basin beneath the front bottom surface thereof and spaced therefrom at a position for responding to the human body.

13. The device defined in claim 12, wherein said regulating means includes means further for regulating the water flow through said faucet at a prescribed rate upon detection of a human body at the front of said basin and means for preventing water to flow upon detection of the absence of a human body at the front of said basin irrespective of the proximity of a human body to said faucet.

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