

Description

The present invention relates to an automatic faucet capable of turning on and off the water on the basis of a sensor output from a hand detecting sensor.

According to one form of an automatic faucet, in the past, a spout is formed of a casting, the interior of which is divided by a partitioning wall into two spaces to constitute a two-layer construction, one space being used as a discharge water flow path, the other space being used as a space in which a hand detecting sensor such as an infrared sensor or a control unit is mounted, and a sensor wire is provided.

In such a spout as described above, behavior of a user's hand is detected by a sensor, while maintaining a compact shape thereof, and an electromagnetic closing valve or the like is driven on the basis of the detected output so that operation of turning on and off the water can be performed automatically. Since it is not necessary to operate the closing valve directly by the hand, the mode of use can be materially improved.

However, the spout cannot be disassembled because it is an integrally molded article formed of a casting or the like. Therefore, the work for mounting a hand detecting sensor into the spout and a work for wiring a sensor wire to the sensor are cumbersome.

As a result, the manufacturing cost for the faucet becomes high, and when any trouble occurs, maintenance cannot be carried out easily.

The same observations apply to US-A-4 735 357 upon which the preamble of appended Claim 1 is based

It is an object of the present invention to provide an automatic faucet which can solve the aforementioned problem.

The present invention provides an automatic faucet characterized as shown in Claim 1: a protective cover for a sensor is removably mounted in a superposed manner to the inner surface of spout body, with a discharge conduit formed integrally inside a wall, so as to constitute a spout, and a space for accommodating the sensor is formed between the spout body and the protective cover for the sensor.

In this invention, the spout constituting the principal portion of the automatic faucet is formed by assembling the spout body having formed therein the discharge conduit and the protective cover for the sensor.

Accordingly, the hand detecting sensor can be fitted in advance on the protective cover for the sensor, and the sensor wire can be wired in advance along the inner surface of the protective cover for the sensor. Thereafter, the protective cov-

er for the sensor is mounted on the inside of the spout body whereby the spout of the automatic faucet can be easily assembled.

Further, when any trouble occurs with the sensor or the sensor wire is broken, the protective cover for the sensor can be removed rapidly from the spout body and the broken portion can be fixed or replaced easily.

FIG. 1 is a perspective view of the interior of a toilet room having many washbowls each equipped with an automatic faucet according to the present invention; FIG. 2 is a perspective view of the washbowl; FIG. 3 is a sectional side view showing the entire construction of the automatic faucet; FIG. 4 is a sectional side view of a valve control box taken on line I - I of FIG. 3; FIG. 5 is a sectional plan view of the valve control box taken on line II - II of FIG. 3; FIG. 6 is an enlarged sectional plan view of fitting portion of a control device to a drive portion unit; FIG. 7 is an enlarged sectional side view taken on line III - III of FIG. 6; FIG. 8 is an enlarged sectional plan view of the interior of the control device; FIG. 9 is an arrowed side view taken along the line IV - IV of FIG. 8; FIGS. 10 to 12 are cross-sectional views of a spout body taken on lines V - V, VI - VI and VII - VII, respectively, of FIG. 3; FIG. 13 is a view for explaining the fitting state of a manual sensor at the extreme end of the spout body; FIG. 14 is a cross-sectional view of a sensor taken on line VIII - VIII of FIG. 13; FIG. 15 is an exploded perspective view of a locking construction of the spout body; FIG. 16 to 18 are explanatory views, respectively, of a work for locking a spout body; FIG. 19 is an explanatory view of an operating portion of a thermostat type mixing valve; FIG. 20 is an exploded perspective view of the same; FIG. 21 is a side view showing the entire construction of an automatic faucet according to another embodiment; FIG. 22 is a plan view of the same partly sectioned; FIG. 23 is a front view of the same partly sectioned; FIG. 24 is a front view of essential parts of the same; FIG. 25 is a view for explaining the fitting state of a manual sensor at the extreme end of the spout; FIG. 26 is a cross-sectional view of a sensor taken on line IX - IX of FIG. 25; FIG. 27 is an explanatory view of the internal construction of an electromagnetic closing valve; and FIGS. 28 and 29 are sectional views taken on lines X - X and XI - XI, respectively, of FIG. 21.

The present invention will be described with reference to the accompanying drawings for describing the present invention in detail.

FIG. 1 shows the interior of a toilet room in which many washbowls B are mounted on a cabinet C, each washbowl B being equipped with an automatic faucet A according to the present invention, as shown in the drawings.

FIGS. 2 and 3 show the entire construction of the washbowl B and the automatic faucet A. As shown in the drawings, the washbowl B is fitted in and secured to a fitting groove cut in a counter forming an upper portion of the cabinet C.

Next, the entire construction of the automatic faucet A will be described with reference to FIG. 3. A spout 11 is fixedly mounted on a mounting surface 10a in the inner part of a bowl 10 of the washbowl B, and a drive portion unit 13 connected in communication to the spout 11 through a hot water supply pipe 12 is disposed at the lower part of the bowl 10.

In the above-described construction, as shown in FIG. 3, the drive portion unit 13 integrally encases therein an electromagnetic closing valve 14 connected in communication to an upstream side of the hot water supply pipe 12, a thermostat type mixing valve 15 connected in communication to the electromagnetic closing valve 14, a control device 16 for controlling the operation of the electromagnetic closing valve 14 and various sensors described later, and a power supply device 17.

As shown in FIGS. 4 and 5, openings on the other side of a pipe 18 on the hot water side and a pipe 19 on the cold water side of which one end is embedded in and supported on the wall D are connected in communication to a hot water opening and a cold water opening of the thermostat type mixing valve 15.

Water stop valves are housed in the base portions of the pipe 18 on the hot water side and the pipe 19 on the water side, respectively.

In the construction as described above, when the electromagnetic closing valve 14 is driven and opened, mixed hot water having a suitable temperature can be discharged from the spout 11 into the washbowl B through the pipe 18 on the hot water side, the pipe 19 on the water side → the thermostat type mixing valve 15 → the electromagnetic closing valve 14 → the hot water supply pipe 12.

Parts constituting the aforesaid automatic faucet A will be described in detail hereinafter.

First, the construction of the drive portion unit 13 constituting the subject matter of the present invention will be described in detail with reference to FIGS. 3 to 9.

Referring to FIGS. 3 to 5, particularly to FIG. 4, the drive portion unit 13 is constituted by removably connecting a control device 16 in the shape of a small rectangular box and a power supply device 17 with a rectangular space 70 formed at one side corner at the upper portion of a body case 13a in the shape of a rectangular box.

In the above-described construction, the body case 13a consists of a base plate 71 on the wall side which is thick and substantially in the shape of

a rectangular plate and a thin box-like cover 72 removably connected to the base plate 71 on the wall side by means of a connecting bolt 71m.

The box-like cover 72 is formed from a front plate 72a, a top plate 72b, a bottom plate 72c and left and right side plates 72d and 72e.

The box-like cover 72 is provided with an opening 72f for connecting the control device at a location at the upper portion of the right side plate 72e and connected to the control device 16.

The internal construction of the body case 13a will now be described. In the central portion within the body case 13a, there are disposed a thermostat type mixing valve 15, a water stop valve 61 and an electromagnetic closing valve 14 in that order vertically from bottom to top on a hot water supply flow path 40.

In the thermostat type mixing valve 15, a cylindrical body 15a encases a movable (forward and backward) valve stem 15b for adjusting a valve opening degree according to a temperature of mixed hot water whereby the temperature of the mixed hot water can be automatically adjusted to a set temperature.

The cylindrical body 15a of the thermostat type mixing valve 15 is connected to a pair of bended pipes 73 and 74 which once extend laterally as shown in FIG. 4 and thereafter extend through a base plate 71 on the wall side of the body case 13a and project outside as shown in FIG. 3. The bended pipes 73 and 74 are removably connected to the pipe 18 on the hot water side and the pipe 19 on the water side by annular connecting fittings 73a and 74a, respectively, as shown in FIG. 3.

The water stop valve 61 consists of a valve plate 61b for turning off an opening 61a provided in the midst of the hot water supply flow path 40 and a threaded rod 61c for moving the valve plate 61b forward and backward, which is used to fix trouble which may occur on the downstream side from the electromagnetic closing valve 14.

The electromagnetic closing valve 14 used in the present embodiment comprises a diaphragm valve which is operated by a latching solenoid. By application or release of voltage, the electromagnetic closing valve 14 can cause a plunger 14c thereof to be moved forward and backward, a valve body 14a formed from a diaphragm to come into contact with or to move away from a valve seat 14b and an opening 14d remotely provided at the upper portion of the hot water supply flow path 40 to be opened and closed.

The hot water supply flow path 40 provided interiorly of the drive portion unit 13 will be described hereinafter. The flow path 40 comprises a first hot water supply internal pipe 75 connected in communication to the thermostat type mixing valve 15 and the water stop valve 61, a second hot water

supply internal pipe 76 connected in communication to the water stop valve 61 and the electromagnetic closing valve 14, and a third hot water supply internal pipe 77 connected in communication to the electromagnetic closing valve 14 and the hot water supply pipe 12.

In the above-mentioned construction of the hot water supply flow path 40, as shown in FIG. 3, an upper portion of the base plate 71 on the wall side of the body case 13a is connected and secured to the third hot water supply internal pipe 77 by means of a fastening screw 78, and a lower portion of the base plate 71 on the wall side is supported by the bended pipes 73 and 74.

Accordingly, in the present embodiment, the drive portion unit 13 is substantially supported in a cantilever fashion by the pipe 18 on the hot water side and the pipe 19 on the water side embedded in and supported on the wall D through the base plate 71 on the wall side of the body case 13a, the hot water supply flow path 40 and the bended pipes 73 and 74.

The drive portion unit 13 can be easily removed from and connected to the pipe 18 on the hot water side and the pipe 19 on the water side by loosening and tightening annular connecting fittings 73a and 74a shown in FIG. 3.

The body case 13a can separate the base plate 71 on the wall side and the box-like cover 72.

Accordingly, a work for installing the drive portion unit 13 can be easily carried out. Even when any defect occurs in the electromagnetic closing valve 14 within the drive portion unit 3, the water stop valve 61, the thermostat type mixing valve 15, or the control device 16 or the power supply device 17, whole or part of the drive portion unit 13 can be quickly and easily removed from the pipe 18 on the hot water side and the pipe 19 on the water side to quickly take adequate measure such as repair. After termination of the repair or the like, they can be quickly connected to the pipe 18 on the hot water side and the pipe 19 on the water side.

As described above, in the present embodiment, the execution and maintenance of the drive portion unit 13 can be materially improved.

Furthermore, as described above, since the drive portion unit 13 integrally encases not only the electromagnetic valve 14 but also the thermostat type mixing valve 15 and the water stop valve 61, a so-called drive portion for the automatic faucet A can be formed into a compact shape and the external appearance thereof can be also improved.

As shown in FIGS. 3 and 4, in the present embodiment, a dew drop preventing weir plate 72h is projected on the peripheral edge of a pipe leading opening 72g provided in a top plate 72b of the box-like cover 72, and only a portion in commu-

nication with the base plate 71 on the wall side of the weir plate 72h is cut to form an outflow opening 72i.

By the above-described construction, even when a dew drop occurs on the outer peripheral surface of the hot water supply pipe 12 connected to the third hot water supply internal pipe 77, the dew drop which moves along the top plate 72b of the box-like cover 72 into the control device 16 and the power supply device 17 is blocked to positively prevent from occurrence of trouble.

The construction of the control device 16 will be described with reference to FIGS. 4 to 9.

As will be apparent from FIG. 5, the base plate 71 on the wall side of the drive portion unit 13 is in the shape of an L-letter as viewed in plan, a part of which is extended into a control device connecting opening 72f of the box-like cover 72 to form a thick-wall partitioning wall 71a.

The partitioning wall 71a is integrally formed with a rectangular annular projection 71b over the entire peripheral edge of the control device mounting side.

In the partitioning wall 71a, a contact 71d for an electromagnetic closing valve formed from a conductive plate which is thin and has an elasticity is secured to the side on the control device side by connecting screws 71c, as shown in FIGS. 5, 6, and 7.

One end of a lead wire 71f for an electromagnetic closing valve is connected to the contact 71d for an electromagnetic closing valve, and the other end of the lead wire 71f is connected to the electromagnetic closing valve 14 through a connection opening 71e opened to the partitioning wall 71a.

Reference numeral 71g designates a seal cap provided within the connection opening 71e.

On the other hand, the control device protective cover 16a forming an external portion of the control device 16 has a rectangular box shape, the partitioning wall 71a side of which is opened, and as shown in FIGS 5; 6 and 7, an annular opening 16b on the partitioning wall side is removably fitted and engaged with a rectangular annular projection 71b of the partitioning wall 71a.

A packing 80 such as an O-ring is fitted in said fitting and engaging surface to secure water-tightness so as to prevent entry of water or the like into the drive portion unit 13 from outside.

In FIG. 5, reference numerals 80a and 80b designate a fixing screw and a fixing bolt provided to positively retain the aforesaid fitting and engagement.

By the aforementioned construction, the control device 16 and the power supply device 17 integral therewith can be easily and rapidly mounted on or disengaged from the drive portion unit 13 to materially improve the execution and maintenance.

Furthermore, since the water-tightness in the connection portion between the control device 16 and the drive portion unit 13 can be sufficiently secured, it is possible to positively prevent entry of water into the control device 16 and the power supply device 17, thus preventing trouble.

Next, the construction of the control device protective cover 16a will be described. A bracket 16c for mounting a control base plate is disposed at a position close to the partitioning wall 71a, and a control base plate 16d having a control portion 81 mounted on the upper surface thereof is mounted on the bracket 16c.

On one side end of the control base plate 16d is mounted an L-shaped contact 16e for an electromagnetic closing valve on the control device side, and when the control device protective cover 16a is removably fitted in and engaged with the rectangular annular projection contact 16e can contact with the contact 71d for an electromagnetic closing valve to electrically connect the control portion 81 with the electromagnetic closing valve 14.

In this manner, the control portion 81 can be connected to the electromagnetic closing valve 14 merely by mounting the control device 16 to the drive portion unit 13 without requiring any separate connecting work. Therefore, the execution and maintenance of the drive portion unit 13 can be materially improved.

As shown in FIG. 5, the other end of a sensor wire 37 with one end connected to a manual sensor 24 is connected with a terminal 16f provided on the other end of the control base plate 16d. A detection output can be positively sent from the manual sensor 24 to the control portion 81 by the sensor wire 37 to drive the electromagnetic closing valve 14.

In order to positively prevent entry of water into the control device 16 along the outer peripheral surface of the sensor cord 37, a seal ring 71i and a lid 71j are mounted within a sensor cord inserting opening 71h provided in the base plate 71 on the wall side, the seal ring 71i and the lid 71j being tightened by a tightening nut 71k.

The power supply device 17 will be now described. As shown in FIGS. 5, 8 and 9, a dry cell case 17a composed of a flat plate 17a-1 and an L-shaped plate 17a-2 is disposed approximately parallelly with the bracket 16c for mounting a control base plate within the control device protective cover 16a.

The dry cell case 17a is interiorly formed with a dry cell storing space 17b, on one end of which is provided an opening 17c for mounting a dry cell and on the other end of which is provided an opening 17f for guiding connection of contact for connecting both poles of the dry cell 17d stored in

the dry cell storing space 17b to a dry cell contact 17e to be described hereinafter.

That is, the dry cell contact 17e is composed of a conductive plate which is thin and has an elasticity, as shown in FIGS. 8 and 9, a base of which is secured to the inside on one end side of the bracket 16c for mounting a control base plate by means of a connecting pin 17g.

On the other hand, an end of the dry cell contact 17e is disposed facing to the opening 17f for guiding connection of contact of the dry cell case 17a, and when the dry cell 17d is stored into the dry cell storing space 17b, the said end automatically comes into contact with both poles of the dry cell 17d to render them conductive.

As shown in FIGS. 8 and 9, an extension 17h is provided on the base end of the dry cell contact 17e, and the end of the extension 17h is connected to a conduction guide plate 17i provided on the control base plate 16d.

Accordingly, when the dry cell 17d is mounted within the dry cell storing space 17b, power can be supplied to the control device 16 through the dry cell contact 17e, and power can be supplied also to the electromagnetic closing valve 14 through the aforementioned contacts 16e and 17d for an electromagnetic closing valve.

As shown in FIGS. 8 and 9, the dry cell case 17a, the bracket 16c for mounting a control base plate and the control base plate 16d are integrally formed in the state where the contact 16e for an electromagnetic closing valve and the dry cell contact 17e are assembled, which, in that form, can be incorporated into the control device protective cover 16a.

Accordingly, the assembling and maintenance of the control device 16 and the power supply device 17 can be improved.

As shown in FIGS. 4 and 5, a rectangular opening 17j in communication with the dry cell storing space 17b is provided frontwardly of the control device protective cover 16a, and a lid 17l having a circular dry cell mounting opening 17k in the central portion thereof is removably mounted on the rectangular opening 17j by means of a connecting bolt 17m.

A dry cell fixing plate 17n is integrally connected to the upper portion at the rear end of the dry cell 17d stored into the dry cell case 17a through the opening 17k for mounting the dry cell, the plate 17n being removably connected to the lid 17l by means of a fixing bolt 17o.

Accordingly, replacement of the dry cell 17d can be easily accomplished merely by loosening the fixing bolt 17o to remove it together with the dry cell fixing plate 17n, mounting the dry cell fixing plate 17a on the rear portion of a new dry cell 17d, thereafter storing the dry cell 17d into the

dry cell storing space 17b through the opening 17k for mounting a dry cell, and connecting the dry cell fixing plate 17n to the lid 17l by the fixing bolt 17o.

As shown in FIGS. 4 and 5, a power-off display lamp 82 such as LED is connected to one side of the control base plate 16d, and a transparent window 83 for facilitating vision from the outside is provided on the front wall of the control device protective cover 16a ahead of the display lamp 82.

Accordingly, when a power output of the dry cell 17d drops to a level below a predetermined voltage, a comparator or the like is used to detect it so that the power-off display lamp 82 formed from LED or the like can be quickly flickered to quickly inform a maintenance person or a user or time for replacement of the dry cell 17d.

Alternatively, when power drops to a level below a predetermined voltage, the machine in the system is temporarily stopped to flicker the power-off display lamp 82 formed from LED or the like so that a maintenance person or a user may pay attention thereto.

In the above-described embodiment, the power supply device 17 uses the dry cell 17d so that a low voltage is supplied to the electromagnetic closing valve 14 or the manual sensor 24 therefrom. Therefore, trouble such as an electric shock can be positively prevented.

A further construction of the automatic faucet A in the present embodiment will be described hereinafter.

First, the construction of the spout 11 will be described in detail with reference to FIGS. 3 and 10 to 16.

A feature of the spout 11 substantially resides in the construction in which a protective cover 22 for a sensor or the like formed of a synthetic resin material such as plastics is removably mounted on the inside of a spout body 21 made of casting having a discharge water flow path 20 formed integral with the wall, and a fitting space S for the sensor or the like is formed between the spout body 21 and the protective cover 22 for the sensor or the like to store a manual sensor 24 or the like therein, as shown in FIG. 3.

In the above-described construction, the construction of the spout body 21 will be first described. As shown in FIGS. 2 and 3, the spout body 21 has its base end side secured to a place surface 10 at the inner part of a washbowl 10, and an extreme end thereof directed frontwardly of the bowl 10 and extended in an upwardly inclined state.

As shown in FIG. 10, the spout body 21 is formed with a lengthy space 25 having an approximately semicircular section over all length thereof, and a part of the lengthy space 25 is divided by a part of an upper wall 21a and an L-shaped parti-

tioning wall 21b to form a discharge water flow path 20.

The lengthy space 25 provided interiorly of the spout body 21 can cooperate with the protective cover 22 for the sensor or the like described later to form a fitting space S for the sensor or the like previously mentioned.

The construction of the extreme end of the spout body 21 will be described hereinafter with reference to FIG. 3. On the extreme end are provided a front wall 26 and a crossing partitioning wall 27 spaced apart from the front wall 26. Between the front wall 26 and the crossing partitioning wall 27, a manual sensor 24 is stored in the sensor fitting space 28.

On the other hand, at the rear of the crossing partitioning wall 27 is formed a sensor cord storing space 29 extending to the base end of the spout body 21, as shown in FIGS. 3 and 10.

That is, the fitting space S for the sensor or the like is constituted by the sensor fitting space 28 and the sensor wire storage space 29.

In the spout body 21, the extreme end of the L-shaped partitioning wall 21b forming the discharge water flow path 20 is bended downwardly at the rear position spaced from the crossing partitioning wall 27 to cooperate with the crossing partitioning wall 27 to form a cylindrical opening 30, as shown in FIG. 3.

A water discharge cap 30a is removably threadedly mounted within the cylindrical opening 30.

The construction of the base portion of the spout body 21 will be described. The aforesaid base portion is composed of a semicircular rear wall 21c and a pair of frontwardly extending walls 21d and 21d frontwardly extending parallel with each other from the both front ends of the rear wall 21c, as shown in FIGS. 3 and 11.

The base portion of the spout body 21 cooperate with a base portion 22a of the protective cover 22 for the sensor or the like to form a cylindrical spout fitting portion, as shown in FIG. 11.

Next, the construction of the protective cover 22 for the sensor or the like will be described. The protective cover 22 is formed from a thin lengthy flat plate formed of a synthetic resin material and removably mounted on the inside of the spout body 21 to thereby form a spout 11, as shown in FIG. 3.

In the present embodiment, the mounting of the protective cover 22 for the sensor or the like is carried out by threadedly connecting the extreme end and the central portion of the protective cover 22 for the sensor or the like to a boss portion 33 at the extreme end and a central boss portion 34 of the spout body 21 by connecting screws 31 and

32, respectively, as shown in FIG. 3.

As shown in FIG. 3, the protective cover 22 for the sensor or the like is provided in its extreme end with a through-hole 35 for the sensor for exposing a sensor block 24a of the sensor 24 to outside and at a position spaced rearwardly of the through-hole 35. For the sensor with a cylindrical opening with the water discharge cap 30a threadedly mounted thereon, that is, a water discharging opening 36 for exposing a water discharge port 30 to outside.

Further, as shown in FIG. 11, the base portion 22a of the protective cover 22 for the sensor or the like is in the form of a flat plate, which cooperates with the rear wall 21c of the spout body 21 as previously mentioned to form a water-tight cylindrical spout fitting portion. By this construction, the protective cover 22 for the sensor or the like is connected to the spout body 21 in a water-tight state over the overall length thereof.

Since the fitting space S for the sensor or the like is not in a completely water-tight state, it is designed so that a weir 100 is provided, and moved-in water is escaped from both sides of the protective cover 22 or from a clearance between the base portion 22a of the protective cover for the sensor or the like and an upper portion defining ring 45 described later.

Next, a sensor 24 disposed in the fitting space S for the sensor or the like formed between the spout body 21 and the protective cover 22 for the sensor or the like and a sensor cord 37 for connecting the manual sensor 24 with the control device 16 will be described with reference to FIGS. 3, 13 and 14.

First, the construction of the manual sensor 24 will be described. As shown in FIG. 13, a sensor mounting space 38 with a through-hole 35 for the sensor opened to the lower surface thereof is formed in the upper surface at the extreme end of the protective cover 22 for the sensor or the like.

Within the sensor mounting space 38, a sensor block 24a, a sensor base plate 24b for connecting one end of the sensor wire 37 described later and a transparent plate 24c are integrally molded, by resin mold agent 24d such as epoxy resin, within a sealed box in the shape of a rectangular box composed of a rectangular cylindrical sensor case 24e and a case cover 24f.

In the above-described construction, the sensor block 24a is interiorly provided with sensor element fitting holes 24g and 24h in a spaced relation, and a projection element 24i formed from a phototransistor the base end of which is connected to the sensor base 24b and a light receiving element 24j formed from a photodiode are mounted within the fitting holes 24g and 24h.

When infrared ray emitted from the projection element 24i and reflected by the hand is received

by the light receiving element 24j, the manual sensor 24 generates a detection output to send an output signal to the control device 16, to drive the electromagnetic closing valve 14 and to automatically discharge hot water from the discharge water cap 30a.

As described above, in the present embodiment, since the sensor 24 and the sensor cord 37 connected to the sensor 24 are substantially disposed within a resin mold construction, it is possible to positively prevent entry of water to the sensor block 24a and the sensor base plate 24b and erroneous operation of the sensor 24.

Since the sensor direction D_1 of the manual sensor 24 is made parallel with the discharge water direction D_2 of the discharge water port 30, the manual sensor 24 will not detect a discharge water flow but the erroneous operation can be positively prevented, as shown in FIG. 3.

Moreover, since as shown in FIG. 3, the sensor 24 is provided on the extreme end side distanced from the discharge water port 30, when hands reach out toward the discharge water port 30, the sensor 24 first detects it and actuates, after which water is turned on quickly. On the other hand, after the hands have been completely withdrawn from the discharge water port 30 after cleaning, the sensor 24 generates an off-output to quickly stop the water discharge.

Accordingly, the using convenience of the automatic faucet A can be materially improved.

Next, the construction of the sensor wire 37 for connecting the manual sensor 24 having the aforesaid construction to the control device 16 will be described.

As shown in FIGS. 13 and 14, one end of a plurality of sensor wires 37 is connected to the upper surface of the sensor base plate 24b, and the other end of the sensor wire 37 extends into the sensor wire storage space 29 formed between the spout body 21 and the protective cover 22 for the sensor or the like through a sensor wire leading path 24k provided interiorly of the case cover 21f and thereafter is connected to the control device 16 through the cylindrical metal fitting portion of the automatic faucet A.

In the construction as described above, as shown in FIGS. 13 and 14, a rubber bushing 24m is introduced under pressure against the resilient force thereof into the sensor wire leading end 24l of the sensor wire leading path 24k, and one end of the sensor wire 37 is embedded into a resin mold agent 24d.

Accordingly, the cooperation between the aforesaid resin mold construction and the rubber bushing 24m can improve the contactness between the sensor wire 37 and the resin mold agent 24d, materially improve the water resistance of the sen-

sor 24 and more positively prevent the erroneous operation of the sensor 24.

In the present embodiment, the sensor case 24e has a support bracket 24n extended rearwardly from the wall as shown in FIG. 9, the bracket 24n being secured in a cantilever fashion to the protective cover 22 for the sensor or the like by means of a fixing bolt 24o.

The plurality of sensor cords 37 are extended into the sensor wire storage space 29 and thereafter encircled integrally by a sensor wire protective cable 39, the protective cable 39 being connected to the control device 16 through the base portion of the spout 11, as shown in FIG. 3.

The sensor wire protective cable 39 has a water return ring 39a mounted at the rear of the sensor wire storage space 29, as shown in FIG. 3. By the provision of the ring 39a, it is possible to positively prevent scattered water or the like entered into the sensor wire storage space 29 from moving along the outer peripheral surface of the sensor wire protective cable 39 and reaching the control device 16 to produce a defective control.

As shown in FIG. 10, the sensor wire protective cable 39 is removably supported on a sensor wire fitting device 39d secured by means of a connecting screw 39c to the upper surface of a support post 39b stood upright in the central portion of the protective cover 22 for the sensor or the like. Accordingly, the sensor protective cable 39 can be positioned considerably above the upper surface of the protective cover 22 for the sensor or the like along which scattered water flows, and in view of this, the water resistance with respect to the sensor cord 37 can be achieved.

Referring now to FIG. 3, a hot water supply pipe construction will be described in which hot water is supplied from a hot water supply flow path 40 formed in the drive portion unit 13 to a discharge water flow path 20 formed in the spout body 21 of the spout 11.

As shown in FIG. 3, the spout 11 is provided in its base end with a cylindrical threaded portion 41a connected in communication to the lower part of the discharge water flow path 20.

An upper end of a discharge water flow path connecting pipe 41 is threadedly mounted on the cylindrical threaded portion 41, and the lower end of the connecting pipe 41 extends through a spout fitting opening 42 provided at the place surface 10a in the inner part of the bowl 10 and at a position immediately below the base end of the spout 11 to be extended downwardly.

The lower end of the discharge water flow path connecting pipe 41 is connected to the side end at downstream of the hot water supply pipe 12 in a water-tight state by use of a union 43, whereas the side end at upstream of the hot water supply pipe

12 is connected to an opening at downstream of the hot water supply flow path 40 formed within the drive portion unit 13.

With this construction, when the electromagnetic closing valve 14 is driven, the mixed hot water can be supplied quickly to the discharge water flow path 20 through the hot water supply flow path 40 → the hot water supply pipe 12 → the discharge water flow path connecting pipe 41.

Referring now to FIGS. 3, 11, 12 and 15, a spout fixing construction will be described in which the spout 11 is secured to the place surface 10a in the inner part of the bowl 10.

As shown in FIGS. 3 and 15, the spout fixing construction is substantially composed of in upper seal ring 44 and an upper defining ring 45 provided in a superposed state above the spout fitting opening 42 provided in the place surface 10a in the inner part of the bowl 10, a shake proof washer 47 provided in a superposed state below the spout fitting opening 42, a lower fitting washer 48, and a fastening nut 49.

In the above-described construction, the upper defining ring 45 is composed of an annular collar 45a provided in the central outer peripheral edge thereof, a spout fitting portion 45b and a washbowl fitting portion 45c formed above and below, respectively, thereof, as shown in FIG. 15.

As shown in FIG. 3, the spout fitting portion 45b is fitted to the base portion of the spout 11 and is integrally connected by a connecting bolt 50 as shown in FIG. 7. On the other hand, the bowl fitting portion 45c is fitted into the spout fitting opening 42 provided in the bowl 10 to positively locating a fitting position of the spout 11.

As shown in FIG. 15, the upper defining ring 45 is provided with a heart-shaped irregular through-hole 52 through which extend the discharge water flow path connecting pipe 41, the sensor cord protective cable 39 and a guide pin 51 described later. A through hole 53 for a pop-up type drain plug operating rod is provided at a position adjacent to the through-hole 52.

Further, as shown in FIG. 15, the lower fitting washer 48 is composed of an upper spread collar 48a having a horse-shoe shape, and a lower cylindrical portion 48b integrally connected at an eccentric position from the centre on the inside of the collar 48a.

The lower fitting washer 48 is provided in its eccentric position from the center with a large-diameter through-hole 54 through which is inserted the discharge water flow path connecting pipe 41 and a small-diameter through-hole 55 through which is inserted a guide pin 51 described later, as shown in FIGS. 12 and 15.

The lower fitting washer 48 is further provided in the peripheral edge of the upper spread collar

48a with a circular cutaway space 56 one end of which is opened to outside, as shown in FIG. 15, and the sensor cord 37 and a pop-up type drain plug operating rod 57 are inserted into the space 56, as shown in FIG. 3.

Next, a work for fitting the spout body 11 to the bowl 10 in the spout fixing construction having the above-described construction will be described with reference to FIGS. 3, 15 and 16.

First, the upper defining ring 45 is fitted, connected and fixed to the base end of the spout body 11 with the sensor and cord protective cable 39 for protecting the manual sensor 24 and the sensor cord 37 incorporated therein in advance, as shown in FIGS. 3 and 15 to 18, and the upper end of the discharge water flow path connecting pipe 41 and the upper end of the guide pin 51 are threadedly fitted to the cylindrical threaded portions 14a (FIG. 3) and 41b (FIG. 16) provided in the base end of the spout body 11.

After completion of the above-described connection and fixing work, as shown in FIG. 16, the discharge water flow path connecting pipe 41 is made to extend through the spout fitting opening 42 provided in the bowl 10, and the lower fitting portion 45c of the upper defining ring 45 is fitted into the spout fitting opening 42 through the upper seal ring 44.

On the other hand, the shake proof washer 47, the lower fitting washer 48 and the fastening nut 49 are fitted in order into the outer peripheral surface of the discharge water flow path connecting pipe 41 from the lower end of the latter, and the guide pin 51 is made to extend through the pin insert hole 55 provided in the lower fitting washer 48.

Subsequently, the fastening nut 49 is turned to engage an internal threaded hole 49a with an external threaded portion 58 provided in the outer peripheral surface in the midst of the discharge water flow path connecting pipe 41, as shown in FIG. 16.

Thereafter, when the fastening nut 49 is continuously turned, the lower fitting washer 48 is to be moved upward since the washer 48 cannot be rotated due to the presence of the guide pin 51.

When the fastening nut 49 is further continuously turned, the lower seal ring 46 and the shake proof washer 47 are pressed against the mounting surface 10a in the inner part of the bowl 10, as shown in FIG. 17.

Thereby, the upper defining ring 45 is powerfully secured to the bowl 10, and the spout 11 integral with the upper defining ring 45 is also powerfully secured to the bowl 10.

In the fixing work as described, since the lower fitting washer 48 has a horse-shoe shape and is provided with the circular cutaway space 56 one end of which is opened, as shown in FIGS. 8 and 11, the sensor and cord protective cable 39 can be

fitted in and engaged with the circular cutaway space 56 from the outer side, and the spout fixing work can be very easily carried out despite the presence of the protective cable 39.

In the above-described fixing work, since at the time of mounting the lower fitting washer 48 to the discharge water flow path connecting pipe 41, the washer guiding guide pin 51 extended downward from the base of the discharge water metal 11 can be inserted into the pin insert hole 55 provided in the lower fitting washer 48, the lower fitting washer 48 remains immovable even by thereafter movement of the fastening nut 49. Accordingly, it is possible to positively prevent engagement of the sensor cord 37 caused by the immovable lower fitting washer 48 between the lower surface of the place surface 10a in the inner part of the bowl 10 and the upper surface of the lower fitting washer 48 or the shake proof washer 47, and prevent the sensor cord 37 from being broken.

Since the cutaway space 56 provided in the lower fitting washer 48 can be positioned in a given direction at which the sensor cord 37 is easily drawn out, it is possible to prevent the sensor cord 37 from being twisted, and it is possible to easily carry out a work for drawing the sensor wire 37.

Furthermore, in the present embodiment, the relative positional relationship between the external threaded portion 58 provided in the outer peripheral surface of the discharge water flow path connecting pipe 41 and the washer guiding guide pin 51 is set so as not to threadedly engage with the internal threaded hole 49a of the fastening nut 49 till the washer guiding guide pin 51 is inserted into the pin insert hole 55. Therefore, it is possible to positively prevent occurrence of erroneous execution to position the cutaway space 56 to an accurate sensor cord drawing position.

Since in the present embodiment, the pin insert hole 55 provided in the lower fitting washer 48 has a length enough to insert the washer guiding guide pin 51, even if the spout fitting plate such as the mounting surface 10a in the inner part of the bowl 10 is thin as shown in FIG. 18, it is possible to positively guide vertically moving operation of the lower fitting washer 48 to firmly fix the spout 11 to the discharge water fitting plate, and prevent trouble such as a breakage of the sensor wire 37.

After completion of the above-described fixing work, the lower end of the discharge water flow path connecting pipe 41 is connected in a water-tight state to the side end at upstream of the hot water supply pipe 12 by use of a box nut 43.

As shown in FIG. 3, the pop-up type drain plug operating rod 57 is extended downward through the small-diameter through-hole 59 provided in the base of the metal 11, the through-hole 53 for the pop-up type drain plug operating rod provided in

the upper defining ring 45, the upper seal ring 44, the discharge water metal fitting opening 42, the shake proof washer 47, and the circular cutaway space 56 of the lower fitting washer 48, and the extended end thereof is operatively connected to a pop-up drain plug not shown.

Next, the automatic faucet A having the above-described configuration will be described hereinafter.

As previously mentioned, the dry cell 17d is mounted on the dry cell case 17a whereby a low voltage is supplied to the electromagnetic closing valve 14 and the manual sensor 24 to render the automatic faucet A initial state.

When a user reaches out downwardly of the discharge water cap 30a positioned at the extreme end of the automatic faucet A after attending to one's business, the manual sensor 24 issues an ON-output. The control device 16 sends a drive signal to the electromagnetic closing valve 14 on the basis of the on-output to drive the electromagnetic closing valve 14 whereby the plunger 14c is moved backward and the valve body 14a is moved away from the valve seat 14b to open the valve, as shown in FIG. 3.

Thereby, the mixed hot water at a moderate temperature adjusted by the thermostat type mixing valve 15 is supplied to the discharge water flow path 20 through the hot water supply flow path 40 → the hot water supply pipe 12 → the discharge water flow path connecting pipe 41, after which the hot water is discharged out of the discharge water cap 30a so that hands can be cleaned.

After completion of cleaning, when a user draws his hand, the manual sensor 24 does not detect the hands any longer. It sends an OFF-output to the control device 16. The control device 16 causes the plunger 14c of the electromagnetic closing valve 14 to move forward on the basis of the OFF-output to bring the valve body 14a into contact with the valve seat 14b to open the valve.

In the above-described operation, in the case where the electromagnetic closing valve 14 is subjected to latching solenoid driving, the electromagnetic closing valve 14 is driven to open or close the valve, after which even if power is not supplied, opening or closing state of the valve can be self-maintained to save power.

In the present embodiment, the water resistance of the electromagnetic closing valve 14 and the control portion 81 can be attained by mounting them in the drive portion unit 13 and the control device protective cover 16, and thereafter fitting and connecting the control device protective cover 16a to the drive portion unit 13 in a water-tight state.

In the fitting and connection as described, a packing 80 such as an O-ring is provided in the

fitting portion to provide a complete water-tightness.

Accordingly, since the electromagnetic closing valve 14 and the control portion 18 need not be independently water proof construction, the water proof construction becomes simple so that the number of parts can be reduced, the device can be manufactured at less cost, and the execution can be improved. Furthermore, the control device protective cover 16a can be removed from the drive portion unit 13 to facilitate the repairing work. Therefore, maintenance such as adjustment of sensing length of the manual sensor 24 can be also improved.

While the present invention has been described with reference to the embodiments, it is to be noted that the scope of the present invention is not limited to those described above. For example, as shown in FIGS. 2 and 3, a how-to-use display plate 101 can be mounted on the surface of the discharge water metal 11 and on the front wall 26 of the metal main body 21 which attracts user's attention. In this case, a user of the automatic faucet A irrespective of an ordinary person as well as an infant and the old can easily and positively recognize the how-to-use displayed on the how-to-use display plate 101, which can be used easily and accurately.

As shown in FIGS. 3, 19, and 20, the mixing valve 15 is designed so that a temperature setting screw 15d is exposed to the front surface of a front panel 15f of the casing encasing therein the mixing valve 15, a collar ring 15i is fitted into the temperature setting screw 15d from the outside, a cover ring 15j formed with a projection 15k on the inner peripheral surface and a notch 15p extending from the surface to the inside is fitted on the outside of the collar ring 15i, the cover ring 15j is secured to the temperature setting screw 15d with interference of the temperature setting screw 15d and the projection 15k, and a part of the collar ring 15i is made visible from the outside through the notch 15p.

With the construction as described, a mark can be provided on the side of the cover ring 15j having a good appearance merely by providing the collar ring 15i and the cover ring 15j over the temperature setting screw 15d. Since the position of the notch 15p can be adjusted freely, the mark on the side of the temperature setting screw can be registered with the mark on the side of the front panel.

In FIGS. 3, 19 and 20, reference numeral 15g denotes a screw insert hole, 15h, a circular groove for insertion of a tool such as a driver or a coin, 15m a mark of the front panel 15f of the drive portion unit 13, 15n a seal member, and 15o a spring for biasing a thermostat 15c in a direction of

the valve seat 15e.

As shown in FIGS. 5, 8 and 9, in the power supply device 17, a short-circuit plate 17r is attached to the upper surface in the inner part of the flat plate 17a-1 so as to oppose to a contact portion 17q extended to the extreme end of a dry cell contact 17e. When the dry cell 17d is mounted, an abutment 17v placed in abutment with the inner end of the dry cell 17d and raised upward to release the contact between the short-circuit plate 17r and the dry cell contact 17e to prevent the dry cell 17d from being short-circuited. In the state that the dry cell 17d is not mounted, the contact portion 17q comes into contact with the short-circuit plate 17r to short-circuit + - of the contact 17+, 17- to erase a charge of the control base plate 16d.

Accordingly, a charge such as static electricity is prevented from being applied to IC or the like to prevent the IC or the like from being damaged.

Although not shown, in the drive portion unit 13, a dry cell drawing rod is provided on a lid of the dry cell case 17a encasing the dry cell 17d, and the contact portion is extended to an input terminal of power supply of the control base plate 16d of the control device 16 so that when the dry cell 17d is drawn, the contact portion comes into contact with the dry cell drawing rod to erase the charge of the control device 16.

Alternatively, in the state where the dry cell 17d is not mounted, both poles of the input terminal of the power source of the control base plate 16d of the control device 16 are made to be short-circuited to erase the charge of the control device 16.

Accordingly, the charge such as static electricity can be prevented from being applied to prevent the IC or the like from being damaged.

Another embodiment of the automatic faucet according to the present invention will be described hereinafter with reference to FIGS. 21 to 29.

First, the entire construction of the automatic faucet A will be described with reference to FIG. 21. A spout body 111 is placed in a fixed state on a mounting surface 110a in the inner part of a bowl 110 of a washbowl B.

The spout body 111 is interiorly provided with a hot and cold water mixing valve 115 of which upstream is connected in communication to a pipe 118 on the hot water supply side and a pipe 119 on the water supply side, an electromagnetic closing valve 114 having its upstream connected in communication to the mixing valve 115 and its downstream connected in communication to a cylindrical opening 130 formed with a discharge port through a hot water supply pipe 12, a controller 116 for controlling the drive of at least the electromagnetic closing valve 114, a sensor 124 for sending an output signal to the controller 116, and

a battery type power source 117 for feeding power to the electromagnetic closing valve 114, the controller 116 and the manual sensor 124.

With the construction as described, when the electromagnetic closing valve 114 is driven and opened, the mixed hot water at a moderate temperature can be supplied from the cylindrical opening 130 provided at extreme end of the spout body 111 into the washbowl 8 through the pipe 118 on the hot water supply side and the pipe 119 on the cold water supply side → the mixing valve 115 → the electromagnetic closing valve 114 → the hot water supply pipe 112.

As described above, in the automatic faucet A, the spout 111 is interiorly integrally provided with the hot water and cold water mixing valve 114, the controller 116 for controlling the driving of the electromagnetic closing valve 114, the manual sensor 124 for sending an output signal to the controller 116, and the battery type power source 117 for feeding power to the electromagnetic closing valve 114, the controller 116 and the sensor 124. Therefore, the automatic faucet A, irrespective of existing installation or new installation, can be installed merely by ordinary waterworks without necessity of complicated electric wiring works to reduce fitting and installation costs.

Further, in the automatic faucet A, the spout 111 interiorly integrally provided with the hot water and cold water mixing valve 115, the electromagnetic closing valve 114, the sensor 124 for sending an output signal to the controller 116, and the battery type power source 117 for feeding power to the electromagnetic closing valve 114, the controller 116 and the sensor 124. Therefore, a space for a toilet room or the like can be utilized at maximum.

Next, the spout 111 of the automatic faucet A according to the present invention and the internal construction thereof will be described in detail with reference to FIGS. 21 to 29.

The spout 111 is substantially formed in a manner such that as shown in FIGS. 21, 28 and 29, a protective cover 122 for a controller or the like formed of synthetic resin material such as plastics is removably mounted on the lower surface of a spout 121 made of casting having a U-shaped section with a lower portion opened. The spout 111 is interiorly formed with a fitting space S for a controller or the like to integrally store therein the electromagnetic closing valve 114, the mixing valve 115, the sensor 124 and the like other than the controller 116.

In the above-described construction, the construction of the spout 121 will be described. As shown in FIG. 21, the spout 121 has the base end secured to the mounting surface 110a in the inner part of the bowl 110 and the extreme end extended

in an upwardly inclined state while being bended in a linear state over two stages directed frontwardly of the bowl 110.

The spout 121 has its extreme end alone formed to have an approximately semi circular section as shown in FIG. 23, said extreme end being formed with a front wall 126. Preferably, a how-to-use display plate on which a how-to-use of the automatic faucet A is described is mounted on the outer surface of the front wall 126.

Next, the construction of the peripheral edge of the front wall 126 will be described. At the rear portion spaced apart from the front wall 126, a crossing diaphragm block 127 is mounted on the inner surface of the spout body 121 by means of a connecting bolt 127a. Between the front wall 126 and the crossing diaphragm block 127, the sensor 124 is stored within a sensor installing space 128.

On the other hand, at the rear of the crossing diaphragm block 127 is formed an accommodating space S for a controller or the like extending to the base end of the spout body 121 as shown in FIGS. 21, 28 and 29.

As shown the crossing diaphragm block 127 is interiorly formed with an L-shaped flow path 127b, one end of which is connected in communication to the hot water supply pipe 112.

On the other hand, the other end of the L-shaped flow path 127b is connected in communication to a cylindrical opening 130 provided at the rear of a sensor supporting plate 124r which will be described later.

A discharge water cap 130a is removably threadedly mounted within the cylindrical opening 130.

Next, a base portion 121a of the spout body 121 will be described. The base portion 121a cooperates with a base portion 122a of the protective cover 122 for the controller or the like to form a cylindrical spout fitting portion, as shown in FIG. 21.

Then, the construction of the protective cover 122 for the controller or the like will be described. As shown in FIG. 21, the protective cover 122 is formed from a thin lengthy flat plate formed of synthetic resin material, and can be removably mounted on the inside of the spout body 121 to thereby form a spout 111.

In the present embodiment; the mounting of the protective cover 122 for the controller or the like is carried out, as shown in FIG. 21, by threadedly connecting the upper portion of the protective cover 122 for the controller or the like to a rib 132 provided on the inner surface of the spout body 121 and inserting a lower end 122b of the protective cover 122 into an insert hole 145d provided in an annular collar 145a of an upper defining ring 145 which will be described later.

With the construction as described, the protective cover 122 for the controller or the like is connected in a water-tight state over the full length to the spout body 121.

Next, a sensor 124 disposed in the fitting space 3 for the controller or the like fold between the spout body 121 and the protective cover 122 for the controller or the like and a sensor cord 137 for connecting the manual sensor 124 and the controller 116 will be described with reference to FIG. 21.

The construction of the sensor 124 will be first described. As shown in FIGS. 22, 23, 24, 25 and 26, a sensor support plate 124r is mounted between the upper end 122b of the protective cover 122 for the controller or the like and the extreme end 121b of the spout body 121, the sensor support plate 124r being formed in its lower surface with a sensor mounting space 138 with a through-hole 135 for a sensor opened.

The sensor mounting space 138 is interiorly integrally molded with a sensor block 124a, a sensor base plate 124b and a transparent plate 124c by a resin mold agent 124d within a rectangular box formed from a rectangular sensor case 124e and a case cover 124f.

In the above-described construction, sensor fitting holes 124g and 124h are provided in a spaced apart relation within the sensor block 124a, and a projection element 124i formed from a phototransistor with the base end connected to the sensor base plate 124b and a light receiving element 124j formed from a photodiode are fitted within the fitting holes 124g and 124h, respectively.

When infrared ray projected from the projection element 124i and reflected by hands is received by the light receiving element 124j, the sensor 124 generates a detection output to send an output signal to the controller 116. The electromagnetic closing valve 114 is then driven to automatically discharge hot water from the discharge water cap 130a.

The sensor wire 137 for connecting the sensor 124 having the above-described construction to the controller 116 will be described.

As shown in FIGS. 25 and 26, one end of a plurality of sensor wires 137 is connected to the upper surface of the sensor base plate 124b, and the other end of the sensor cord 137 is extended into the sensor wire storage space 129 formed between the spout body 121 and the protective cover 122 for the controller or the like through a sensor wire leading path 124k provided within the case cover 124f, after which the wire is connected to the controller 116 through the cylindrical spout fitting portion of the automatic faucet A.

In the construction as described, as shown in FIGS. 25 and 26, a bushing 124m made of rubber

is pressed under pressure into a sensor wire leading end 124l of the sensor wire leading path 124k, and one end of the sensor wire 137 is embedded into a resin mold agent 124d.

Accordingly, the contactness between the sensor wire 137 and the resin mold agent 124d is improved, the water resistance of the sensor 124 can be materially improved, and the erroneous operation of the sensor 124 can be positively prevented.

In the present embodiment, as shown in FIG. 25, the sensor case 124e has a support bracket 124n extended rearwardly from the rear wall thereof, the bracket 124n being secured in a cantilever state to the protective cover 122 for the controller or the like by means of a fixing bolt 124o.

The plurality of sensor wires 137 are extended into the fitting space S for the controller or the like and thereafter connected to a base plate 116a of the controller 116 which will be described later, as shown in FIG. 21.

Next, a hot water and cold water supply piping construction will be described with reference to FIG. 21, in which hot water and cold water are supplied from the pipe 118 on the hot water supply side and the pipe 119 on the cold water supply side into the hot water and cold water mixing valve 15 provided on the base portion of the spout body 121 of the spout 111.

As shown in FIGS. 21 and 23, the mixing valve 115 is provided in the base end of the valve body block 115a with a pair of a hot water introducing hole 115b and a water introducing hole 115c, and the upper ends of the pipe 118 on the hot water supply side and the pipe 119 on the cold water supply side are inserted into and connected to both the introducing holes 115b and 115c, respectively.

The lower ends of the pipe 118 on the hot water supply side and the pipe 119 on the cold water supply side extend through the spout opening 142 provided at the mounting surface 110a in the inner part of the bowl 110 and at a position immediately below the base end of the spout body 111, and are extended downwardly.

In the mixing valve 115, the base end of the valve body block 115a is provided with an internal threaded hole 115d parallel with the hot water introducing hole 115b and the water introducing hole 115c, and the upper ends of the pipe 118 on the hot water supply side and the pipe 119 on the cold water supply side are inserted into and connected to the introducing holes 115b and 115c, respectively.

With the construction as described, hot water and cold water can be supplied from the pipe 118 on the hot water supply side and the pipe 119 on the cold water supply side to the mixing valve 115.

Next, a spout fixing construction will be described with reference to FIG. 21, in which the spout 111 is fixed and connected to the place surface 110a in the inner part of the bowl 110.

The spout fixing construction is substantially designed so that an upper seal ring 144 and an upper defining ring 145 are disposed in a superposed state upwardly of the spout fitting opening 142 provided in the place surface 110a in the inner part of the bowl 110, a shake proof washer 147, a lower fitting washer 148 and a fastening nut 149 are disposed in a superposed state below the spout fitting opening 142, and an external threaded rod 158 having an upper end threadedly mounted to the valve body block 115a of the mixing valve 115 is extended downward through the spout fitting opening 142 and a through-hole provided in the lower fitting washer 148, the fastening nut 149 being threadedly mounted on said extended end.

With the construction as described, the upper defining ring 145 comprises, as shown in FIG. 11, an annular collar 145a provided in the central peripheral edge thereof, and a spout body fitting portion 145b and a bowl fitting portion 145c formed above and below thereof.

As shown in FIG. 21, the spout body fitting portion 145b is fitted to the base portion of the spout 111 and integrally connected by a connecting bolt 150. On the other hand, a bowl fitting portion 145c is fitted to the spout opening 142 provided in the bowl 110 to positively perform locating of the fitting position of the spout fitting 111.

As shown in FIG. 21, since the lower fitting washer 148 has a horse-shoe shape and is provided with a circular cutaway space 156 one end of which is opened, the pipe 118 on the hot water supply side and the pipe 119 on the water supply side can be fitted into and engaged with the circular cutaway space 156 from the external side, thus facilitating the spout fixing work.

Next, the hot water and cold water mixing valve 115 will be described. As shown in FIG. 21, in the mixing valve 115, the valve body block 115a is interiorly formed with a mixed hot water and cold water flow path 115f closeably communicated with the hot water introducing hole 115b and the cold water introducing hole 115c through a rotary valve body 115e.

As shown in FIGS. 21 and 23, the rotary valve body 115e is provided with through-holes 115g and 115h with axes thereof deviated in a circumferential direction in an axially spaced relation, and a temperature adjusting handle 115k is connected to one end thereof by means of a connecting bolt 115j. With the construction as described, the temperature adjusting handle 115k can be suitably rotated to thereby change a mixing ratio of hot water and

cold water flowing into the mixing flow path 115f from the hot water introducing hole 115b and the water introducing hole 115c whereby the mixed hot water and cold water at a desired temperature can be obtained.

While in the present embodiment, the mixing valve 115 has been of the manual type, it is to be noted that the valve may comprise an automatic valve controlled by the controller 116 which will be described later.

Next, the electromagnetic valve 114 will be described with reference to FIGS. 21 and 27.

In the present embodiment, the electromagnetic closing valve 114 comprises a valve fitting block 114a integrally formed above the valve body block 115a of the mixing valve 115, a mixed hot water and cold water inlet path 114b and a mixed hot water and cold water outlet path 114c formed interiorly of the valve fitting block 114a, a pilot type diaphragm valve 114d disposed between the inlet path 114b and the outlet path 114c, and a latching solenoid 114e disposed above the diaphragm valve 114d.

The latching solenoid 114e comprises, as shown in FIG. 27, a solenoid 114f, a plunger 114g disposed movably forward and backward in an axial direction within the solenoid 114f, and a permanent magnet 114h for latching.

With the construction as described, by applying and releasing a voltage from the electromagnetic closing valve 114 to move the plunger 114g forward and backward, the diaphragm valve 114d is opened and closed to provide communication and cutoff between the inlet path 114b and the outlet path 114c.

Next, the battery type power source 117 will be described. As shown in FIGS. 21, 28 and 29, the power source 117 is constituted by a dry cell 117a removably mounted within a dry cell case 117b mounted on the inner surface in the midst of the protective cover 122 for the controller or the like.

By feeding a low voltage from the dry cell 117a to the electromagnetic closing valve 114, the manual sensor 124 and the controller, it is possible to positively prevent trouble such as electric shock.

Next, the controller 116 will be described. As shown in FIGS. 21, 28 and 29, the controller 116 comprises a control base plate 116a disposed above the dry cell case 117b of the battery type power source 117, and controller body 116b provided above the control base plate 116a.

Another construction in the illustrated embodiment will be briefly described. In FIG. 21, a power-off display lamp 182 formed from an LED or the like is connected to one side of the control base plate 116a, and a transparent window 183 for facilitating viewing from outside is provided in a portion of the protective cover 122 for the controller ahead

of the display lamp 182.

Wire supporters 184 and 185 for supporting sensor wires 137 are provided on the upper surface of the dry cell case 117b of the battery type power source 117.

The operation of the automatic faucet A having the above-described construction will be briefly described.

As previously mentioned, the dry cell 117a is mounted on the dry cell case 117b whereby a low voltage is applied to the controller 116, the electromagnetic closing valve 114 and the sensor 124 to set the automatic faucet A in a initial state.

When a user reaches out below the discharge water cap 130a positioned at the extreme end of the automatic faucet A after attending to one's business, the sensor 124 issues an ON-output, and the controller 116 sends a drive signal to the electromagnetic closing valve 114 in response to the ON-output to drive the electromagnetic closing valve 114 so that as shown in FIG. 3, the plunger 114c is moved backward to open the pilot type diaphragm valve 114d.

Thereby, the mixed hot water and cold water at a moderate temperature adjusted by the mixing valve 114 can be discharged out of the discharge water cap 130a to clean hands.

When a user draws his hands after cleaning, the sensor 124 does not detect hands any longer. Therefore, an off-output is sent to the controller 116 so that the controller 116 causes the plunger 114g of the electromagnetic closing valve 114 to move forward in response to the OFF-output to close it by the pilot type diaphragm valve 114d.

In the above-described operation, in the case where the electromagnetic closing valve 114 is subjected to latching solenoid driving, opening or closing state of valve can be self-maintained even if a power is not fed after the electromagnetic closing valve 114 has been once driven to be opened or closed, thus saving power.

As described above, the automatic faucet according to the present invention has the merits as follows:

- (1) The automatic faucet is integrally provided in its body with the hot water and cold water mixing valve, the electromagnetic closing valve, the controller for controlling the driving of the electromagnetic closing valve, the sensor for sending an output signal to the controller, and the battery type power source for feeding a power to the electromagnetic closing valve, the controller and the sensor. Therefore, the automatic faucet, irrespective of existing installation and new installation, can be installed merely by ordinary waterworks without necessity of complicated electric-works, thus reducing fitting and installation costs.

(2) In the present embodiment, the automatic faucet compactly stores the hot water and cold water mixing valve, the electromagnetic closing valve, the controller for controlling the electromagnetic closing valve, the sensor for sending an output signal to the controller and the battery type power source for feeding a power to the electromagnetic closing valve, the controller and the sensor. Therefore, the installation space for the automatic faucet alone will suffice, and the space for the toilet room can be utilized at maximum.

Claims

1. An automatic faucet comprising a) an elongated spout body (11) having a base placed and fixed to a mounting place surface (10a) and comprising a water discharge port (30) at the outer end thereof, b) a water discharge conduit (20) formed over the full length within the wall of the spout body (11), having an opening on the inner side which is connected in communication to a hot water and cold water supply pipe (18), (19) and an opening on the outer end side which is connected in communication to the water discharge port (30), and c) a mixer unit (13) for supplying the mixed hot water and cold water at a moderate temperature through a hot water and cold water supply pipe (18), (19) in response to a sensor output from a hand detecting sensor (24),
characterized in that a protective cover (22) for protecting the sensor is removably mounted on the bottom surface of the spout body (44) in a superposed manner, that said protective cover (22) cooperates with the spout body (11) to form a spout, and that a storage space for sensor for storing the hand detecting sensor (24) and a sensor wire (32) is defined between said protective cover and the inner surface of the spout body (11).
2. An automatic faucet according to claim 1, wherein the hand detecting sensor (24) is mounted at the outer end of the discharge port in a juxtaposed state relative to said discharge port, and the sensor direction of the hand detecting sensor (24) is made approximately parallel with the discharge direction of the discharge port.
3. An automatic faucet according to claim 1, wherein the mixer unit (13) houses therein an electromagnetic closing valve (14) having a contact and a control device (16) for opening and closing the electromagnetic closing valve (14) in response to a sensor output from the hand detecting sensor (24), and the electromagnetic closing valve and the control device can be electrically connected through a contact movable to and from.
4. An automatic faucet according to claim 1, wherein a protective cover (16a) for the control device (16) encircling the control device (16) for opening and closing the electromagnetic closing valve (14) in response to a sensor output from the hand detecting sensor (24) in a water-tight state is provided on the mixer unit (13) encircling the electromagnetic closing valve (14), and the electromagnetic closing valve (14) and the control device (16) are electrically connected.
5. An automatic faucet according to claim 4, wherein an opening (16b) of the protective cover (16a) for the control device (16) having box-shape is removably fitted into an opening of the mixer unit (13) having a box-shape, and a packing (30) formed from an O-ring is provided in said fitting portion.
6. An automatic faucet according to claim 1, wherein the drive portion unit (13) internally integrally stores therein the electromagnetic closing valve (14) and the control device (16) for opening and closing the electromagnetic closing valve in response to a sensor output from the hand detecting sensor (24), and a dry cell case (17a) for storing a dry cell (17d) therein is integrally connected to a control base plate fitting bracket (16c) forming a part of the control device (16) to constitute an assembly, said assembly being incorporated into the mixer unit (13).
7. An automatic faucet according to claim 6, wherein a contact (17e) for the dry cell (17d) connected to the control base plate is mounted on the control base plate fitting bracket (16c), and the dry cell (17d) and the control base plate are electrically connected through the contact for the dry cell (17d) in interlocking with the mounting operation of the dry cell (17d) into the dry cell case (17a).
8. An automatic faucet according to claim 6, wherein a contact for the dry cell (17d) connected to the control base plate (16d) is mounted on the control base plate fitting bracket (16c), the dry cell (17d) and the control base plate (16d) are electrically connected through the contact for the dry cell (17d) in interlocking with the mounting operation of the dry cell



(2) In the present embodiment, the automatic faucet compactly stores the hot water and cold water mixing valve, the electromagnetic closing valve, the controller for controlling the electromagnetic closing valve, the sensor for sending an output signal to the controller and the battery type power source for feeding a power to the electromagnetic closing valve, the controller and the sensor. Therefore, the installation space for the automatic faucet alone will suffice, and the space for the toilet room can be utilized at maximum.

Claims

1. An automatic faucet comprising a) an elongated spout body (11) having a base placed and fixed to a mounting place surface (10a) and comprising a water discharge port (30) at the outer end thereof, b) a water discharge conduit (20) formed over the full length within the wall of the spout body (11), having an opening on the inner side which is connected in communication to a hot water and cold water supply pipe (18), (19) and an opening on the outer end side which is connected in communication to the water discharge port (30), and c) a mixer unit (13) for supplying the mixed hot water and cold water at a moderate temperature through a hot water and cold water supply pipe (18), (19) in response to a sensor output from a hand detecting sensor (24),

characterized in that a protective cover (22) for protecting the sensor is removably mounted on the bottom surface of the spout body (44) in a superposed manner, that said protective cover (22) cooperates with the spout body (11) to form a spout, and that a storage space for sensor for storing the hand detecting sensor (24) and a sensor wire (32) is defined between said protective cover and the inner surface of the spout body (11).

2. An automatic faucet according to claim 1, wherein the hand detecting sensor (24) is mounted at the outer end of the discharge port in a juxtaposed state relative to said discharge port, and the sensor direction of the hand detecting sensor (24) is made approximately parallel with the discharge direction of the discharge port.
3. An automatic faucet according to claim 1, wherein the mixer unit (13) houses therein an electromagnetic closing valve (14) having a contact and a control device (16) for opening and closing the electromagnetic closing valve

(14) in response to a sensor output from the hand detecting sensor (24), and the electromagnetic closing valve and the control device can be electrically connected through a contact movable to and from.

4. An automatic faucet according to claim 1, wherein a protective cover (16a) for the control device (16) encircling the control device (16) for opening and closing the electromagnetic closing valve (14) in response to a sensor output from the hand detecting sensor (24) in a water-tight state is provided on the mixer unit (13) encircling the electromagnetic closing valve (14), and the electromagnetic closing valve (14) and the control device (16) are electrically connected.
5. An automatic faucet according to claim 4, wherein an opening (16b) of the protective cover (16a) for the control device (16) having box-shape is removably fitted into an opening of the mixer unit (13) having a box-shape, and a packing (30) formed from an O-ring is provided in said fitting portion.
6. An automatic faucet according to claim 1, wherein the drive portion unit (13) internally integrally stores therein the electromagnetic closing valve (14) and the control device (16) for opening and closing the electromagnetic closing valve in response to a sensor output from the hand detecting sensor (24), and a dry cell case (17a) for storing a dry cell (17d) therein is integrally connected to a control base plate fitting bracket (16c) forming a part of the control device (16) to constitute an assembly, said assembly being incorporated into the mixer unit (13).
7. An automatic faucet according to claim 6, wherein a contact (17e) for the dry cell (17d) connected to the control base plate is mounted on the control base plate fitting bracket (16c), and the dry cell (17d) and the control base plate are electrically connected through the contact for the dry cell (17d) in interlocking with the mounting operation of the dry cell (17d) into the dry cell case (17a).
8. An automatic faucet according to claim 6, wherein a contact for the dry cell (17d) connected to the control base plate (16d) is mounted on the control base plate fitting bracket (16c), the dry cell (17d) and the control base plate (16d) are electrically connected through the contact for the dry cell (17d) in interlocking with the mounting operation of the dry cell



- (17d) in the dry cell case (17a), and in a state where the dry cell (17d) is not mounted, both poles of a power source input terminal of the control base plate (18a) of the control device (18) are short-circuited to erase a charge of the control device (16).
9. An automatic faucet according to claim 1, wherein the hand detecting sensor (24) is designed so that a sealed box disposed in a sensor mounting space (38) formed within the spout is internally molded by a resin mold agent (24d) with a sensor block provided with a transmitter element and a light receiving element (24j) and a sensor base plate (24b) having one end of a sensor cord (32) connected thereto, and a rubber bushing (24m) is mounted on a leading portion (24l) from the sealed box for the sensor cord (32).
 10. An automatic faucet according to claim 1, wherein a discharge conduit connecting pipe (41), the upper end of which communicates with the lower portion of the spout, is extended downwardly extending through a spout fitting opening (42) provided in a spout fitting plate, a lower fitting washer and a fastening nut are mounted in a vertically superposed state around the outer peripheral surface of an extended portion below the discharge conduit connecting pipe (41), said fastening nut being threadedly engaged with an external threaded portion (41a) provided on the extended portion below the discharge conduit (12) connecting pipe to press the lower fitting washer to the spout fitting plate, and said lower fitting washer being formed into and an approximately horse-shoe shape to form cutaway space in the outer peripheral edge thereof, sensor wires connected to the hand detecting sensor (24) mounted on the spout can be inserted into said cutaway space, a downwardly extending guide pin for guiding the washer is provided below the spout, and a pin insert hole for inserting the guide pin is provided in the lower fitting washer.
 11. An automatic faucet according to claim 1, wherein the drive portion unit (13) is internally integrally provided with an electromagnetic closing valve (14), a control device (16) for opening and closing the electromagnetic closing valve (14) in response to a sensor output from the hand detecting sensor (24) and a water stop valve, said drive portion unit (13) being separably connected to a leg having a base end connected to the wall or the like.
 12. An automatic faucet according to claim 1, wherein said leg comprises a pipe on the hot water supply side and a pipe on the cold water side secured to the wall.
 13. An automatic faucet according to claim 1, wherein a pipe leading opening for leading pipe for supplying hot water and cold water from the electromagnetic closing valve (14) to the spout is provided in a top plate of the drive portion unit (13) interiorly provided with the electromagnetic closing valve (14) and the control device for opening and closing the electromagnetic closing valve (14) in response to a sensor output from the hand detecting sensor (24), and a dew drop preventing weir plate (72h) for preventing outflow of dew water into the control portion is provided in the peripheral edge of the pipe leading opening.
 14. An automatic faucet according to claim 1, wherein the mixer unit (13) internally integrally stores the electromagnetic closing valve (14) and the control device (16) for opening and closing the electromagnetic closing valve (14) in response to a sensor output from the hand detecting sensor (24), power can be fed from the dry cell (17d) to the electromagnetic closing valve (14), the control device (16) and the hand detecting sensor (24), a power-off display lamp (32) actuated when a feed voltage of the dry cell (17d) drops to a level below set voltage is provided, and a transparent window (83) is provided at a part of the peripheral wall of the drive portion unit (13) and at a location confronting the power-off display lamp.
 15. An automatic faucet according to claim 1, wherein a how-to-use display plate (101) is mounted on the surface of the spout and at a location capable of being viewed by a user.
 16. An automatic faucet according to claim 1, wherein the mixer unit (13) internally integrally stores an electromagnetic closing valve (14), a control device (16) for opening and closing the electromagnetic closing valve in response to a sensor output from the hand detecting sensor (24) and a thermostat type mixing valve (15), a temperature setting screw (15d) of said mixing valve (15) is exposed to the front surface of a front panel of casing for encasing said mixing valve, a collar ring (15i) formed in its inner peripheral surface with a projection (15k) and a notch (15p) extending from the surface to the inside is fitted on the outside of the collar ring (15i), the cover ring (15j) being secured to the temperature setting screw (15d) with interfer-



ence of the temperature setting screw (15d) and the projection, and a part of the collar ring can be viewed from outside through said notch (15p).

17. An automatic faucet according to claim 1, wherein the spout houses therein a mixer unit (13), said mixer unit (13) comprising a hot water and cold water mixing valve (15), the upstream of which is connected in communication to a pipe on the hot water (18) supply side and a pipe on the cold water side (19), an electromagnetic closing valve (14), the upstream of which is connected in communication to said mixing valve, and the downstream of which is connected in communication to a discharge port (30), a control device (16) for controlling the driving of at least the electromagnetic closing valve (14), a hand detecting sensor (24) for sending an output signal to the control unit (16), and a battery type power source (12) for feeding power to at least the electromagnetic closing valve (14), the control unit (16) and the hand detecting sensor (24).

Patentansprüche

1. Automatischer Wasserhahn mit a) einem länglichen Ausflußrohrkörper (11), der eine Basis aufweist, die auf einer Befestigungsstellenoberfläche (10a) angeordnet und auf dieser befestigt ist und eine Wasserauslaßöffnung (30) an seinem Außenende hat, b) einem Wasserauslaßkanal (20), der über die gesamte Länge in der Wand des Ausflußrohrkörpers (11) gebildet ist, eine Öffnung an der Innenseite, die in Verbindung mit einem Heißwasser- und einem Kaltwasserzuleitungsrohr (18, 19) steht, und eine Öffnung an der Außenendseite hat, die in Verbindung mit der Wasserauslaßöffnung (30) steht, und c) einer Mischereinheit (13) zum Zuführen des gemischten heißen und kalten Wassers mit mäßiger Temperatur durch ein Heißwasser- und Kaltwasserzuleitungsrohr (18, 19) ansprechend auf ein Sensorausgangssignal von einem Handerfassungssensor (24), dadurch gekennzeichnet, daß eine Schutzabdeckung (22) zum Schützen des Sensors auf der Bodenoberfläche des Ausflußrohrkörpers (11) in überdeckender Weise angebracht ist, daß die Schutzabdeckung (22) mit dem Ausflußrohrkörper (11) zur Bildung eines Ausflußrohrs zusammenwirkt, und daß ein Sensorunterbringungsraum zum Unterbringen des Handerfassungssensors (24) und eines Sensor drahts (32) zwischen der Schutzabdeckung und der Innenoberfläche des Ausflußrohrkörpers (11) festgelegt ist.

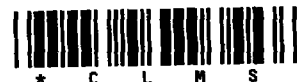
2. Automatischer Wasserhahn nach Anspruch 1, wobei der Handerfassungssensor (24) am Außenende der Auslaßöffnung in nebeneinanderliegendem Zustand relativ zu der Auslaßöffnung angebracht ist, und die Sensor- bzw. Erfassungsrichtung des Erfassungssensors (24) ungefähr parallel zur Auslaßrichtung der Auslaßöffnung verläuft.

3. Automatischer Wasserhahn nach Anspruch 1, wobei die Mischereinheit (13) im Innern ein elektromagnetisches Schließventil (14) aufnimmt, das einen Kontakt und eine Steuervorrichtung (16) zum Öffnen und Schließen des elektromagnetischen Schließventils (14) ansprechend auf ein Sensorausgangssignal von dem Handerfassungssensor (24) aufweist, und das elektromagnetische Schließventil und die Steuervorrichtung durch einen hin- und herbeweglichen Kontakt elektrisch verbunden werden können.

4. Automatischer Wasserhahn nach Anspruch 1, wobei eine Schutzabdeckung (16a) für die Steuervorrichtung (16), die die Steuervorrichtung (16) zum Öffnen und Schließen des elektromagnetischen Schließventils (14) ansprechend auf ein Sensorausgangssignal von dem Handerfassungssensor (24) in einem wasserdichten Zustand umgibt, auf der Mischereinheit (13) vorgesehen ist, welche das elektromagnetische Schließventil (14) umgibt, und das elektromagnetische Schließventil und die Steuervorrichtung (16) elektrisch verbunden sind.

5. Automatischer Wasserhahn nach Anspruch 4, wobei eine Öffnung (16b) der Schutzabdeckung (16a) für die Steuervorrichtung (16), die Kastenform aufweist, entfernt in eine Öffnung der Mischereinheit (13) eingesetzt ist, die Kastenform aufweist, und eine Dichtung (30), die aus einem O-Ring gebildet ist, in dem Einsatzabschnitt vorgesehen ist.

6. Automatischer Wasserhahn nach Anspruch 1, wobei die Antriebsabschnitteinheit (13) das elektromagnetische Schließventil (14) und die Steuervorrichtung (16) zum Öffnen und Schließen des elektromagnetischen Schließventils ansprechend auf ein Sensorausgangssignal von dem Handerfassungssensor (24) im Innern integral aufnimmt, und ein Trockenzellengehäuse (17a) zum Aufnehmen einer Trockenzelle (17d) im Innern integral mit einer Steuerbasisplatten-Befestigungsstütze (16c) verbunden ist, die einen Teil der Steuervorrichtung (16) zur Bildung einer Baueinheit bildet, wobei die Baueinheit in der Mischereinheit (13) eingebaut



ist.

7. Automatischer Wasserhahn nach Anspruch 6, wobei ein mit der Steuerbasisplatte verbundener Kontakt (17e) für die Trockenzelle (17d) auf der Steuerbasisplatten-Befestigungsstütze (16c) angebracht ist, und die Trockenzelle (17d) und die Steuerbasisplatte durch den Kontakt für die Trockenzelle (17d) beim Einsetzvorgang der Trockenzelle (17d) in das Trockenzellengehäuse (17a) einen Formschluß bildend elektrisch miteinander verbunden sind. 5
8. Automatischer Wasserhahn nach Anspruch 6, wobei ein mit der Steuerbasisplatte (16d) verbundener Kontakt (17e) für die Trockenzelle (17d) auf der Steuerbasisplatten-Befestigungsstütze (16c) angebracht ist, und die Trockenzelle (17d) und die Steuerbasisplatte (16d) durch den Kontakt für die Trockenzelle (17d) beim Einsetzvorgang der Trockenzelle (17d) in das Trockenzellengehäuse (17a) einen Formschluß bildend elektrisch miteinander verbunden sind, und wobei in einem Zustand, in dem die Trockenzelle (17d) nicht eingesetzt ist, beide Pole eines Stromquelleneingangsanschlusses der Steuerbasisplatte (18a) der Steuervorrichtung (18) kurzgeschlossen sind, um eine Aufladung der Steuervorrichtung (16) zu lösen bzw. abzuleiten. 10 15 20 25 30
9. Automatischer Wasserhahn nach Anspruch 1, wobei der Handfassungssensor (24) derart ausgelegt ist, daß eine abgedichtete Kapsel, die in einem Sensorunterbringungsraum (28) angeordnet ist, der in dem Ausflußrohr gebildet ist durch ein Harzgießmittel (24d) mit einem Sensorblock intern vergossen ist, der mit einem Übertragungselement und einer Lichtempfangselement (24j) und einer Sensorbasisplatte (24d) versehen ist, an die ein Ende einer Sensorleitung (32) angeschlossen ist, und wobei eine Durchführungstülle (24m) auf einem vorderen bzw. Leitungsabschnitt (24i) von der abgedichteten Kapsel für die Sensorleitung (32) angebracht ist. 35 40 45
10. Automatischer Wasserhahn nach Anspruch 1, wobei ein Ausflußleitungsverbindungsrohr (41), dessen oberes Ende in Verbindung mit dem unteren Abschnitt des Ausflußrohrs steht, nach unten verlängert ist und sich durch eine Ausflußrohr-Befestigungsöffnung (42) erstreckt, die in einer Ausflußrohr-Befestigungsplatte vorgesehen ist, wobei eine untere Paßunterlegscheibe und eine Befestigungsmutter in vertikal übereinanderliegendem Zustand um die Außenumfangsfläche eines verlängerten Ab-

schnitts unter dem Ausflußleitungsverbindungsrohr (41) angebracht sind, wobei die Befestigungsmutter mit einem Außengewindeabschnitt (41a) im Schraubeingriff steht, der auf dem verlängerten Abschnitt unter dem Ausflußleitungsverbindungsrohr vorgesehen ist, um die untere Paßunterlegscheibe gegen die Ausflußbefestigungsplatte zu drücken, und wobei die untere Paßunterlegscheibe ungefähr in Hufeisenform gebildet ist, um einen Freischnittraum in ihrer Außenumfangskante zu bilden, wobei Sensordrähte, die an den Handfassungssensor (24) angeschlossen sind, der am Ausflußrohr angebracht ist, in den Freischnittraum eingesetzt werden können, wobei ein sich abwärts erstreckender Führungsstift zum Führen der Unterlegscheibe unter dem Ausflußrohr vorgesehen ist, und wobei ein Stifteinführungsloch zum Einführen des Führungsstifts in der unteren Paßunterlegscheibe vorgesehen ist.

11. Automatischer Wasserhahn nach Anspruch 1, wobei die Antriebsabschnitteinheit (13) im Innern integral mit einem elektromagnetischen Schließventil (14), einer Steuervorrichtung (16) zum Öffnen und Schließen des elektromagnetischen Schließventils ansprechend auf ein Sensorausgangssignal von dem Handfassungssensor (24) und einem Wasserstoppventil versehen ist, wobei die Antriebsabschnitteinheit (13) getrennt mit einem Schaft verbunden ist, der ein Basisende aufweist, das an der Wand oder dergleichen befestigt ist. 25 30
12. Automatischer Wasserhahn nach Anspruch 1, wobei der Schaft auf der Seite der Heißwasserzufuhr und der Kaltwasserzufuhr, die an der Wand befestigt sind, jeweils ein Rohr umfaßt. 35 40
13. Automatischer Wasserhahn nach Anspruch 1, wobei eine Rohrleitungsöffnung für ein Leitungsrohr zum Zuführen heißen und kalten Wassers von dem elektromagnetischen Schließventil (14) zu dem Ausflußrohr in einer Kopfplatte der Antriebsabschnitteinheit (13) vorgesehen ist, die im Innern mit dem elektromagnetischen Schließventil (14) und der Steuervorrichtung zum Öffnen und Schließen des elektromagnetischen Schließventils (14) ansprechend auf ein Sensorausgangssignal von dem Handfassungssensor (24) versehen ist, und wobei eine Tautropfen-verhindernde Wehrplatte (72h) zum Verhindern eines Ausflusses von Tauwasser in den Steuerabschnitt in der Umfangskante der Rohrleitungsöffnung vorgesehen ist. 45 50 55



14. Automatischer Wasserhahn nach Anspruch 1, wobei die Mischereinheit (13) das elektromagnetische Schließventil (14) und die Steuervorrichtung (16) zum Öffnen und Schließen des elektromagnetischen Schließventils (14) ansprechend auf ein Sensorausgangssignal von dem Handfassungssensor (24) im Innern integral aufnimmt, wobei dem elektromagnetischen Schließventil (14), der Steuervorrichtung (16) und dem Handfassungssensor (24) von der Trockenzelle (17d) Strom zugeführt werden kann, wobei eine Lampe (32) zum Anzeigen eines Strom-aus-Zustands, die betätigt wird, wenn Speisespannung der Trockenzelle (17d) auf einen Pegel unter einer eingestellten Spannung abfällt, vorgesehen ist, und wobei ein transparentes Fenster (83) an einem Teil der Umfangswand der Antriebsabschnitteinheit (13) und einer der Strom-aus-Anzeigelampe gegenüberliegenden Stelle vorgesehen ist.

15. Automatischer Wasserhahn nach Anspruch 1, wobei eine Benutzungsanleitungs-Anzeigeplatte (101) auf der Oberfläche des Ausflußrohrs und an einer Stelle angebracht ist, die durch einen Benutzer eingesehen werden kann.

16. Automatischer Wasserhahn nach Anspruch 1, wobei die Mischereinheit (13) ein elektromagnetisches Schließventil (14), eine Steuervorrichtung (16) zum Öffnen und Schließen des elektromagnetischen Schließventils ansprechend auf ein Sensorausgangssignal von dem Handfassungssensor (24) und ein Thermostadmischventil (15) im Innern integral aufnimmt, wobei eine Temperatureinstellschraube (15d) des Mischventils (15) auf der vorderen Oberfläche einer Frontplatte eines Gehäuses zum Aufnehmen des Mischventils freiliegt, wobei ein Abdeckring (15j), der in seiner Innenumfangsfläche mit einem Vorsprung (15k) und einer Kerbe (15p) gebildet ist, die sich von der Oberfläche zur Innenseite erstrecken, auf der Außenseite des Kragenrings (15i) befestigt ist, wobei der Abdeckring (15j) an der Temperatureinstellschraube (15d) unter gegenseitiger Beeinflussung der Temperatureinstellschraube (15d) und des Vorsprungs befestigt ist, und wobei ein Teil des Kragenrings von außen durch die Kerbe (15p) sichtbar ist.

17. Automatischer Wasserhahn nach Anspruch 1, wobei das Ausflußrohr im Innern eine Mischereinheit (13) aufnimmt, die ein Heiß- und Kaltwassermischventil (15) umfaßt, dessen stromaufwärtige Seite in Verbindung mit einem Rohr auf der Heißwasser(18)zuführseite und einem

Rohr auf der Kaltwasserseite (19) in Verbindung steht, ein elektromagnetisches Schließventil (14), dessen stromaufwärtige Seite in Verbindung mit dem Mischventil steht, und dessen stromaufwärtige Seite in Verbindung mit einer Auslaßöffnung (30) steht, eine Steuervorrichtung (16) zum Steuern des Antriebs von wenigstens dem elektromagnetischen Schließventil (14), einem Handfassungssensor (24) zum Senden eines Ausgangssignals zu der Steuereinheit (16), und eine Batterie-stromquelle (12) zum Leiten von Strom zu wenigstens dem elektromagnetischen Schließventil (14), der Steuereinheit (16) und dem Handfassungssensor (24).

Revendications

1. Robinet automatique comprenant a) un corps de chenal d'écoulement allongé (11) dont la base est disposée et fixée sur une surface d'emplacement de montage (10a) et comprenant une embouchure d'évacuation d'eau (30) sur son extrémité externe de celui-ci, b) un conduit d'évacuation d'eau (20) formé sur la totalité de la longueur dans de la paroi du corps de chenal d'écoulement (11), disposant d'une ouverture sur la face interne qui est reliée en communication avec des tuyauteries d'alimentation en eau chaude et en eau froide (18), (19) et d'une ouverture sur le côté d'extrémité externe qui est reliée en communication avec l'embouchure d'évacuation d'eau (30), et c) une unité de mélange (13) pour délivrer l'eau chaude et l'eau froide à travers une tuyauterie d'alimentation en eau chaude et eau froide (18, 19) mélangées à une température modérée en réponse à une sortie de détection d'un capteur de détection de main (24), caractérisé en ce qu'un couvercle protecteur (22) destiné à protéger le détecteur est monté de façon amovible sur la face inférieure du corps de chenal d'écoulement (44) d'une manière superposée, en ce que ledit couvercle protecteur (22) coopère avec le corps de chenal d'écoulement (11) pour former un chenal d'écoulement, et en ce qu'un espace de mise en place pour le détecteur destiné à mettre le capteur de détection de main (24) et un fil de détecteur (32) en place est défini entre ledit couvercle de protection et ladite surface interne dudit corps de chenal d'écoulement (11).

2. Robinet automatique selon la revendication 1, dans lequel le capteur de détection de main (24) est monté sur l'extrémité externe de l'embouchure d'évacuation dans un état juxtaposé par rapport à ladite embouchure d'évacuation,



et le sens de détection du capteur de détection de main (24) est approximativement parallèle au sens d'évacuation de l'embouchure d'évacuation.

3. Robinet automatique selon la revendication 1, dans lequel l'unité de mélange (13) contient à l'intérieur une vanne de fermeture électromagnétique (14) pourvue d'un contact et d'un dispositif de commande (16) pour ouvrir et fermer la vanne de fermeture électromagnétique (14) en réponse à une sortie de détection issue du capteur de détection de main (24), et la vanne de fermeture électromagnétique et le dispositif de commande peuvent être reliés électriquement par l'intermédiaire d'un contact mobile va et vient. 5
4. Robinet automatique selon la revendication 1, dans lequel un couvercle protecteur (16a) pour le dispositif de commande (16) entourant le dispositif de commande (16) destiné à ouvrir et à fermer la vanne de fermeture électromagnétique 14 en réponse à une sortie de détection issue du capteur de détection de main (24) dans un état étanche à l'eau est prévu sur l'unité de mélange (13) entourant la vanne de fermeture électromagnétique (14), et dans lequel la vanne de fermeture électromagnétique (14) et le dispositif de commande (16) sont reliés électriquement. 10 15 20 25 30
5. Robinet automatique selon la revendication 4, dans lequel une ouverture (16b) du couvercle protecteur (16a) pour le dispositif de commande (16) présentant une forme de boîte est assemblé de façon amovible dans une ouverture de l'unité de mélange (13) présentant une forme de boîte, et une étanchéité (30) formée un joint torique est prévue dans ladite partie d'assemblage. 35 40
6. Robinet automatique selon la revendication 1, dans lequel l'unité de mélange (13) contient intégralement à l'intérieur de celle-ci la vanne de fermeture électromagnétique (14) et le dispositif de commande (16) destiné à ouvrir et à fermer la vanne de fermeture électromagnétique en réponse à une sortie de détection issue du capteur de détection de main (24), et une boîte de pile sèche (17a) pour contenir une pile sèche (17d) à l'intérieur est reliée intégralement à un crochet d'assemblage de plaque de base de commande (16c) formant une partie du dispositif de commande (16) pour constituer un ensemble, ledit ensemble étant incorporé dans l'unité de mélange (13). 45 50 55

7. Robinet automatique selon la revendication 6, dans lequel un contact (17e) pour la pile sèche (17d) reliée à la plaque de base de commande est monté sur le crochet d'assemblage de plaque de base de commande (16c), et dans lequel la pile sèche (17d) et la plaque de base de commande sont reliées électriquement par l'intermédiaire d'un contact pour la pile sèche (17d) de manière interverrouillée lors de l'opération de montage de la pile sèche (17d) dans le boîtier de pile sèche (17a). 5 10
8. Robinet automatique selon la revendication 6, dans lequel un contact pour la pile sèche (17d) reliée à la plaque de base de commande (16d) est monté sur le crochet d'assemblage de plaque de base de commande (16c), la pile sèche (17d) et la plaque de base de commande (16d) sont reliées électriquement par l'intermédiaire du contact pour la pile sèche (17d) de manière interverrouillée lors de l'opération de montage de la pile sèche (17d) dans le boîtier de pile sèche (17a), et dans un état dans lequel la pile sèche (17d) n'est pas montée, les deux pôles d'une borne d'entrée de source de puissance de la plaque de base de commande (18a) du dispositif de commande (18) sont court-circuités pour effacer une charge du dispositif de commande (16). 15 20 25 30
9. Robinet automatique selon la revendication 1, dans lequel le capteur de détection de main (24) est conçu comme un boîtier étanche disposé dans un espace de montage de détecteur (38) formé à l'intérieur du chenal d'écoulement, un agent de moulage en résine (24d) étant coulé à l'intérieur avec un bloc de détection étant prévu avec un élément de transmission et un élément d'émission et un élément de réception de lumière (24j) et une plaque de base de détecteur (24b) sur laquelle une extrémité d'un câble de détection (32) est reliée, et un bossage en caoutchouc (24m) est monté sur une partie avant (24l) du boîtier étanche pour le câble de détecteur (32). 35 40 45 50 55
10. Robinet automatique selon la revendication 1, dans lequel une tuyauterie de liaison au conduit d'évacuation (41), dont l'extrémité supérieure communique avec la partie inférieure du chenal d'écoulement est allongé vers le bas en s'étendant à travers une ouverture d'assemblage de chenal d'écoulement (42) prévue dans une plaque d'assemblage de chenal d'écoulement, une rondelle d'assemblage inférieure et un écrou de fixation sont montés dans un état superposé verticalement autour de la surface périphérique externe d'une partie allon-



- gée au-dessous de la tuyauterie de liaison au conduit d'évacuation (41), ledit écrou de fixation étant engagé par filetage sur une partie externe filetée (41a) prévue sur la partie et allongée au-dessous de la tuyauterie de liaison du conduit d'évacuation (12) pour appliquer la rondelle d'assemblage inférieure sur la plaque d'assemblage de chenal d'écoulement, et ladite rondelle d'assemblage inférieure étant formée à l'intérieur et approximativement en forme de sabot de cheval pour former un espace découpé sur le bord périphérique externe de celle-ci, des fils de détecteur reliés au capteur de détection de main (24) monté sur le chenal d'écoulement peuvent être insérés dans ledit espace découpé, une broche de guidage s'étendant vers le bas destinée à guider la rondelle est prévue au-dessous du chenal d'écoulement, et un orifice d'insertion de broche destiné à insérer la broche de guidage est prévu sur la rondelle d'assemblage inférieure.
11. Robinet automatique selon la revendication 1, dans lequel l'unité mélange (13) est pourvue, intégralement à l'intérieur, d'une vanne de fermeture électromagnétique (14), d'un dispositif de commande (16) pour ouvrir et fermer la vanne de fermeture électromagnétique (14) en réponse à une sortie de détection issue du capteur de détection de main (24) et d'une vanne d'arrêt d'eau, ladite unité de mélange (13) étant reliée de manière amovible à une jambe dont une extrémité de base est reliée à la paroi ou analogue.
12. Robinet automatique selon la revendication 1, dans lequel ladite jambe comprend une tuyauterie du côté d'alimentation en eau chaude et une tuyauterie du côté de l'eau froide fixées sur la paroi.
13. Robinet automatique selon la revendication 1, dans lequel une ouverture en tête de tuyauterie pour la tuyauterie de tête destinée à alimenter en eau chaude et en eau froide à partir de la vanne de fermeture électromagnétique (14) vers le chenal d'écoulement est prévue sur une plaque supérieure de l'unité de partie de mélange (13) prévue à l'intérieur de la vanne de fermeture électromagnétique (14) et du dispositif de commande destiné à ouvrir et à fermer la vanne de fermeture électromagnétique (14) en réponse à une sortie de détection issue du capteur de détection de main (24), et une limitation de fuite de condensation de la plaque de barrage (72e) pour empêcher la fuite de l'eau de condensation dans une partie de commande est prévu sur le bord périphérique de l'ouverture de tête de tuyauterie.
14. Robinet automatique selon la revendication 1, dans lequel l'unité de mélange (13) contient, intégralement, à l'intérieur la vanne de fermeture électromagnétique (14) et le dispositif de commande (16) destiné à ouvrir et à fermer la vanne de fermeture électromagnétique (14) en réponse à une sortie de détection issue du capteur de détection de main (24), la puissance peut être délivrée à partir de la pile sèche (17d) vers la vanne de fermeture électromagnétique (14), le dispositif de commande (16) et le détecteur de détection de main (24), un témoin d'affichage de puissance inactive (32) activé lorsqu'une tension d'alimentation de la pile sèche (17d) dépasse un niveau au-dessous d'une tension réglée est prévu, et une fenêtre transparente (83) est prévue sur une partie de la paroi périphérique de l'unité mélange (13) et à un emplacement opposé au témoin d'affichage de puissance inactive.
15. Robinet automatique selon la revendication 1, dans lequel un panneau d'affichage d'instruction d'utilisation (101) est monté sur la surface du chenal d'écoulement et à un emplacement pouvant être vu par un utilisateur.
16. Robinet automatique selon la revendication 1, dans lequel l'unité de mélange (13) contient, intégralement, à l'intérieur une vanne de fermeture électromagnétique (14), un dispositif de commande (16) destiné à ouvrir et à fermer la vanne de fermeture électromagnétique en réponse à une sortie de détection issue du capteur de détection de main (24) et une vanne de mélange du type à thermostat (15), une vis de réglage de température (15d) de ladite vanne de mélange (15) est exposée sur la surface avant d'un panneau avant de l'enveloppe destiné à envelopper ladite vanne de mélange, un anneau de serrage (15i) formé sur sa surface périphérique interne avec une saillie (15k) et une encoche (15p) s'étendant depuis la surface vers l'intérieur est assemblée à l'extérieur de l'anneau de serrage (15i), l'anneau de couverture (15j) étant fixé sur la vis de réglage de température (15d) en interférant avec la vis de réglage de température (15d) et la saillie, et une partie de l'anneau de serrage peut être vue depuis l'extérieur à travers ladite encoche (15p).
17. Robinet automatique selon la revendication 1, dans lequel le chenal d'écoulement contient à l'intérieur une unité de mélange (13), ladite unité de mélange (13) comprenant une vanne



de mélange d'eau chaude et d'eau froide (15), dont l'amont est relié en communication avec une tuyauterie sur le côté d'alimentation en eau chaude (18) et une tuyauterie sur le côté d'eau froide (19), une vanne de fermeture électromagnétique (14), dont l'amont est relié en communication avec ladite vanne de mélange, et l'aval est relié en communication avec une embouchure d'évacuation (30), un dispositif de commande (16) destiné à commander l'attaque d'au moins la vanne de fermeture électromagnétique (14), un capteur de détection de main (24) destiné à envoyer un signal de sortie vers l'unité de commande (16), et une source de puissance de type pile (12) destiné à alimenter la puissance vers au moins la vanne de fermeture électromagnétique (14), l'unité de commande (16) et le capteur de détection de main (24).

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