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(54) Title: AUTOMATIC WATER SAVING FAUCET FOR ABLUTION AND SHOWERING

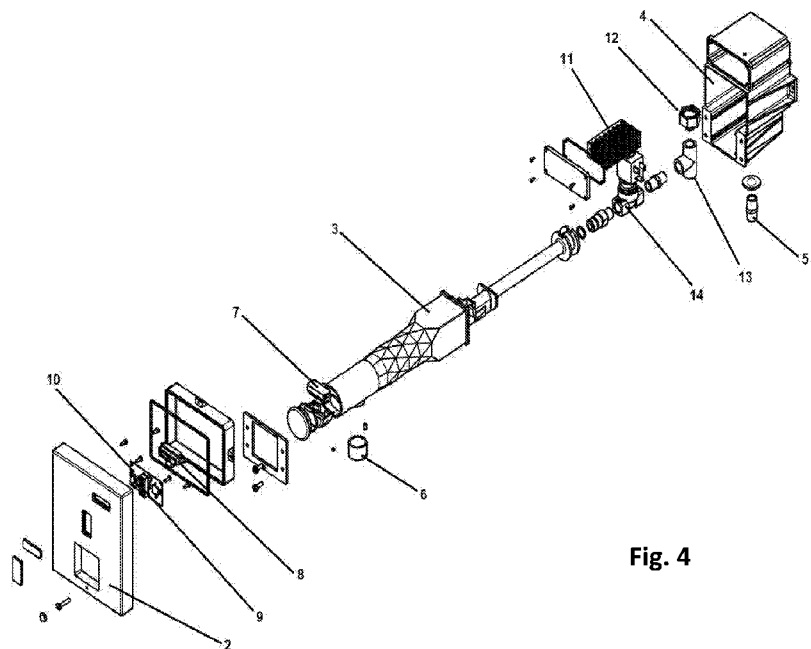


Fig. 4

(57) Abstract: In this invention a practical method for making ablution and shower according to what prophet Mohammad used to practice is disclosed. Prophet Mohammad (peace be upon him) used complete ablution with 1 Modd amount of water which is an ancient Arabic volume unit and used to shower using Saa', approximately four times the size of the Modd. Introduced water faucet is also used for applications other than ablution. It can be used as an alternative informative water saving faucet that limits water consumption. Faucet consists of an electronic control card equipped water level indicator i.e. led bar graph, hands free sensors, pressure transducer or flow meter and other instruments.



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AUTOMATIC WATER SAVING FAUCET FOR ABLUTION AND SHOWERING

5 The Technical Field Of The Invention

This invention is related to Islamic practice of ablution and showering with the automated self-calibrated adjustment of water flow and water saving faucet and shower head.

Prior Art About The Invention (Previous Technique)

- 10 The continuous increase in the human population worldwide reduced accessible natural clean water resources. In addition to increase on water demand, global warming as a result of hydrocarbon based fuel combustion disturbed water cycle. Some countries started getting hotter and drier year by year and it is considered, in the future this global warming impact on climate and water cycle will become severe. In addition to increased water consumption
- 15 by humans and global warming effects, industrial and agricultural water usage is also increased. Waste water discharges from industrial plants contaminated clean water resources which also affects clean water resources. It is considered in order to leave a livable world for next generations, any water saving would help to world.
- 20 There are approximately 1,5 billion Muslim population in the world. In the Islamic tradition, there is a process called ablution (Wudu in Arabic) and showering (Ghusul in Arabic) which is washing some or all of the body parts with certain conditions before prayers. Ablution is repeated 5 times every day before every prayer times. Prophet Mohammad (peace be upon him) used to make ablution with a certain amount of water. Volume of the water was 1
- 25 Modd on his time, today's unit conversation it accounts 0.4 to 0.8 liter water consumption per Ablution process. He also used to make Ghusul with Saa' which is four times the size of the Modd. Best practice for Islam is to follow Prophet Mohammad's tradition. According to studies, nowadays people use up to 5 liters of water per ablution with current practice. Prophet Mohammad's practice for ablution was beyond his time in terms of water saving.
- 30 This invention targets to help people, to let them follow Prophet Mohammad's ablution practice with today's technological development in particular and help the environment in general by reducing the water consumption per ablution and Ghusul.

Nowadays, Automatic water faucets are widely being used for homes and public places. These faucets help to reduce water consumption very much thanks to sensor activated control. In the patent search performed to determine automatic faucets and automatic ablution machines, many patent files have been found. They are disclosing a lot of features like water flow control mechanisms, easy usage to target ablution process, flow meters, instruction screens... etc.

However, non-of them provides a faucet with ideal conditions for ablution or Ghusul.

10 Aims Of The Invention And A Brief Explanation

This invention aims to provide convenience to the people who would like to follow Prophet Mohammad's ablution practice, reduce the amount of water for per ablution process, train people to complete their ablution with 0.4 to 0.8 liter of water and complete their shower with 1.6 to 3.2 liters of water, create awareness for the Muslim Communities about wasted water during ablution and Ghusul, let all people to use for each usage maximum a preset amount of water with an informative indication.

This faucet is equipped with sensors to adjust water flow as 0.4 to 0.8 liters $\pm$ 10% for Modd and four times this amount for Saa' of water amount per usage whit an easy level indicator which shows the remaining amount of water to complete ablution and Ghusul in all conditions, a reset button or a touch free sensor to prepare the system immediately for the next user (if necessary), a sensor which detects main line pressure and transfers the signal to electronic control card, an electronic card that receives the signals from sensors and controls electromagnetic or electro mechanic valve to control 0.4 to 0.8 liters $\pm$ 10% for Modd or four times of this amount for Saa' consumption of water for each ablution or Ghusul process.

Another aspect of the invention where in a pressure transducer (12) is a piezoresistive transducer, which creates variant electrical signals for differentiating pressure at measurement point.

The Descriptions Of The Figures Explaining The Invention

In order to better describe automatic water faucet for ablution developed in this invention, figures have been prepared. Definitions of the figures are explained below.

5 Figure 1- Schematic view (isometric perspective) of wall mount automatic water faucet for
ablution assembly

Figure 2- Schematic view (perspective) of sink automatic water faucet for ablution assembly

Figure 3- Schematic view (isometric from bottom perspective) of wall mount automatic water
faucet for ablution assembly

10 Figure 4- Exploded view (isometric perspective) of wall mount automatic water faucet for
ablution assembly

Figure 5- Schematic view of showering system

Figure 6- An algorithm for control narrative of electronic control card.

The Description Of The Parts

15 In order to better describe the automatic water faucet for ablution developed in this
invention, the features in the figures have been numbered. Definitions of the features are
below.

1- Faucet assembly

2- Panel

20 3- Faucet body

4- Box

5- Water inlet

6- Water outlet

7- Hands free sensor for movement detection (IR Sensor)

25 8- Hands free sensor for reset (Reset Sensor)

9- Water level indicator

10- Electronic control card

11- Power supply

12- Pressure transducer

30 13- Tee fitting

14- Solenoid valve

15- Cold Water Inlet

16- Hot Water Inlet

17- Water Mixer

18- Shower Head

5 The Detailed Explanation Of The Invention

A solenoid valve is an on/off type electromechanical flow control instrument for fluids. It basically consists of a coil, a sealing pin and a body with an orifice. When the solenoid valve is closed, sealing pin closes the orifice and stops fluid flow. The coil is activated by electricity in order to pull sealing pin and as a result, let fluid flow through orifice. The fluid flow rate is related to orifice diameter and fluid pressure. For main water supply line in a city or in an apartment, water pressure shows big variety depending on height of the location and level of floor. When the orifice diameters are same for the faucets being used in two houses in same apartment, the water flow rates from those faucets are different. As the water supply line pressure reduces for higher floors water flow rate of the faucet installed to higher floor house will be lower than the one installed to lower one. Additionally, instant high/low amount of water usage in same building or neighborhood can cause pressure variations which again effects water flow rate from a known orifice diameter faucet. In order to provide economical solution for this kind of infrastructural accuracy problems with an acceptable level of water flow rate tolerance, a logical system which contains pressure transducer is designed. A pressure sensor is a piezoresistive transducer, which creates variant electrical signals for differentiating pressure at measurement point. Valve is controlled by a specially programmed electronic card, which receives signal from pressure transducer and movement detection sensor i.e. Infra-red sensors. There are already available precise flow meters. They can also detect the flow rate and can be utilized for accurate water flow control for ablution but, they are expensive and big in terms of dimensions.

Present invention is related to a pressure transducer (12) connected to line in order to measure and transmit line pressure, a solenoid valve (11) with known orifice diameter, hands free sensors (7) which is used for reset and solenoid valve activation purposes, an electronic control card (10) which is used for receiving signals from sensors, calculates the fluid flow, controls the solenoid valve (14) and gives level indication to user about remaining amount of water in order to complete ablution. With these features faucet would provide

convenience for the user who would like to complete ablution with same amount of water that prophet Mohammad used to make.

System works according to algorithm in fig.5. Faucet consist of several main parts such as box (4) which hosts instruments [i.e. water inlet (5), fittings, pressure transducer (12), solenoid or motor valve (14), power supply(14)], panel (2) which hosts electronic components [i.e. control card (10), hands free reset sensor (8)], faucet body which hosts water outlet and activated hands free sensor. It is preferred that to produce box (4) from plastic. Place that hosts power supply (14) for faucet in box (4) is designed according to IP 67 protection specifications. Faucet body and panel are preferred to manufacture out of brass, or aluminum alloy. They can also be manufactured from plastic. In all cases they are considered to be coated with decorative materials like; nickel, chromium, silver, gold... etc.

Pressure transducer (12) is connected to faucet inlet line before solenoid valve (14) through a tee type fitting (13), in order to detect water supply line pressure for self-calibration purposes. Measurement signal, created in pressure transducer (12) is transmitted to electronic control card (10). Electronic control card (10) receives the signal from pressure transducer (12), and calculates the flow rate by using pre-loaded equation in its software. If there is not enough water pressure on line, control card gives a flashing indication on water level indicator (9). And system automatically checks line pressure every 10 sec. In order to give estimated water, it calculates the total duration time of water flow for ablution. This calculated time is called as Timer 1. This calculation is done for each 10 sec. continuously if there is no usage. Operation time, lightening duration (timer) of water level indicator (9) is calculated. Water level indicator (9) can be an embedded electronic component to electronic control card or separate component as well with illumination i.e. led bar graph, led panel, lcd panel, tft screen. As an example, with a measured line pressure, it is calculated that the total duration of water flow, as 50 sec. Total led lamp quantity in the water level indicator (9) led bar graph is 10 pcs. In this case each led lamp represents 5 sec and 75 milliliters for 750 ml water consume. When a user comes to make ablution, he/she put his hand beneath the faucet body (3). IR Sensor (7) detects hand and starts the process. Coil of solenoid valve (14) is electrified by the electronic control card (10) and water flow starts. Timer counts back only when the hands free sensor for movement detection (IR Sensor) (7) is activated by user. If there is no activation (means no water usage) timer is interrupted. A secondary timer is started with preset time. Secondary timer is called as Timer-2 only stopped by new

sensor activation. In case of no sensor after last usage, the secondary timer is completed (i.e. preset 15 sec) and system is automatically reset. Alternatively, system also can be reset by hands free reset button (8) placed on the panel (2) of faucet. As the user uses the faucet for ablution purposes, after each movement (washing of some body parts) used amount of water reduced from the informative indication panel. Only remaining amount of water is shown. This informative led screen will encourage the user to use less but good enough amount of water. After 0.4 to 0.8 lt amount of water is used solenoid valve is closed. System is reset in two seconds. This time is necessary for measuring line pressure again for calibration purposes. If user cannot complete the ablution with 0.4 to 0.8lt of water, after reset (2 sec), user can continue to use water to complete ablution.

An alternative method for 0.4 to 0.8 liter per ablution can be utilization of a flow meter or calibrated water vessel instead of pressure transducer (12) and calculation. A flow meter can be placed on line before or after solenoid valve (14). When the hands free detector for movement detection (7) is activated by user, solenoid valve (14) is electrified by electronic control card (10) and water flow is started. Flow rate of water is measured by flow meter and signal is sent to electronic control card (10). Electronic control card (10) makes work water level indicator for the informative indication for user about the remaining amount of water. System can be reset whether by a preset timer (i.e. 15 sec.) which works with a preset time and takes usage of two consecutive activation or by a reset button which can be hands free or touch free button (8).

In both cases faucet assembly can be applied as wall mounted (Fig. 1) or sink mounted (Fig. 2). A manual or automatic hot/cold water mixer is also can be attached faucet in order to provide comfort for the users. Faucet can be connected to wi-fi, Bluetooth, any Smartphone and smart home system. Usage of faucet can be logged and monitored later. While designing of this faucet, heavy usage public places are also considered.

This faucet logic can be applied to serve other purposes. Amount of the water flow for each usage can be changed from 0.4 to 0.8liters to any other constant amount as factory settings. Alternatively a flow rate adjustment can be trough rotary button (i.e. potentiometer) which can be placed on panel (2) in order to let user adjust the amount of water for per usage by himself. With this arrangement, faucet would work according to new preset amount of water

i.e. 1 lt per usage instead of 0.4 to 0.8 lt. This property of water faucet serves simply to save water, create awareness on people about their water consumption for daily usages and make the product useful for applications other than ablution.

- 5 For showering (Ghusul) system, a schematic view is shown as Fig. 5. Cold and hot water reach to inlets (15, 16) of mixer by which, comfort temperature is adjusted by user. Pressure is measured by pressure transducer and informative screen (9) is water amount is calibrated according to line pressure. When user activates IR start/stop button (8), solenoid valve is activated electronic control card and water flow starts. As the water flows (being consumed)
- 10 water level reduces. When the total amount is consumed pressure is measured, water level is refilled and system turns to stand-by until next triggering.

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CLAIMS

1. An Automatic Water Saving faucet for ablution or showering which is providing convenience for the user who would like make ablution with same amount of water that prophet Mohammad (peace be upon him) used to make and which has Faucet assembly (1), comprising:
 - A pressure transducer (12) which is connected to line in order to measure and transmit line pressure and which is connected to faucet inlet line before solenoid valve (14) through a tee type fitting (13), in order to detect water supply line pressure for self-calibration,
 - A solenoid valve (14) with orifice diameter,
 - A hands free sensors (7) which is used for reset and solenoid valve activation,
 - An electronic control card (10) which is used for receiving signals from sensors to calculate the fluid flow as 0.4-0.8 liters,
 - Giving level indication to user about remaining amount of water in order to complete ablution or showering.
2. Faucet according to claim 1 where the pressure transducer (12) is a piezoresistive transducer, which creates variant electrical signals for differentiating pressure at measurement point.
3. Faucet according to claim 1 further comprising water level indicator (9).
4. Faucet according to claim 3 where water level indicator (9) is embedded into electronic control card.
5. Method for working of faucet according to claim 1 comprising:
 - Creating measurement signal in pressure transducer (12) which is transmitted to electronic control card (10),
 - Receiving the signal from pressure transducer (12) forwarding to Electronic control card (10) and calculating the flow rate by using pre-loaded equation in its software,
 - If there is not enough water pressure on line, flashing indication on water level indicator by control card
 - Checking line pressure every 10 sec automatically,
 - In order to give estimated water, calculating the total duration time of water flow for ablution or showering,
 - Electrifying coil of solenoid valve (14) by the electronic control card (10) and starting flow of water,
 - Closing solenoid valve after 0.4-0.8 L amount of water is used

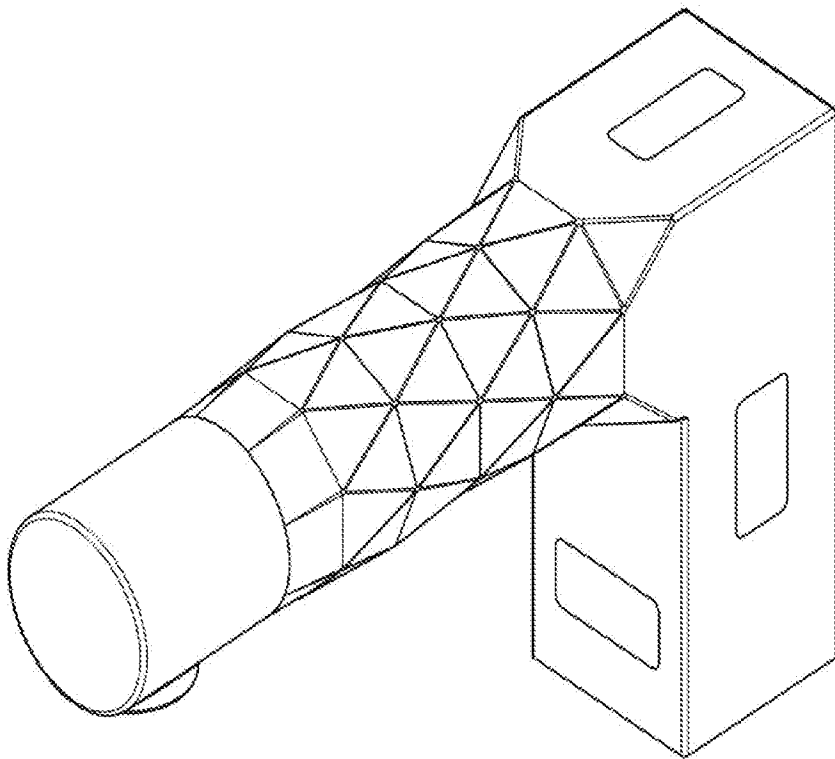


Fig. 1

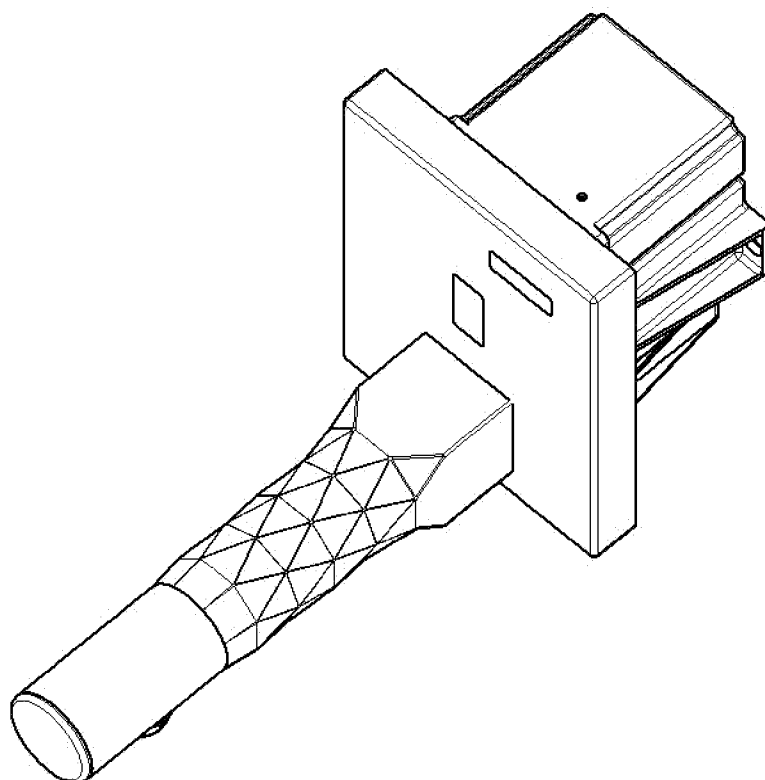


Fig. 2

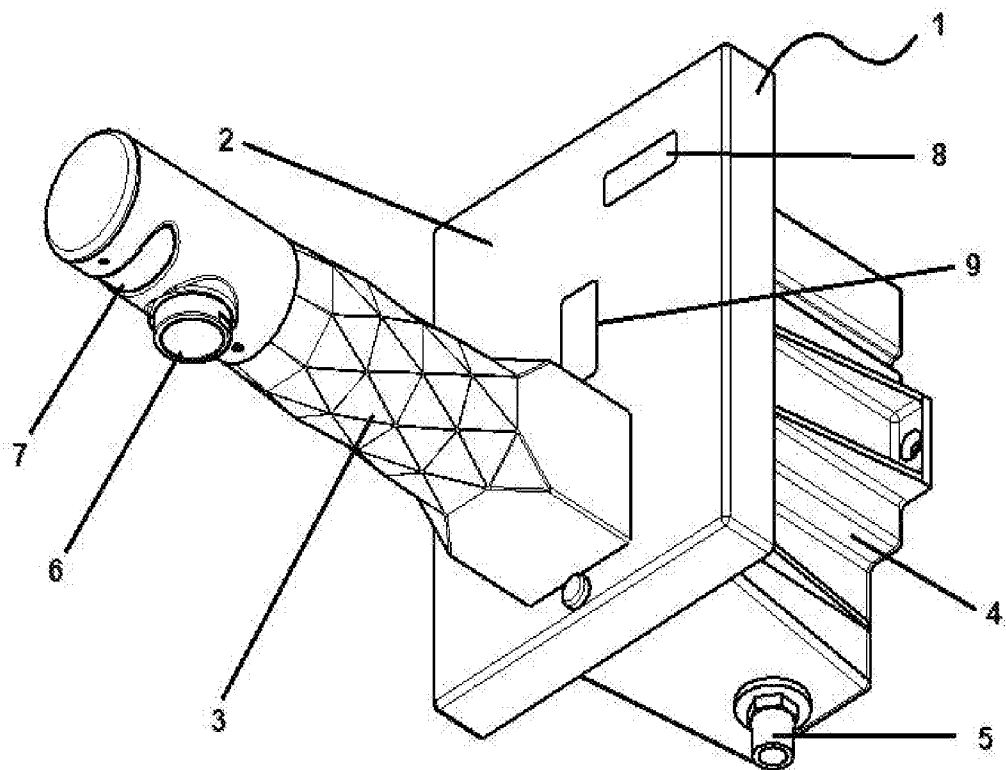


Fig. 3

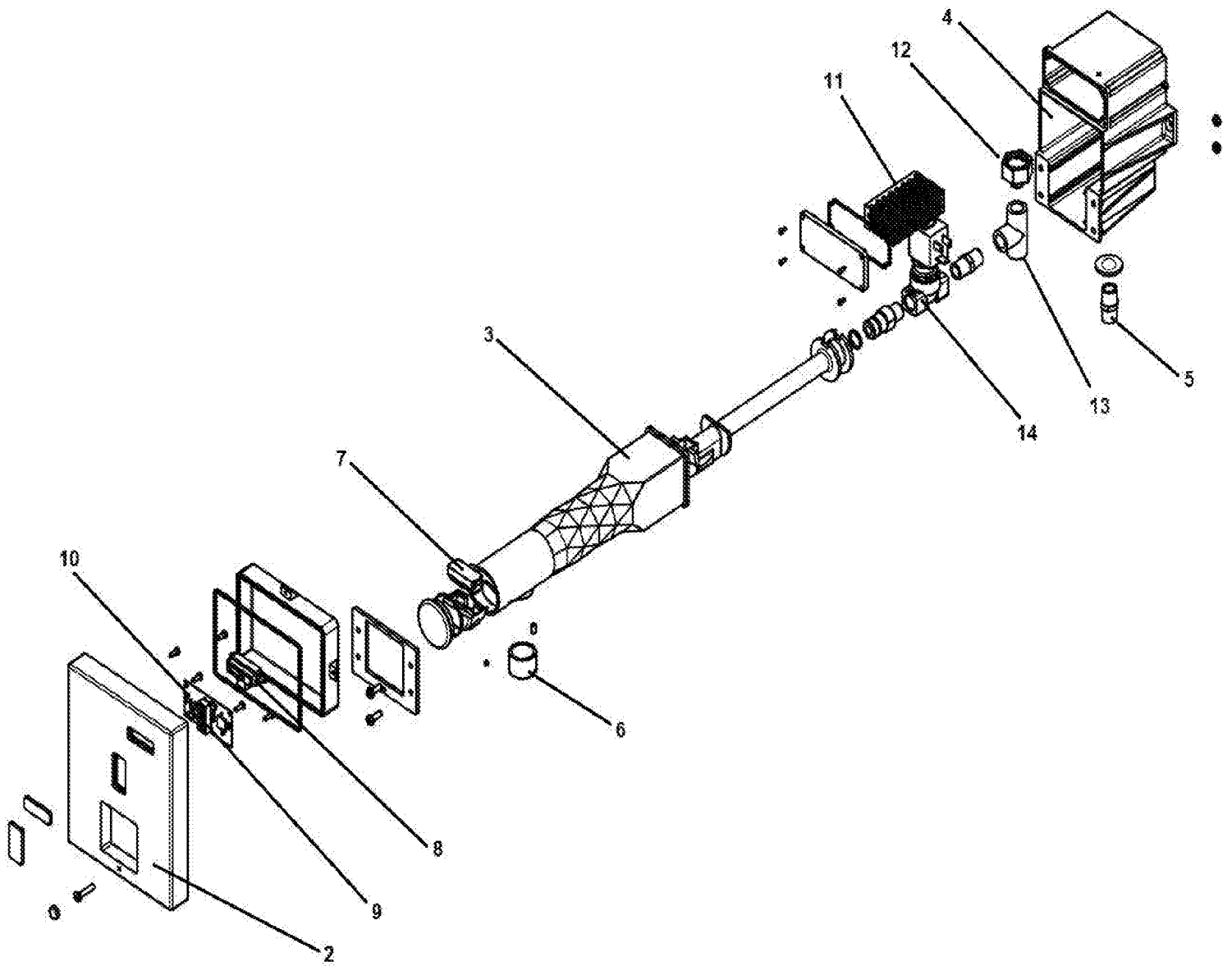


Fig. 4

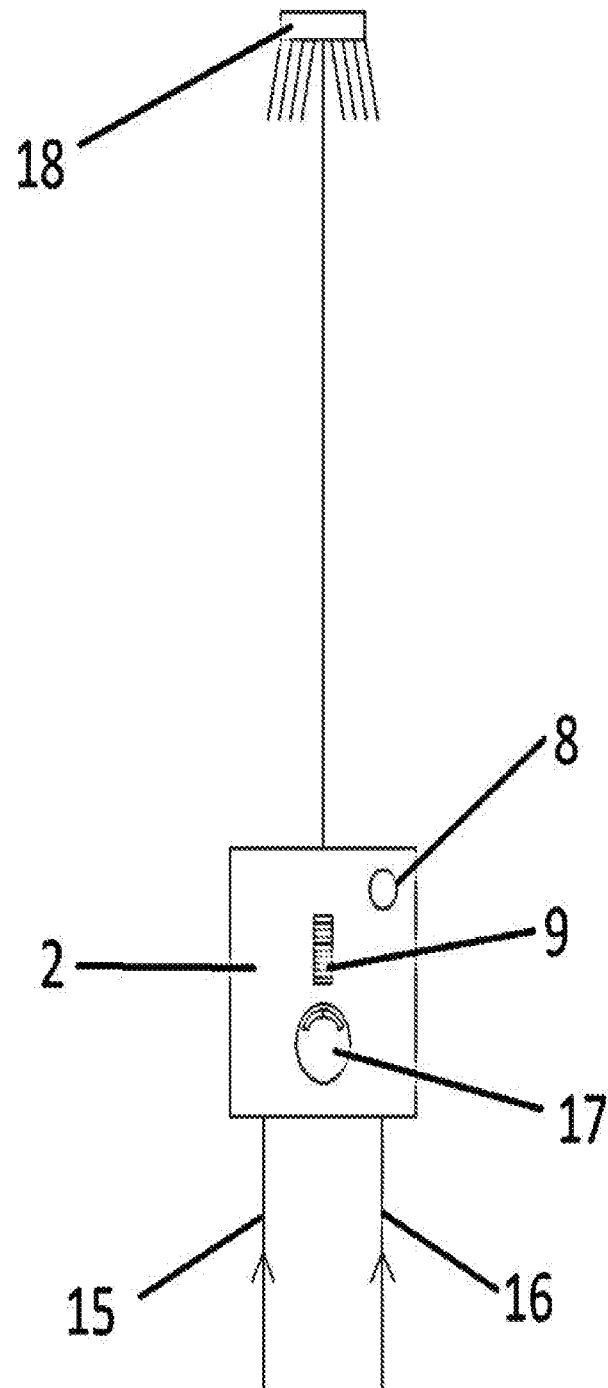


Fig. 5

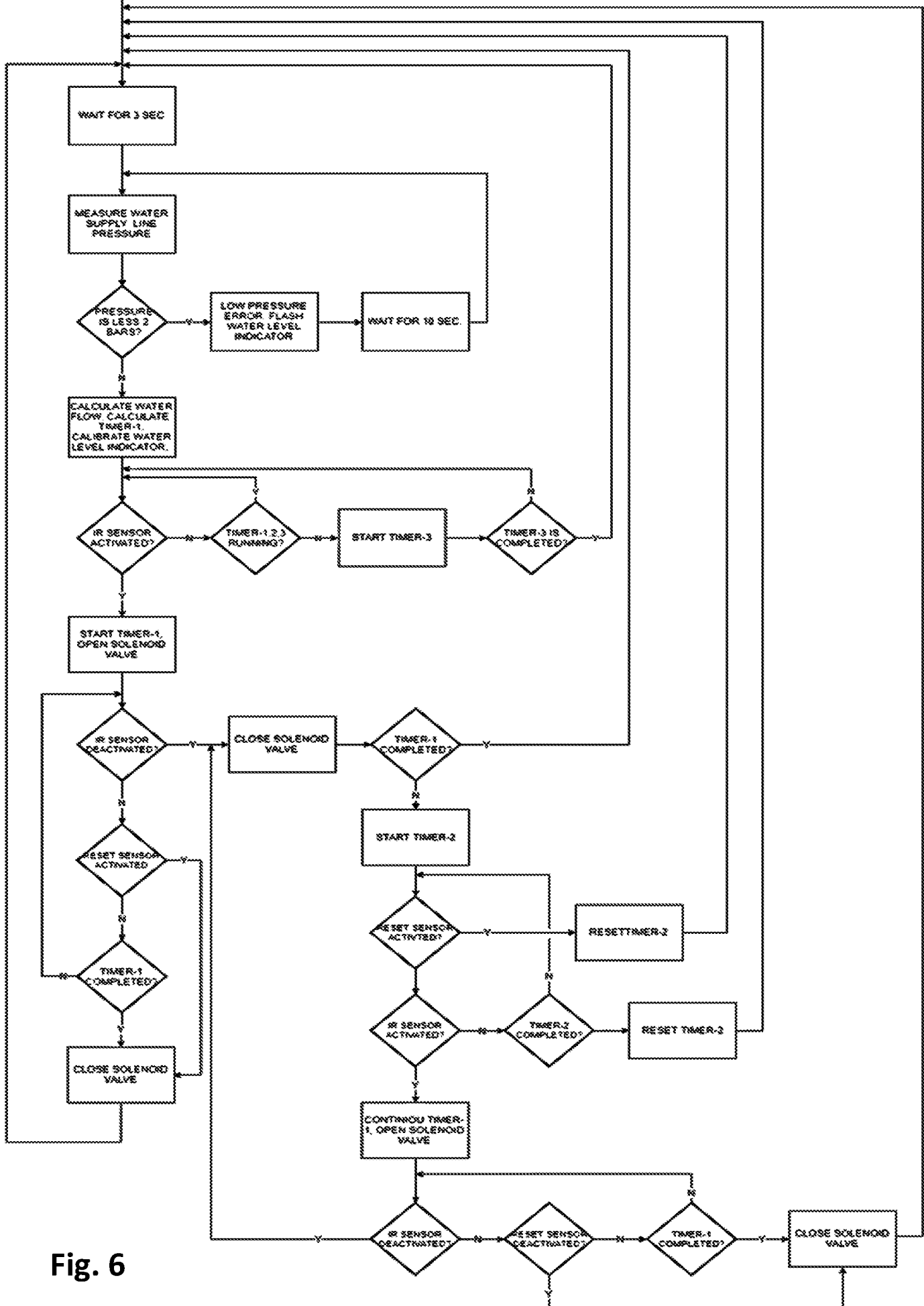


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER

E03C 1/04 (2006.01)i; F16K 31/46 (2006.01)i; F16K 31/62 (2006.01)i; F16K 21/04 (2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E03C; F16K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

TURKPATENT Patent Databases

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO Abstract & Fulltext Databases, WPI Database & Keywords: ablution, wudu, showering, water saving, faucet, shower head, water consumption, preset amount, level indicator, sensor, electronic card

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2010071401 A2 (ABD JELANI ROSLAN [MY]; MOHD HASHIM AZLAN [MY]; BIN YAHAYA MOHD AZMI [MY]) 24 June 2010 (2010-06-24) The Whole Document	1-5
A	JP 2006144325 A (INAX CORP) 08 June 2006 (2006-06-08) The Whole Document	1-5
A	US 2009094740 A1 (JI S M) 16 April 2009 (2009-04-16) The Whole Document	1-5

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Information on patent family members

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WO	2010071401	A2	24 June 2010	NONE			
JP	2006144325	A	08 June 2006	NONE			
US	2009094740	A1	16 April 2009	US	2009094740	A1	16 April 2009
				JP	5384069B	B2	08 January 2014