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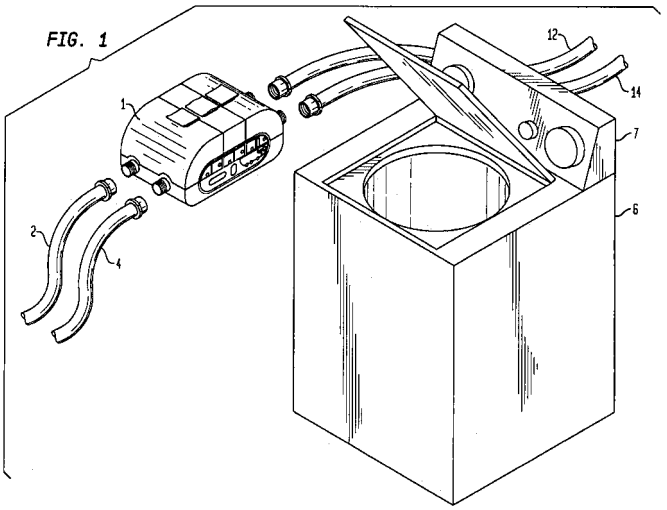
(54) Automatic dispensing device for laundry detergent composition with intermedicate chamber

(57) A non-intrusive device (1) for automatically dispensing at least one liquid laundry care composition to an automatic laundry washing machine (6), the device (1) being located along the water supply feed to the washing machine (6) with incoming (2,4) and outgoing (12,14) water supply hoses connected to the device (1). The device employs a Venturi tube mechanism or a pump to dose the laundry detergent care composition. The dosing is either manually controlled or controlled by a machine-generic algorithm capable of determining the actual cycle at any duration of wash for various cycle designs from various washing machines, without the input of precise cycle design; and dose the correct products correctly and is capable of distinguishing between major water addition and a water pulse.



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Description

FIELD OF THE INVENTION

[0001] Automatic dispensing device, with a choice of automatic, electronically-controlled dosing or manual dosing, for dispensing laundry care composition into an automatic laundry washing machine, and methods for use thereof.

BACKGROUND OF THE INVENTION

[0002] Detergent compositions are provided in many forms, of which granular and liquid compositions are the most prevalent. More recently, unit dose forms of detergent have been proposed in the form of compressed tablets of detergent powder or watersoluble packages, which are consumed during a single cleaning application. The unit dose forms are preferred by some consumers, in that the dose is pre-measured and, consequently, the unit dose form is faster, easier and less messy to use. The unit dose forms, however, involve complexities in manufacture. Furthermore, unit dose detergents do not allow for variations in dosing, depending on water fill level in the machine.

[0003] Various devices for delivering ingredients in a controllable way to washing machines have been described. See, for instance US 4,981,024, US 3,982,666, US 3,881,328, US 4,103,520, US 4,932,227, EP 0611,159, US 5,207,080, US 2003/0116177, US 4,103,520, EP 1088927, WO 03/033804, US 2004/088796, WO 03/069043, US 2003/0182732, and GB 2 134 078.

[0004] The need continues to exist, however, for an improved automatic laundry care composition dispensing device. In addition, it is desirable that a consumer be able to monitor and, if desired, control, the dosing amount.

SUMMARY OF THE INVENTION

[0005] The present invention includes, in its first embodiment, a non-intrusive device for automatically dispensing at least one liquid laundry care composition to an automatic laundry washing machine, the device located along water supply feed to the washing machine with an incoming water supply feed to the device and outgoing water supply feed out of the device, the device comprising:

- a Venturi tube, the both ends of the tube protruding externally to the housing of the device for connections to the incoming and the outgoing water supply feed,
- a dosing container for holding the laundry care composition,
- an intermediate dosing chamber connected to the dosing container with an on/off valve, the throat of the Venturi tube connected by a conduit to the intermediate dosing chamber;
- a sensor for determining water flow through the incoming water supply feed, the sensor located at the incoming water supply feed and connected to
- an electronic circuit containing a clock and a processing unit programmed with a machine-generic algorithm to control
- a solenoid valve, coupled to the same circuit and located within the conduit connecting the Venturi tube and the intermediate dosing chamber, the valve opening or closing the flow of the laundry care composition from the intermediate dosing chamber.

[0006] In its second embodiment, the invention includes the variation wherein the mechanical pump is employed to dispense the detergent, in place of a Venturi tube mechanism.

[0007] The inventive device is suitable for residential washing machines, as well as industrial, or commercial washing machines. The inventive device is suitable for use with front-loading or top-loading washing machines.

[0008] The following detailed description and the drawings illustrate some of the effects of the inventive compositions. The invention and the claims, however, are not limited to the following description and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Figure 1 is a perspective view of an inventive device according to one of the embodiments of the invention, prior to installation on a conventional laundry washing machine;

Figure 1A is a schematic view of the part of the inventive device containing an intermediate dosing chamber, with an optional flushing connection;

Figure 2 is a typical block diagrammatic view of the electronic circuit board design of the inventive device according to a preferred embodiment of the invention;

Figure 3 is an enlarged fragmentary view of the inventive device in Fig. 1;

Figure 4 is an enlarged view of the Venturi tube mechanism of the device of Figure 1;

Figure 4A is an en enlarged view of the an alternative dosing mechanism of the device of Figure 1 (a single solenoid valve design in place of two solenoid valves design in Figure 4);

Figure 5 is a schematic diagram for a single intermediate chamber connected to multiple product care containers, with an optional flushing connection;

Figures 6 and 7 are enlarged fragmentary views of the inventive device according to other preferred embodiments of the invention;

Figure 8 is an enlarged view of the Venturi tube mechanism of the device of Figure 6; Figure 9 is an

enlarged fragmentary view of the inventive device according to another preferred embodiment of the invention, employing a pump mechanism, in place of the Venturi tube mechanism;

Figures 10A, 10B, 11A and 11B are logic flow diagrams for algorithms according to the preferred embodiments of the invention.

[0010] It will be appreciated that for simplicity and clarity of illustration, elements shown in the drawings have not necessarily been drawn to scale. For example, the dimensions of some of the elements are exaggerated relative to each other. Further, where considered appropriate, reference numerals have been repeated among the Figures to indicate corresponding elements.

DETAILED DESCRIPTION OF THE INVENTION

[0011] Except in the operating and comparative examples, or where otherwise explicitly indicated, all numbers in this description indicating amounts of material or conditions of reaction, physical properties of materials and/or use are to be understood as modified by the word "about."

[0012] It should be noted that in specifying any range of time or physical conditions, any particular upper limit can be associated with any particular lower limit.

[0013] For the avoidance of doubt the word "comprising" is intended to mean "including" but not necessarily "consisting of" or "composed of." In other words, the listed steps or options or components need not be exhaustive.

[0014] "Liquid" as used herein means that a continuous phase or predominant part of the composition is liquid and that a composition is flowable at 20°C. Solids (e.g., suspended or other) may be included. Gels and pastes are included within the liquids as used herein.

[0015] "Venturi tube" as used herein means a pipe with a constricted inner surface (throat); fluid passing through the tube speeds up as it enters the tube's throat, and generating a vacuum, which causes the dosing of a laundry care composition from a laundry care container to the washing machine.

[0016] "Non-intrusive" as used herein means external to the washing machine; can be fitted to the washing machine by the user of the machine, without having to invade the machine housing in any way.

[0017] "Laundry care" as used herein means any and all compositions that may be used for the cleaning and care of laundry, including but not limited to detergents, bleach, softening, anti-wrinkling, etc. and any mixtures thereof.

[0018] "Along water supply feed" means that the device is connected to the washing machine via incoming and outgoing water supply hoses, into and out of the device, the outgoing water supply hoses then leading to the washing machine.

[0019] "Machine-generic algorithm" as used herein means an algorithm that is capable of determining the actual cycle at any duration of wash for various cycle designs from various washing machines, without the input of precise cycle design; and dose the correct products correctly.

[0020] "Major water addition" is the water fill with the amount that is sufficient to pre-wash, wash or rinse the articles that to be clean in one time.

[0021] "Incoming" and "outgoing" is used herein with reference to the inventive device, to indicate flow to and out of the device.

[0022] In the following detailed description of exemplary embodiments of the invention, reference is made to the accompanying drawings, which illustrate specific exemplary embodiments in which the invention may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention, but other embodiments may be utilized and logical, mechanical, electrical, electronic and other changes may be made without departing from the scope of the present invention. The following detailed description is, therefore, not to be taken in a limiting sense, and the scope of the present invention is defined only by the appended claims.

[0023] In the following description, numerous specific details are set forth to provide a thorough understanding of the invention. However, it is understood that the invention may be practiced without these specific details. In other instances, well-known circuits, structures and techniques have not been shown in detail in order not to obscure the invention.

[0024] Turning now to the drawings, Figure 1 is a perspective view of a preferred embodiment of the inventive device 1 prior to the installation. Device 1 connects to the incoming (2, 4) and outgoing (12, 14) water supply hoses. The outgoing hoses 12 and 14 connect the device to the washing machine 6. Typically, a pair of hoses is employed, with one connecting to hot water feed, and the other to the cold water feed. The number of the Venturi tubes within the device is generally the same as the number of water supply hoses. With a single water supply hose, the inventive device with a single Venturi tube is employed, as shown in Figures 6-8. Typically, when installed, the device rests on top of the control panel 7 of the washing machine, or on a shelf, or on a wall in proximity to the washing machine, to allow easy access to the display panel of the device, and for replacing/refilling the laundry care containers.

[0025] Figure 1A illustrates a schematic of the operation of the intermediate dosing chamber according to the invention. The intermediate chamber is added along the passage connecting the laundry care dosing container and the Venturi tube or the pump to provide a better control for a user. A check valve is located between the chamber and the Venturi tube or the pump. The other end of the chamber is connected to a product container with a built-in on/off valve, which is used to control the flow of product from the laundry care product container to the intermediate chamber. An o-ring, as a seal, is located the in-take stem above the on-off valve. The see-through

chamber has various dosage lines for different dosage.

[0026] The intermediate chamber is pre-filled by opening the on-off valve between the product container and the intermediate chamber. The on/off valve is manually controlled, followed by the operation described in further detail hereinbelow. In the alternative, the manual on-off valve can be also replaced with a solenoid valve, which is controlled by the algorithm to open the solenoid valve various time for various dosage according to the combination of the selection of various of load size and the degree of dirt in the wash load. A water line connection (on the side of the chamber in Figure 1A) may optionally be added, upstream of the connection to the Venturi tube or pump, for flushing (i.e. rinsing) the chamber. This option may be particularly useful when the same chamber is connected to multiple product containers.

[0027] For a full automatic device, there is a sensing element to detect the actual amount of product has dosed in the intermediate chamber. As shown in Figure 1A, there are multiple electric nodes, 602, at the inner wall and a separate electric node, 601, at the inner bottom of the intermediate chamber. The conductance or resistance between various nodes 602 and node 601, correlated to the actual amount of product has dosed into the intermediate chamber. The measurement of conductance or resistance may be measured by a conductance/ resistance measurement circuit, which is well known by the people skilled in the arts. The measurement can also be a simple detection of close- or open-circuit between various nodes 602 and node 601. Multiple nodes 602 may also be replaced with an electric stripe. A connection from the conductance/resistance device is connected to the top of the electric stripe. The conductance/ resistance between the stripe and node 601 is correlated to the actual amount of the product in the intermediate chamber.

[0028] The actual dosage in an intermediate chamber may also be detected by a flowmeter located between a laundry product reservoir and the intermediate chamber. The flowmeter are selected from ultrasonic/Doppler, turbine, paddle wheel, vortex shedding and magnetic flowmeters. The most preferable flowmeters are turbine and paddle wheel type of flowmeters due to their low cost.

[0029] Figure 2 illustrates the typical design of the electronic circuit board 5 contained within the housing of the inventive device. The circuit board has a connector to one or more sensors (95 or 96); the sensor sends a signal to a control unit which indicates the flow of the water (on or off). The control unit contains a processing unit and a clock. In the illustrated embodiment, the clock is contained within the control unit. The control unit is further connected to the panel display and to one or more solenoid valves within the conduits connecting Venturi tubes, laundry care product containers, water line and intermediate chamber. The processing unit can accept the input of dosages for overwriting the default value for each product by consumers and automatically doses the selected products to the corresponding intermediate chamber at the correct time accordingly. The processing unit is programmed with a machine-generic algorithm, which processes the signal from the sensor, to control the opening or closing of the solenoid valves, at appropriate time points during the operation of the washing machine. The algorithm may be coded into a single electronic chip or a print circuit board, which is the major part of the processing unit.

[0030] The machine-generic algorithm is programmed to differentiate between a major water addition and a water pulse and to differentiate among various wash cycles. In the case of a major water addition, the algorithm determines the state of the wash process and passes the signal to open one or more of the solenoid valves corresponding to the correct products. When the solenoid valves between intermediate chambers and the Venturi tubes are open, the vacuum provided by the flow of water through Venturi tubes allows the flow of one or more of the laundry care compositions to the water stream that is filling the wash machine. The algorithm can also be programmed to open only the solenoid valve which is connected to the Venturi tube with the water flowing through it at that moment in order to prevent the cross-contamination between hot and cold water lines (which happens when both solenoid valves connected to both water lines are open). In other words, only one water supply (hot or cold) might be on, and that is the one that will prompt the appropriate solenoid valve to open.

[0031] The machine-generic algorithm may also be programmed to fill the intermediate chamber with the amount of laundry care products according to the preset or the consumer-input value.

[0032] Figures 3, 4 and 5 illustrate the mechanism of the dosing of a laundry care composition via a preferred embodiment of the inventive device 1. If the algorithm processes the instruction to mean that a major water addition is occurring via incoming hoses 2 and/or 4, the signal is sent from the control unit to the solenoid valves 32, and/or 52 and/or 62 to open (the solenoid valves being connected by wires 31 to the electronic circuit 5), which then results, due to the vacuum in the throats 30 of the Venturi tubes 10 and 20, in the flow of a laundry care composition out of the intermediate dosing chamber. The container 40 is shown elevated; in use it snaps down within the slot 42, so that the spout 38 fits to a conduit 38A, sealed by O-ring 39. The laundry care composition flows down the spout 38, then into the intermediate chamber, then down the conduits 35, 34, 33 and 32 (Fig. 4), mixing with the incoming water flow in the Venturi tubes, and exiting the dosing device via the outgoing water hoses 12 and 14. The resulting water/laundry care mix is carried into the washing machine via hoses 12 and/or 14. The device in Figure 3 contains three laundry care containers 40, according to the most preferred embodiment of the invention, fitting within container slots 42. Depending on the instructions received from the algorithm (differentiating between the wash cycles), different sets of solenoid valves - 32, 52, or 62 - are open to allow various laundry care compositions to flow. Prefer-

ably, the inventive device contains a laundry detergent container, a fabric softener/fabric care container, and/or a bleach or a laundry booster container.

[0033] The device may contain an intermediate chamber for each of the laundry care products, or the product may share the same chamber.

[0034] The length of the throat portion of the Venturi tube is preferably from 1 to 20 cm, more preferably less than 10 cm, most preferably less than 5 cm. The multiple connections from the throat to the containers of laundry products may be distributed along the axial direction or/and the perimeter of the throat.

[0035] The preferred inventive devices contain a safety check assembly within the conduit 35. The safety assembly may be assembled in a variety of ways. One of the embodiments is shown in detail in Figure 4. The safety assembly prevents the flow of the laundry care composition down the conduit 35, if the solenoid valve is open (e.g. malfunctioning, stuck), but there is no water flow through the Venturi tubes. The safety assembly contains spring 36, upon which rests a ball 37. If there is no water flow through throats 30 of the Venturi tubes, there is no vacuum to force the flow of the laundry care composition down the conduit 35, the spring 36 remains at rest, with the ball 37 blocking the flow of the composition. The safety assembly also prevents the water flow into the chamber through the conduit 35. An O-ring 39 is seated on the outside of the conduit 38A, below the top rim, to ensure a better seal between the spout 38 and the conduit 38A.

[0036] Figure 4A illustrates another preferred embodiment (device 1A). The solenoid valve connecting water line 20 and the intermediate chamber provides the flushing and cleaning of the chamber after each dosing of products. Thus, one intermediate chamber may be shared by multiple laundry care product containers. It is preferred because only one solenoid valve or pump is employed. The other reason is that the safety valve is not open for the line which is without water flow. If the algorithm processes the instruction to mean that a major water addition is occurring via incoming hoses 2 and/or 4, the signal is sent from the control unit to the solenoid valve 32, which is located in the conduit 35, to open (the solenoid valve being connected by wires 31 to the electronic circuit 5), which then results in the flow of a laundry care composition out of the intermediate chamber, then down the conduits 35, 34, and 33. The check valve assemblies (spring 36 and ball 37) are located at the conduits 33, which are directly connected to each of hot and cold water lines. The safety valves are open due to the vacuum in the throat 30 generated by the water flow in the Venturi tubes 10 and/or 20, correspondingly. The flow of product then is mixing with the incoming water flow in the Venturi tubes, and exiting the dosing device via the outgoing water hoses 12 and 14. The resulting water/laundry care mix is carried into the washing machine via hoses 12 and/or 14. An O-ring 39 is seated on the outside of the conduit 38A to ensure a better seal between the spout 38 and the conduit 38A .

[0037] According to the preferred embodiment of the invention, the ratio of the diameter of the end of the Venturi tube (d_1) to the diameter of the throat of the Venturi tube (d_2) is greater than 1.65, most preferably greater than 2.5, in order to attain the required vacuum for dosing the products. If the internal diameter of water hoses is less than the diameter of the end of the Venturi tube (d_1), then the preferred ratio should be based on the ratio of the internal diameter of water hose to the diameter of the throat of the Venturi tube (d_2).

[0038] Figure 5 schematically demonstrates a single intermediate chamber shared by three laundry care product containers. Solenoid valves 501, 502, and 503 are open according to the selection of laundry products to fill the intermediate chamber either when the device is initiated by a consumer or self-senses the initial fill of water. The solenoid valves shut off once the required amount is filled. The solenoid valve 505 is then open and the products are sucked into the Venturi tube and added into the washing machine. Typically, depending on the selected dosage, solenoid valve 504 opens 5-90 seconds, preferably 20-60 seconds, after the opening of the solenoid valve 505, to flush the intermediate chamber. The opening of the solenoid valve 504 may last for 5 to 10 seconds. The cleaning water (water used for flushing) for the intermediate chamber is sucked into the Venturi tube through the solenoid valve 505. The flushing may be repeated 2 - 5 times. When water fill is stopped, the solenoid valve closes.

[0039] Optionally, an additional solenoid valve, 506, is added between the top portion of an intermediate chamber and the Venturi tube as Shown in Figure 5. During the filling of a product into an intermediate chamber, solenoid valve 505 is closed and solenoid valve 506 is opened to assist the fill rate. Once the fill reached the preset dosage level, then solenoid 506 is closed and remains closed until another fill.

[0040] Figures 6, 7, and 8 illustrate yet other embodiments of the inventive devices 100 and 110 wherein a single water supply and a single Venturi tube are employed. The Venturi tube 11 in Figure 6 or 15 in Figure 7 is connected to the incoming water supply hose 3 and the outgoing water supply hose 13 via couplings 16 and 22. The mechanism of dosing action is the same as described above for Figures 3, 4, and 5, except that when a single Venturi tube 11 or 15 is employed, it connects directly through the conduit 47 to the intermediate chamber (contrasted to a series of conduits 33, 34, and 35 in Figure 4 for a double Venturi tube device).

[0041] Figure 6 illustrates a single Venturi tube/single laundry care container embodiment of the inventive device 100, while Figure 7 illustrates a single Venturi tube/three laundry care containers embodiment of the device 110. The Venturi tube 11 in Figure 6 connects to a single intermediate chamber via a single conduit 47. The Venturi tube 15 in Figure 7 connects to three intermediate chambers directly via conduits 47, 48, and 49.

[0042] Figure 8 illustrates the example of the safety

assembly for the single Venturi tube embodiment of the device, operating as described above with reference to Figure 4.

[0043] Figure 9 illustrates an alternative embodiment of the invention. The inventive device 120 operates substantially the same as described above in connection with Figures 3-5, except that a pump 210 is employed in place of a Venturi mechanism. The device with pump is highly preferred for washing machines which are placed at a low water pressure locations. Otherwise, according to the present invention, the Venturi mechanism is preferred, since it has no moving parts, as in the pump. In addition, the Venturi-based device does not require an external power supply, only a battery to run the electronic circuit to control the solenoid valves. The pump-based device in Figure 9 employs simple tubes 230 in place of the Venturi tubes. Similarly to the Venturi-based inventive devices, it may include single or dual water supply, either one in combination with a variety of dosing containers.

[0044] In the preferred embodiment of the invention, laundry care containers visibly protrude above the top surface of the device, and most preferably, the containers are transparent, so that the user may monitor the level of the remaining detergent, and refill or replace the containers at an appropriate time.

[0045] Figures 10A, 10B, 11A and 11B are examples of the logic flow diagrams for the machine-generic algorithm for programming the processing unit. The following nomenclature is used in the figures:

Value = 0, the device/statue is off
1, the device/statues is on

V_d = valve between detergent intermediate chamber and Venturi tube

V_s = valve between softener intermediate chamber and Venturi tube

V_c = valve between common intermediate chamber and Venturi tube

V_{DW} = valve between the flush water to detergent intermediate chamber

V_{SW} = valve between the flush water to softener intermediate chamber

V_{CW} = valve between the flush water to the common intermediate chamber

V_{DC} = valve between detergent reservoir to intermediate chamber

V_{SC} = valve between softener reservoir to intermediate chamber

W = water flow

t = master time

t_i = time of each process

P = Pre-wash

t_s = sum of time up to i-1

D = amount of detergent in the intermediate chamber

S = amount of softener in the intermediate chamber

D_{def} = default or previous defined dosage of detergent

S_{def} = default or previous defined dosage of softener

D_{dos}= consumer defined dosage of detergent

S_{dos} = consumer defined dosage of softener

F = number of major water addition

[0046] Figures 10a and 10b are typical algorithms for two intermediate chambers with the option of "Pre-Wash" selection. Once the device is turned on, the algorithm pre-set the all variables to zero, i.e. off status, and retrieves the stored values of default or previous-set dosages of laundry products, e.g. detergent and softener. A consumer may input the desired dosage and overwrite the default value for both products. In addition, the algorithm allows a consumer to select the "Pre-Wash" cycle or "Soak" cycle. The algorithm automatically compensates the "Soak" process. Once starts the process, the valves, V_{DC} and V_{SC}, between product reservoirs and their corresponding intermediate chambers open. These valves close after each intermediate chamber filled with the corresponding product to the desired dosage. The clock starts when the algorithm senses the sign of water addition as a major water fill. The valve, V_d, between first laundry product, said detergent, intermediate chamber and the dosing apparatus, such as a Venturi tube or a pump, is set to open, once the dosing of the product into the intermediate chamber is complete. Consequently, the first laundry product added into and dispersed in the water flow and onto the wash machine. At the stop of water flow, the valve, V_d, closed. If the "Pre-Wash" was selected, then the valve, V_{DC}, opened and filled the corresponding intermediate chamber to the desired dosage then closed. At the detection of the water flow and the flow was last more than 10 seconds, the algorithm then sent a signal to open the valve, V_d, for dosing the second laundry products. The valve, V_d, closed once the water flow stopped. For the case of "no Pre-wash" or the second wash was over for the "Pre-wash" selection, the valve, V_s, opened to inject the second laundry product, when the water flow and last for more than 10 seconds. At the end of water flow, the valve, V_s, closed and the device

system shut down.

[0047] A typical algorithm for one Intermediate Chambers with Pre-Wash selection is shown in Figures 11A and 11B. Due to a single intermediate chamber design, the algorithm has modified to fill the intermediate chamber one at the time and has to be flush washed after the dosing of each product. The algorithm for filling the intermediate chamber and dosing is the same as described in the algorithm for two intermediate chambers with prewash selection design. After the each fill of the product, the algorithm waits for 5 - 90 seconds, preferably from 20 to 60 seconds, to ensure the dosing of the product into the water stream then open the valve, V_{CW}, for 1 minute to clean the chamber.

Sensor

[0048] The sensor senses the flow of water converting a flow signal therefrom into an electronic impulse, and sending the signal that the water flow is on to the processing unit inside the control unit. The preferred sensor is selected from a pressure transducer or a flow or motion sensing devices, or combinations thereof.

[0049] The sensor can be placed at a water supply feed, whether the incoming or outgoing feed from the device. The sensor combined with the algorithm may additionally detect other parameters, e.g. water inflow pattern, total water consumed for each cycle. By the use of the sensors, signals can be obtained (and combined with one another) which monitor the wash cycle and the cycle time and provide a trigger for the inventive dispensing device. Other suitable sensors include but are not limited to devices sensing electrical current, sound, temperature, vibration, etc.

Laundry Care Containers

[0050] Generally, any laundry care container may be used as long as its spout fits snugly into the conduit leading to the Venturi tube. In the preferred embodiment of the invention, however, special cartridges, most preferably removable and replaceable, are employed.

[0051] In a preferred embodiment of the invention, to prevent user mistakes in inserting wrong containers into the slot, the slots and/or containers are clearly labeled and may have an encoded set of information about the container's contents and its use instructions affixed to it, the device further comprising means for retrieving and, optionally, storing said information, and means for executing instructions either received directly from the retrieved information or from the stored information. The instructions may be in the form of a bar code, a magnetic strip, a microchip or any other suitable machine-readable attachment. In another embodiment of the invention, the shape of the containers and the corresponding interlocking slots are shaped differentiy to prevent misplaced installation of products. Another way of preventing misplaced installation is via color or shape or size differention with common interlocks.

[0052] In a preferred embodiment, the bottom of the container (containing the spout) is beveled to enhance the draining of the composition.

Laundry Care Compositions

[0053] Any laundry care compositions are suitable for use with the inventive device. The particular advantage of the inventive device is that it pre-mixes the laundry care composition with water, thus diluting the laundry care composition prior to its introduction into the washing machine. Thus, in a particularly preferred embodiment of the invention the laundry care composition is a concentrate. For a laundry detergent composition, it generally means that the composition comprises at least 20%, by weight of the composition, preferably from 40 to 100%, most preferably from 60 to 100% of a surfactant. Generally, concentrate compositions contain little if any water, generally from 0 to 50%, preferably less than 20%, most preferably less than 10%.

[0054] Another particularly preferred composition for use with the inventive device is a bleach composition; by virtue of pre-dilution associated with the use of the inventive device such composition may be introduced into the washing machine, without causing the pinpoint damage to the fabrics. The most preferred bleach is a peracid, such as imidoperacid, diperoxydodecanoic acid (DPDA), perlauric acid, perbenzoic and alkylperbenzoic acids. Especially preferred peracid is phthalimido-percaproic acid (PAP). In another embodiment, the inventive device may dose sodium hypochlorite solution, which is generally referred to as chlorine beach. The concentration of hypochlorite solution is in the range between 1.5 % to 10%, preferably between 3 to 7%.

[0055] In another embodiment, the inventive device may sequentially dose bleach precursors and peroxygen bleach sources. The nonanoyloxybenzene sulfonate (NOBS) and tetraacetyl ethylene diamine (TAED) are typical bleach precursors. Other classes of bleach precursors comprise acylated citrate ester, benzoxazin-type and amido derived precusors. Suitable peroxygen bleach bleach sources to be used herein are hydrogen peroxide, percarbonates, persilicates, perborates, peroxyacids, hydroperoxides, and diacyl peroxide. As used herein a peroxygen bleach source refers to any compound, which produces perhydroxyl ions when said compound is in contact with water.

Claims

1. A non-intrusive device for automatically dispensing at least one liquid laundry care composition to an automatic laundry washing machine, the device located along water supply feed to the washing machine with an incoming water supply feed to the device and outgoing water supply feed out of the de-

vice, the device comprising:

- a Venturi tube, the both ends of the tube protruding externally to the housing of the device for connections to the incoming and the outgoing water supply feed,
- a dosing container for holding the laundry care composition,
- an intermediate dosing chamber connected to the dosing container with an on/off valve, the throat of the Venturi tube connected by a conduit to the intermediate dosing chamber;
- a sensor for determining water flow through the incoming water supply feed, the sensor located at the incoming water supply feed and connected to
- an electronic circuit containing a clock and a processing unit programmed with a machine-generic algorithm to control
- a solenoid valve, coupled to the same circuit and located within the conduit connecting the Venturi tube and the intermediate dosing chamber, the valve opening or closing the flow of the laundry care composition from the intermediate dosing chamber.

2. The device of claim 1 comprising at least two dosing containers, one for holding a laundry detergent and the other for holding a fabric softener.

3. The device of claim 1 connected to two water supply feeds: hot water and cold water.

4. The device of claim 3 comprising two Venturi tubes, one connected to the hot water supply feed; the other connected to the cold water supply feed.

5. The device of claim 4, wherein the throats of the two Venturi tubes are connected to each other by a connecting conduit, the connecting conduit being in turn connected to the conduit to the intermediate dosing chamber.

6. The device of claim 1, wherein the sensor is selected from a pressure transducer and a flow sensor.

7. The device of claim 1 wherein the processing unit comprises a clock.

8. The device of claim 1 wherein the algorithm resets the clock at the end of the total laundry cycle.

9. The device of claim 1 wherein the algorithm differentiates between various wash cycles based on the number of major water additions.

10. The device of claim 1 wherein the algorithm differentiates between a water pulse and a major water addition.

11. The device of claim 1wherein the algorithm comprises the instructions to open the solenoid valve which is connected to the Venturi tube which has water flow through it on for longer than about 5 to 90 seconds.

12. The device of claim 1 wherein the algorithm comprises instructions to close the solenoid valve if water flow is off.

13. The device of claim 1 wherein the device comprises two dosing containers: a dosing container for a laundry detergent and for a laundry softener and wherein the algorithm comprises the instructions to open the solenoid valve to the laundry softener dosing container at the point of the second major water addition.

14. The device of claim 1 wherein the device further comprises a safety check assembly located in the conduit connecting the Venturi tube and the dosing container, to prevent water flow into the dosing container.

15. The device of claim 1 wherein the intermediate dosing chamber is transparent.

16. The device of claim 1 wherein the intermediate dosing chamber is independently connected to the main water line.

17. The device of claim 16 wherein the algorithm comprises instructions for flushing the intermediate dosing chamber with water.

18. The device of claim 1 further comprising a control panel comprising a selection for reset and for prewash.

19. The device of claim 1 wherein the ratio of the internal diameter of the end of the Venturi tube to the internal diameter of the throat of the Venturi tube is greater than 1.65.

20. The device of claim 1 wherein the ratio of the internal diameter of a water supply feed hose to the internal diameter of the throat of the Venturi tube is greater than 1.65.

21. The device of claim 1 wherein the dosing container is removable.

22. The device of claim 1 wherein the laundry care composition is a concentrated composition.

23. The device of claim 1 wherein the laundry care composition comprises a peracid or chlorine bleach.

24. The device of claim 1 wherein the algorithm in the

electronic circuit is upgradable via switching a new ROM chip containing a new algorithm or via flashing the ROM with a new algorithm.

25. The device of claim 1 wherein the algorithm doses laundry products, measures and confirms the actual dosed quantity prior to the dosing of the product from the intermediate chamber into the water line.

26. A non-intrusive device for automatically dispensing at least one liquid laundry care composition to an automatic laundry washing machine, the device located along water supply feed to the washing machine with an incoming water supply feed to the device and outgoing water supply feed out of the device, the device comprising:

- a water conduit tube, the both ends of the tube protruding externally to the device for connections to the incoming and outgoing water supply feed;
- a dosing container for holding the laundry care composition, the container connected by a conduit to an intermediate dosing chamber,
- a sensor for determining water flow through the incoming water supply feed, the sensor located at the incoming water supply feed and connected to
- an electronic circuit containing a clock and a processing unit programmed with a machine-generic algorithm to control
- a pump, coupled to the same circuit, the suction end of the pump connected by a conduit to the intermediate dosing chamber and the discharge end of the pump connected to the water supply feed,

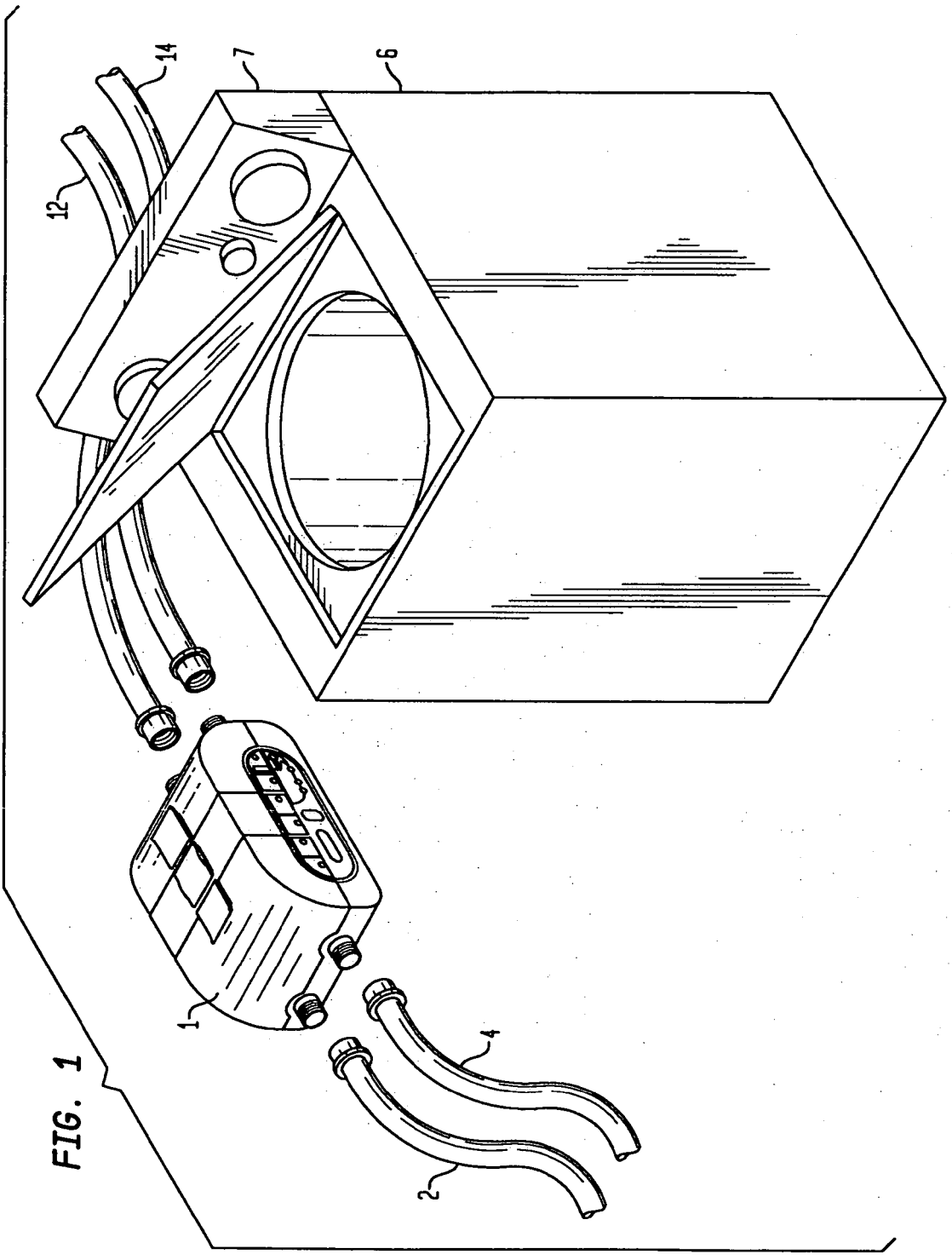


FIG. 1

FIG. 1A

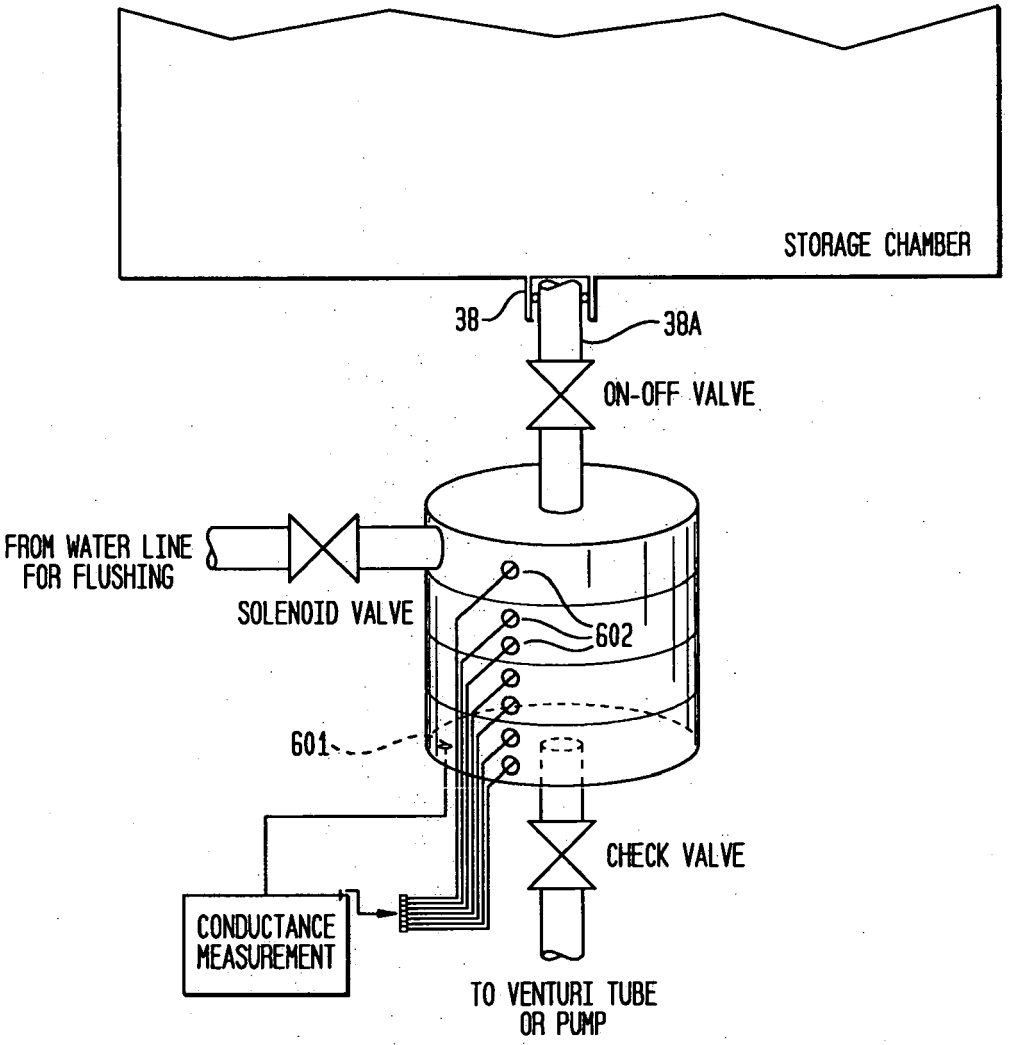

STORAGE CHAMBER
38
38A
ON-OFF VALVE
FROM WATER LINE
FOR FLUSHING
SOLENOID VALVE
602
601
CHECK VALVE
CONDUCTANCE
MEASUREMENT
TO VENTURI TUBE
OR PUMP

FIG. 2

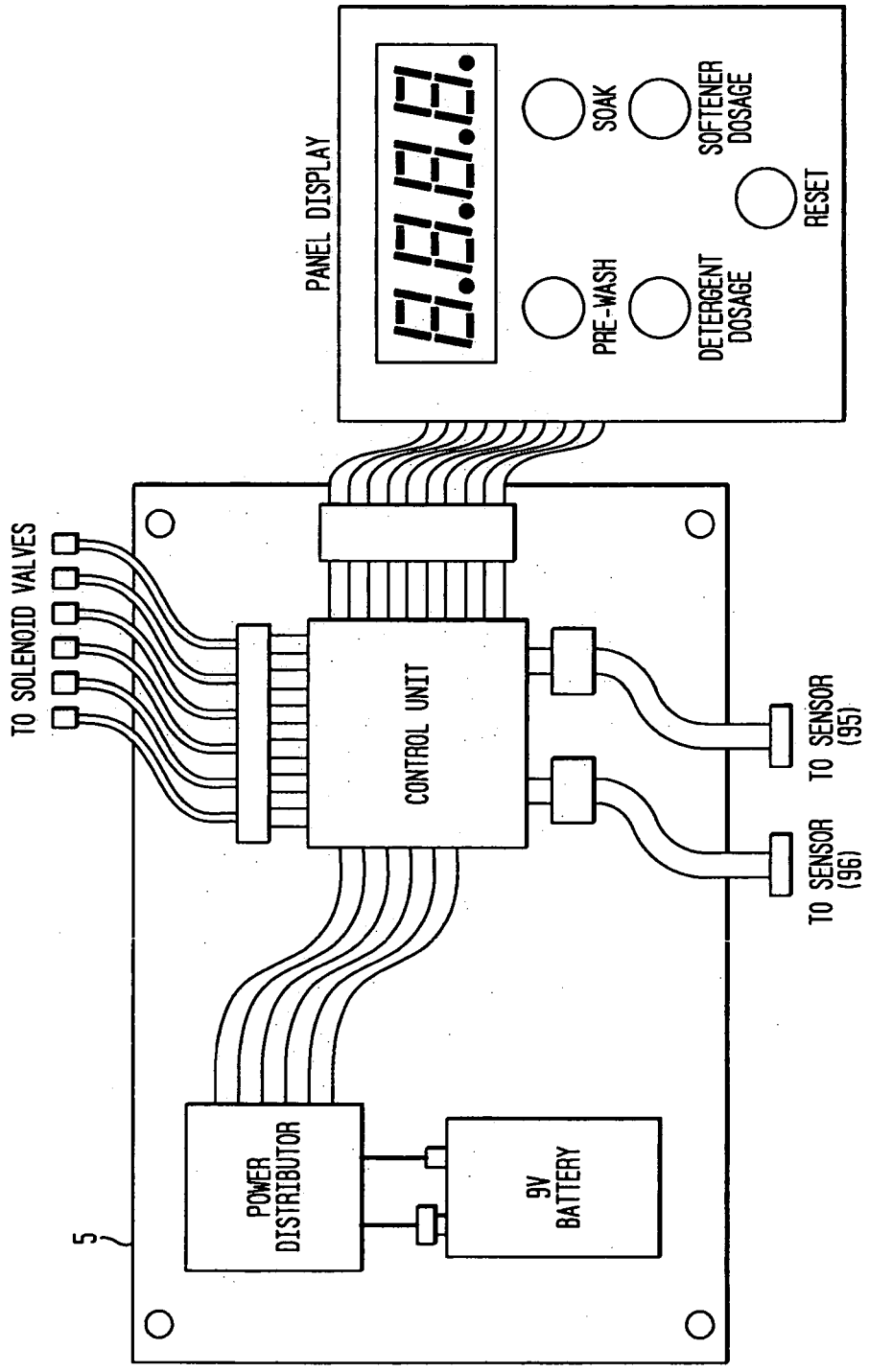
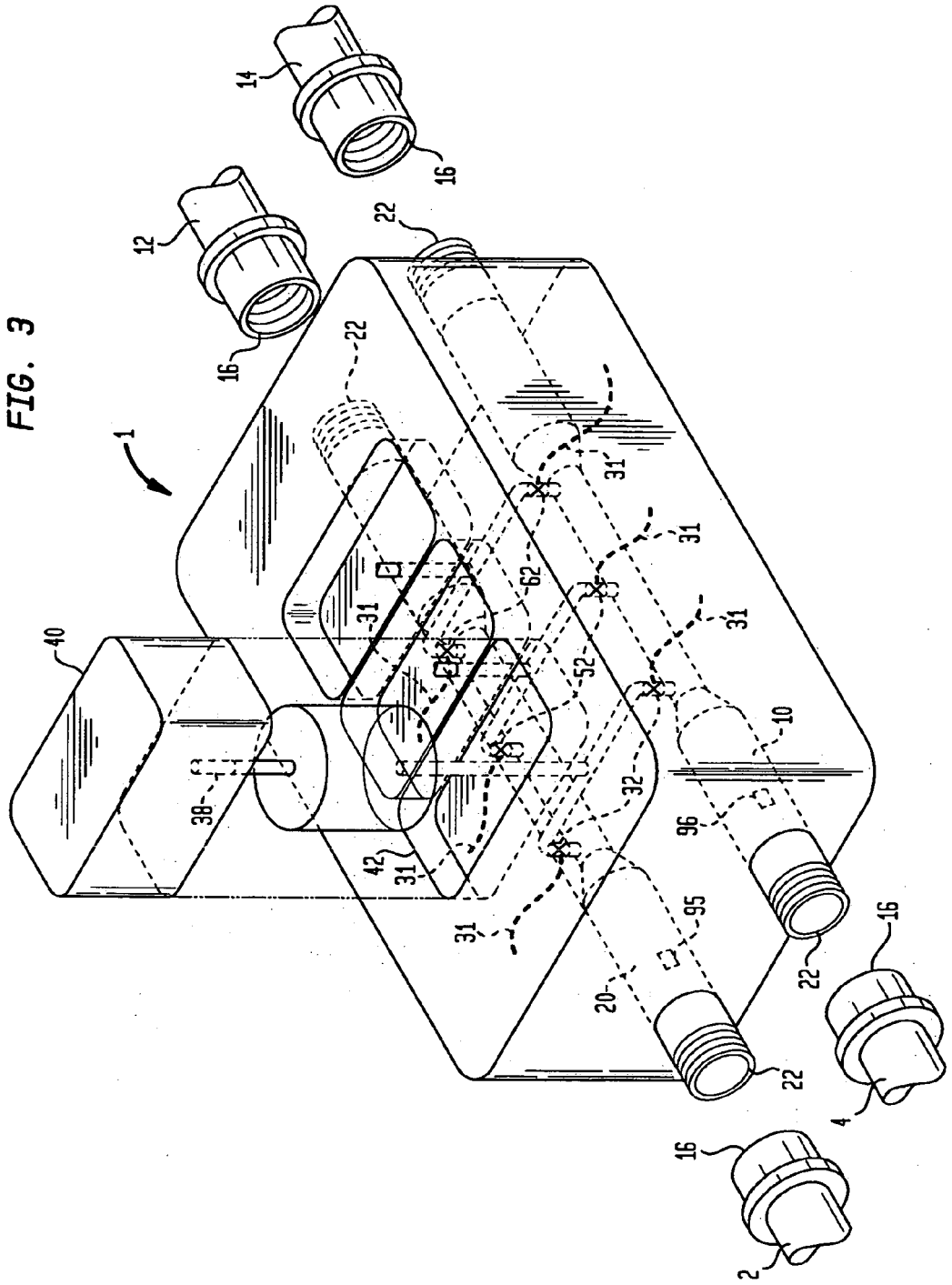

PANEL DISPLAY
SOAK
SOFTENER DOSAGE
RESET
PRE-WASH
DETERGENT DOSAGE
TO SOLENOID VALVES
CONTROL UNIT
TO SENSOR (95)
TO SENSOR (96)
POWER DISTRIBUTOR
9V BATTERY
5

FIG. 3


14
16
12
22
16
22
1
40
31
62
31
31
52
10
38
32
96
42
31
31
95
16
20
22
22
4
16
2

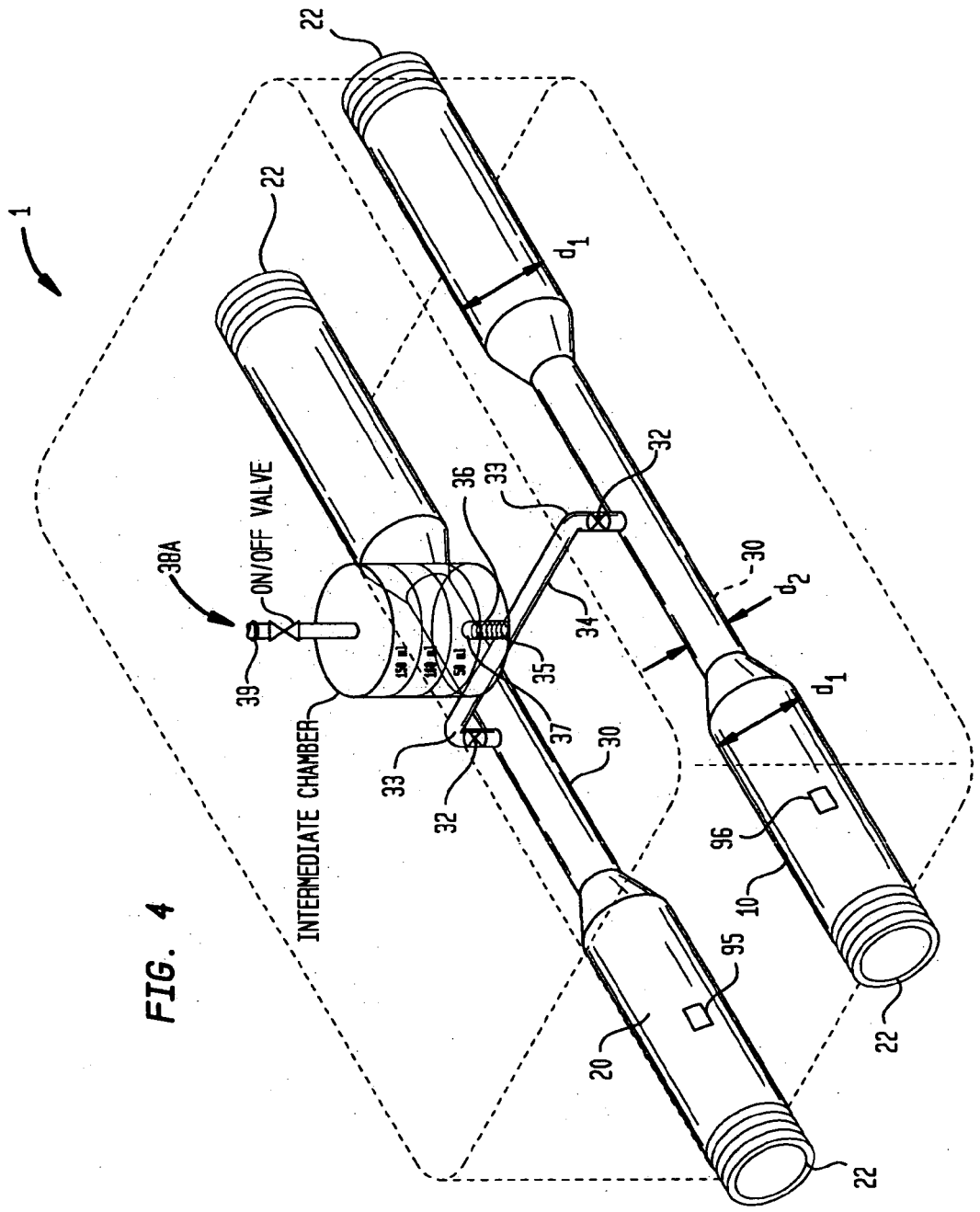

1
22
22
22
22
22
d_1
d_1
d_1
d_2
30
30
32
32
33
33
34
35
36
37
38A
ON/OFF VALVE
39
INTERMEDIATE CHAMBER
96
10
95
20

FIG. 4

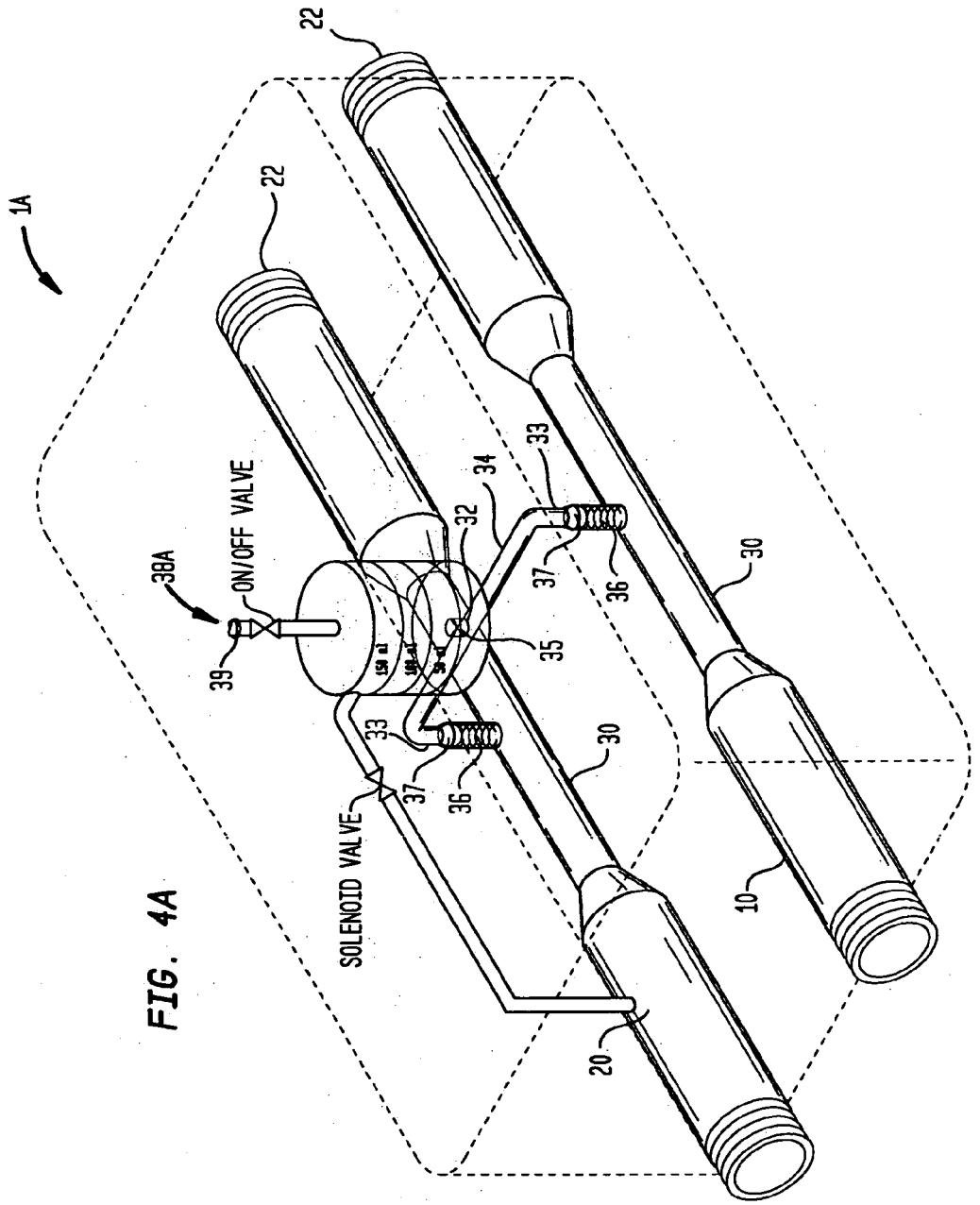

1A
22
22
38A
ON/OFF VALVE
39
32
34
33
35
37
36
30
33
37
36
30
SOLENOID VALVE
10
20

FIG. 4A

FIG. 5

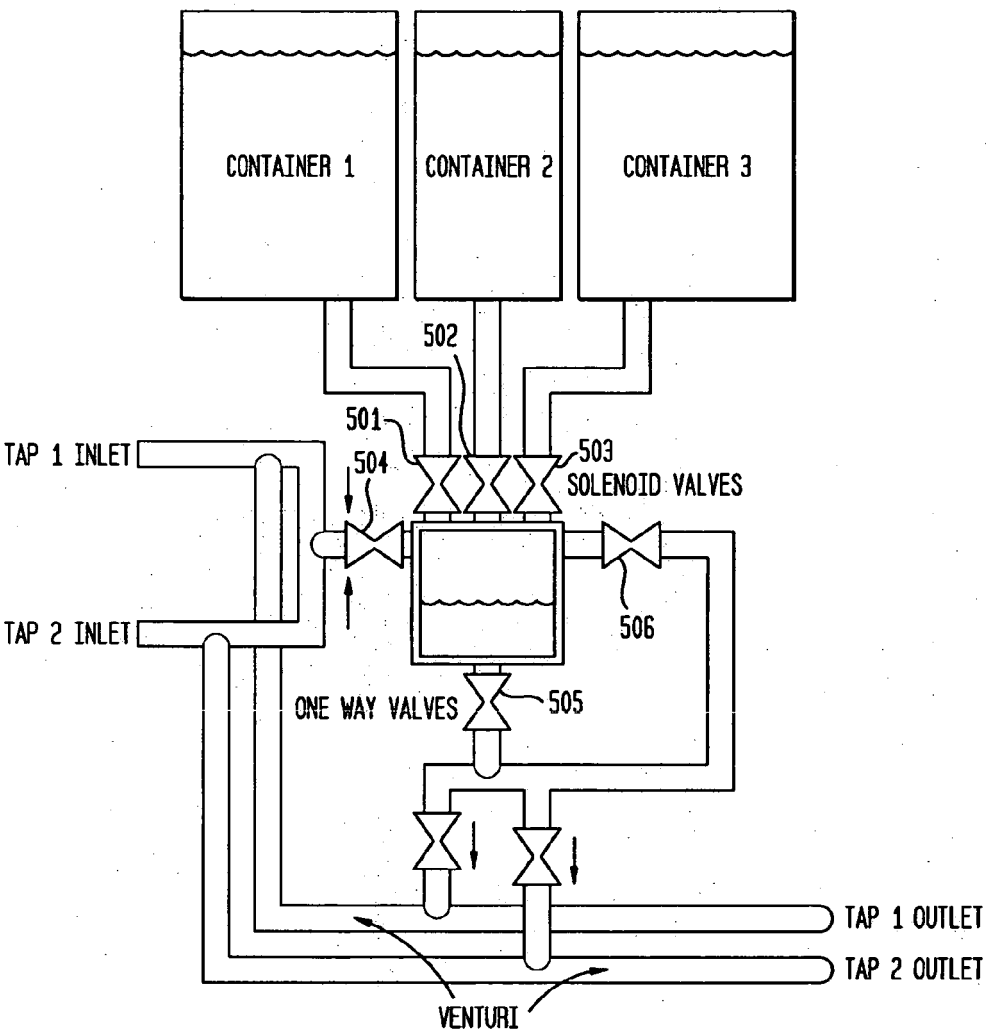

CONTAINER 1
CONTAINER 2
CONTAINER 3
502
501
503
SOLENOID VALVES
504
TAP 1 INLET
TAP 2 INLET
506
ONE WAY VALVES
505
TAP 1 OUTLET
TAP 2 OUTLET
VENTURI

FIG. 6

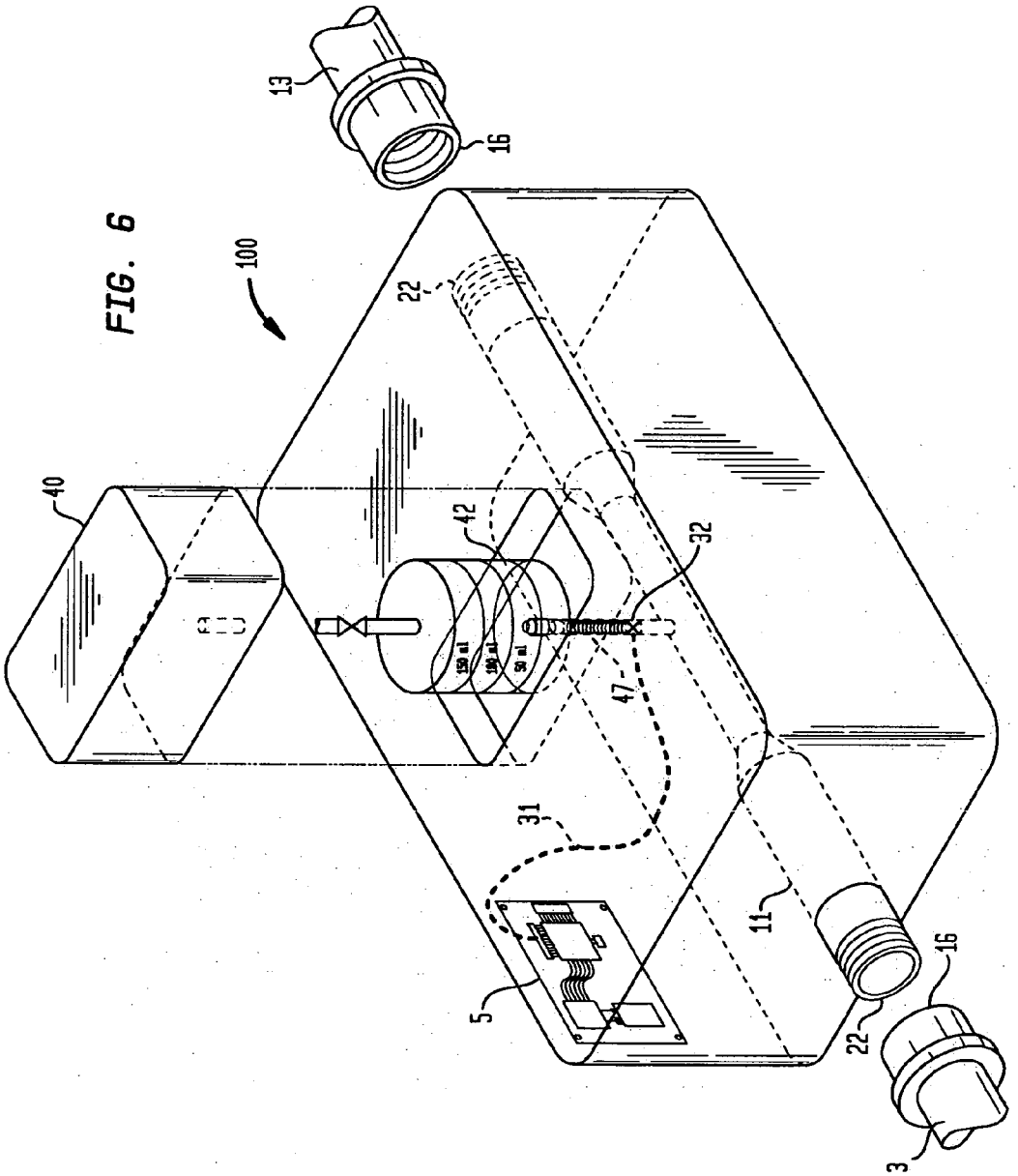
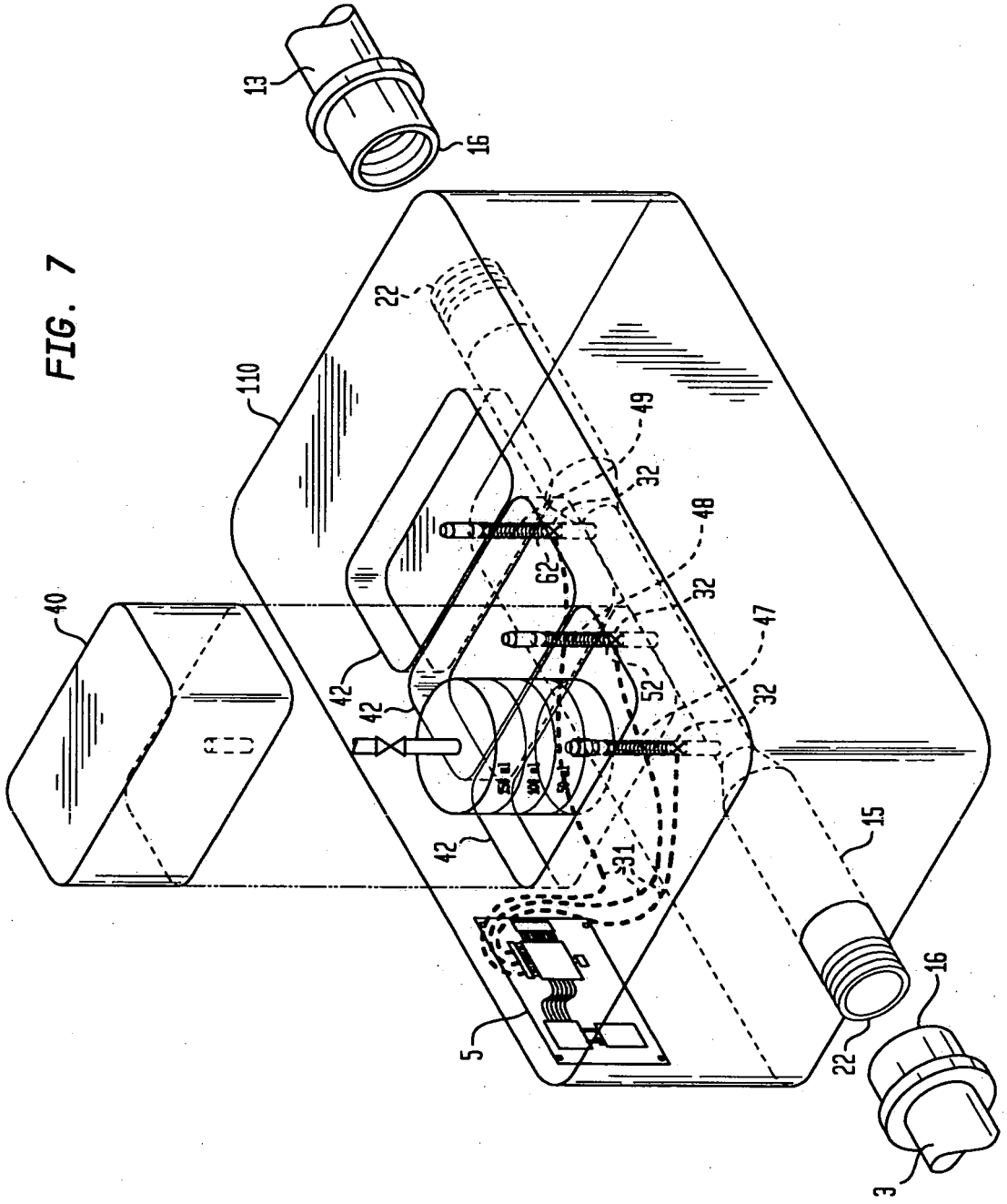


FIG. 7



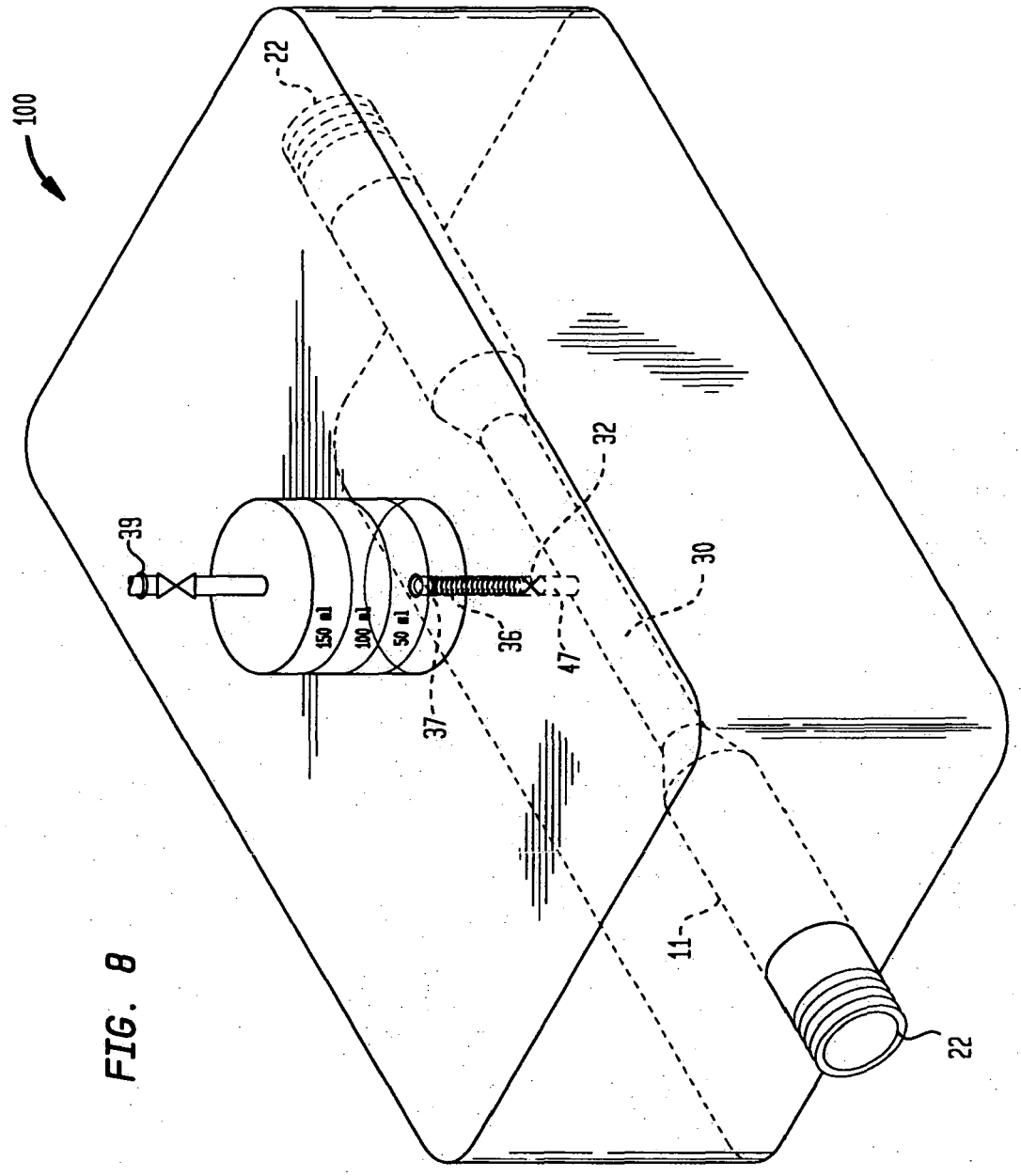


FIG. 8

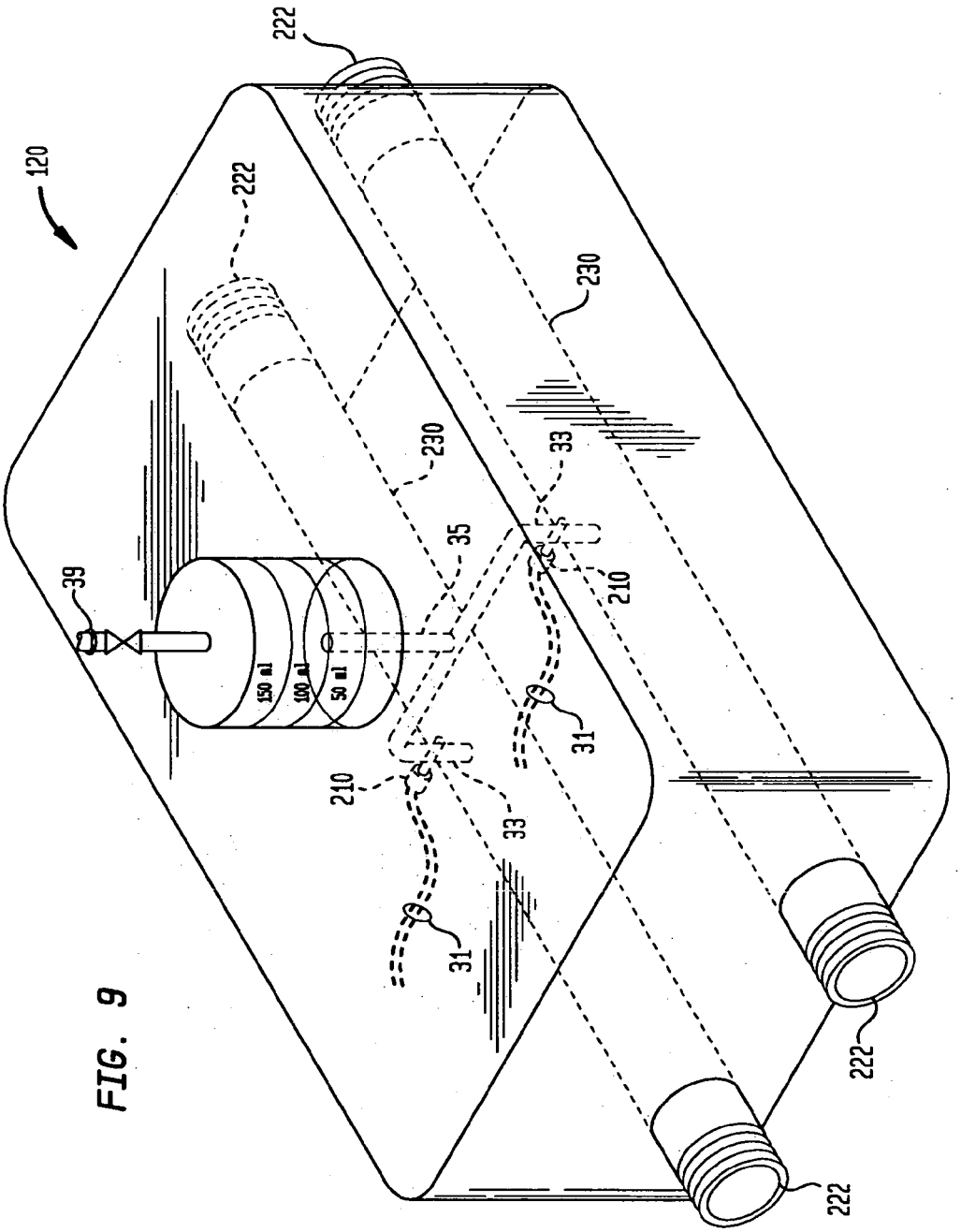

120
222
222
230
230
33
35
39
210
210
31
31
33
222
222
222
150 ml
100 ml
50 ml

FIG. 9

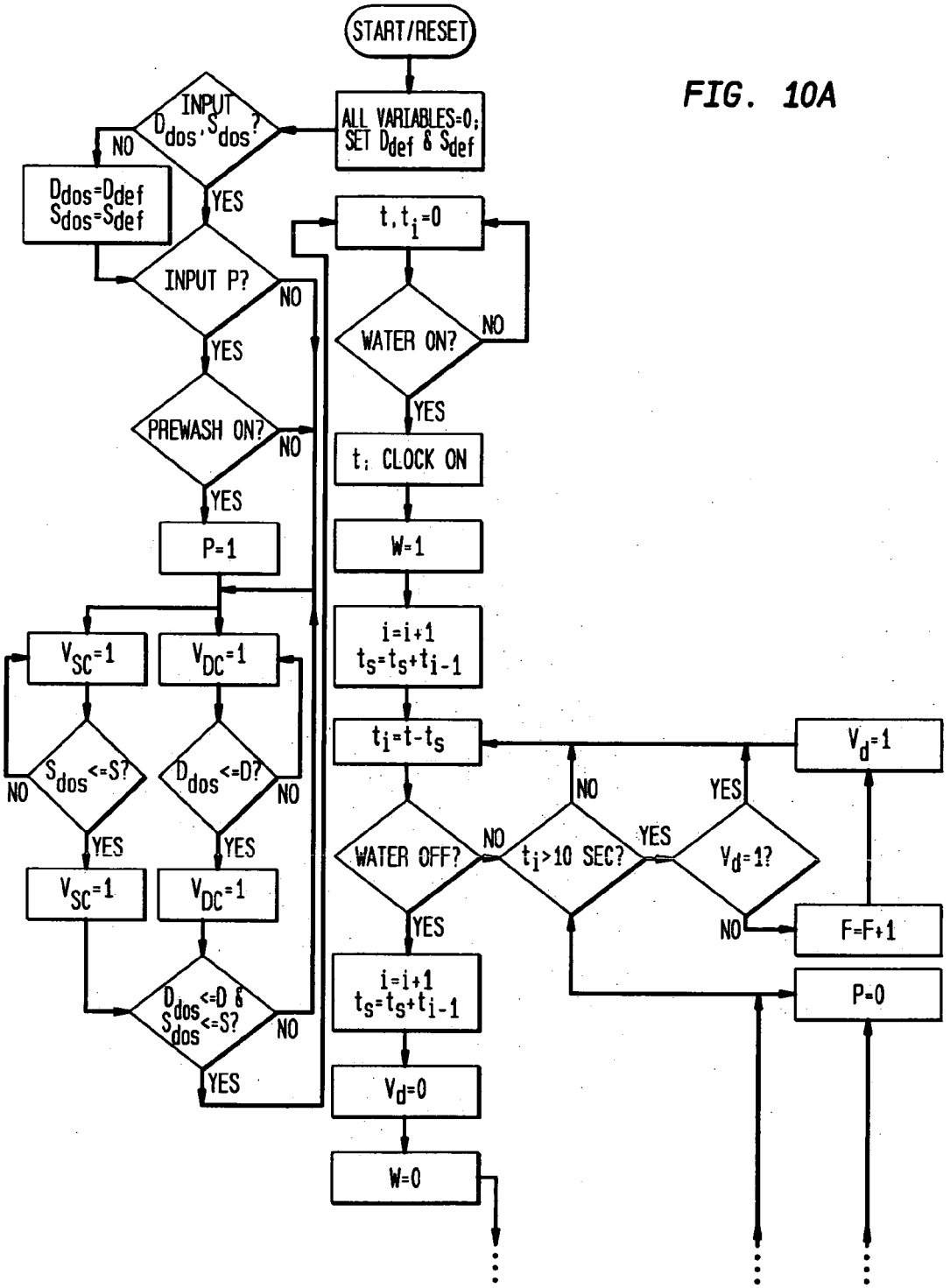
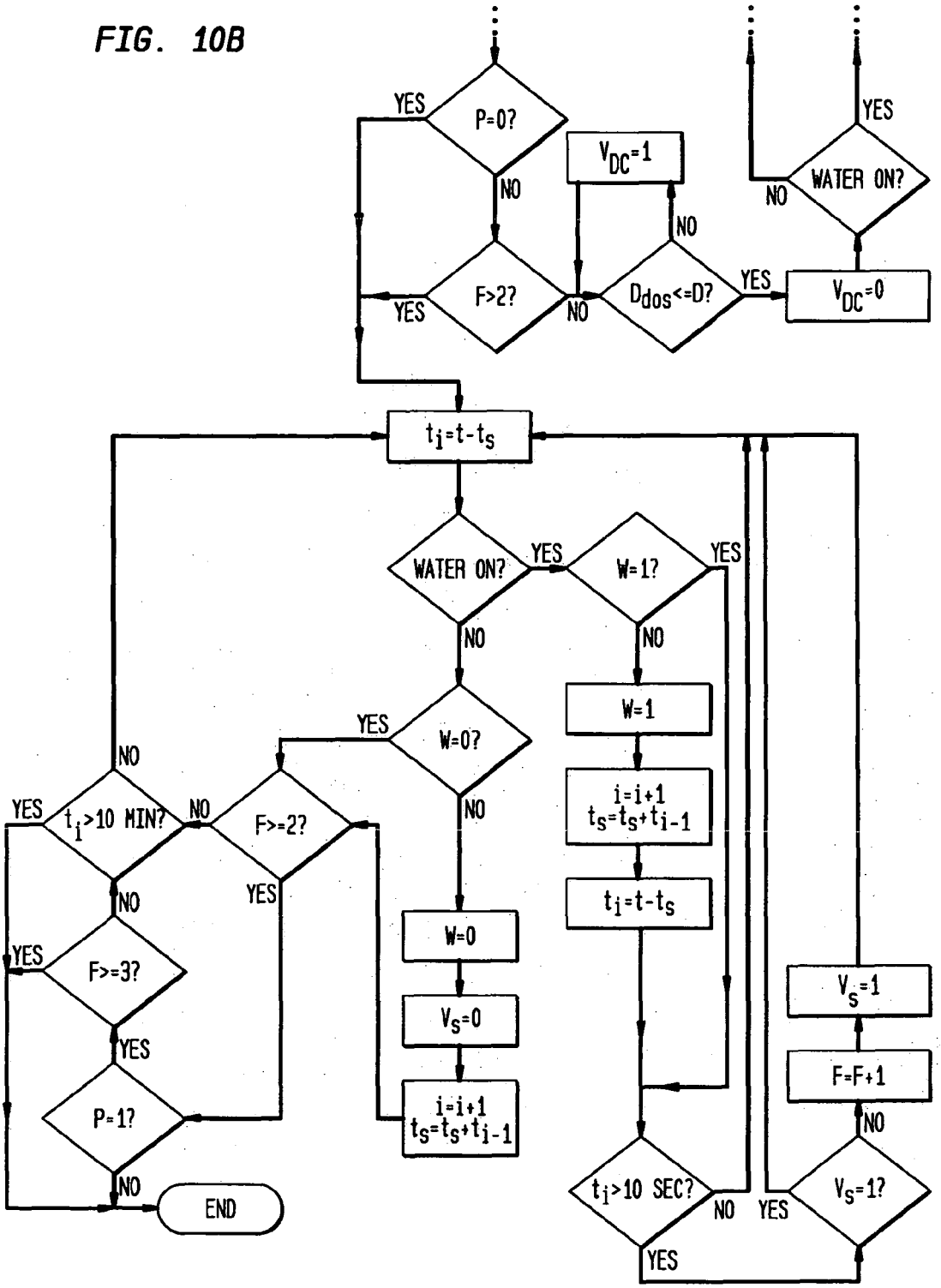

START/RESET
ALL VARIABLES=0;
SET Ddef & Sdef
INPUT Ddos, Sdos?
NO
YES
Ddos=Ddef
Sdos=Sdef
INPUT P?
NO
YES
PREWASH ON?
NO
YES
P=1
VSC=1
VDC=1
Sdos<=S?
Ddos<=D?
NO
YES
VSC=1
VDC=1
Ddos<=D &
Sdos<=S?
NO
YES
t, ti=0
WATER ON?
NO
YES
t; CLOCK ON
W=1
i=i+1
ts=ts+ti-1
ti=t-ts
WATER OFF?
NO
YES
ti>10 SEC?
NO
YES
Vd=1?
YES
NO
Vd=1
F=F+1
P=0
i=i+1
ts=ts+ti-1
Vd=0
W=0

FIG. 10A

FIG. 10B


P=0?
YES
NO
V_{DC}=1
WATER ON?
YES
NO
F>2?
YES
NO
D_{dos}<=D?
YES
NO
V_{DC}=0
t_i=t-t_s
WATER ON?
YES
NO
W=1?
YES
NO
W=0?
YES
NO
W=1
i=i+1
t_s=t_s+t_{i-1}
t_i=t-t_s
t_i>10 MIN?
YES
NO
F>=2?
YES
NO
F>=3?
YES
NO
P=1?
YES
NO
END
W=0
V_S=0
i=i+1
t_s=t_s+t_{i-1}
t_i>10 SEC?
YES
NO
V_S=1?
YES
NO
V_S=1
F=F+1

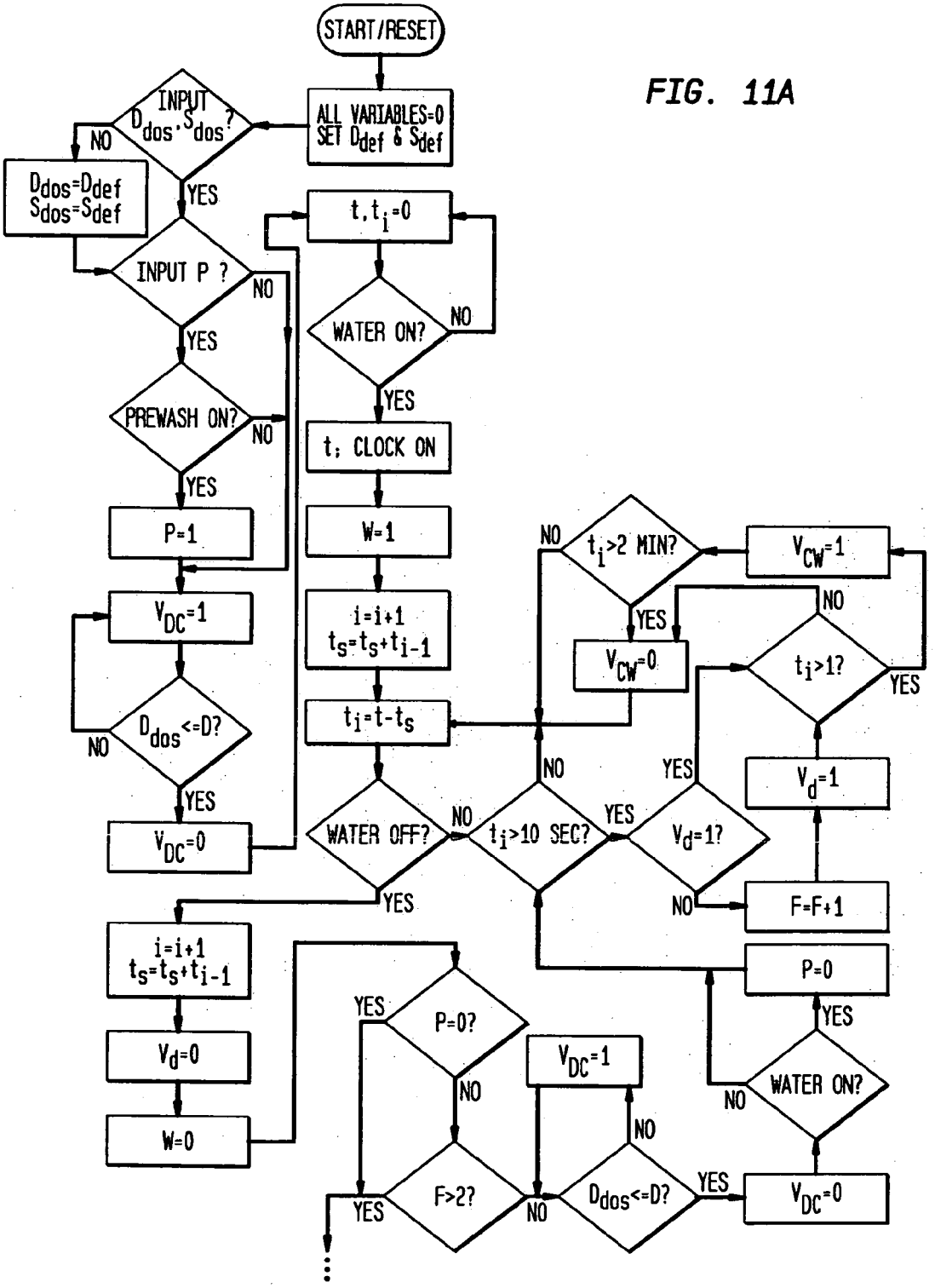
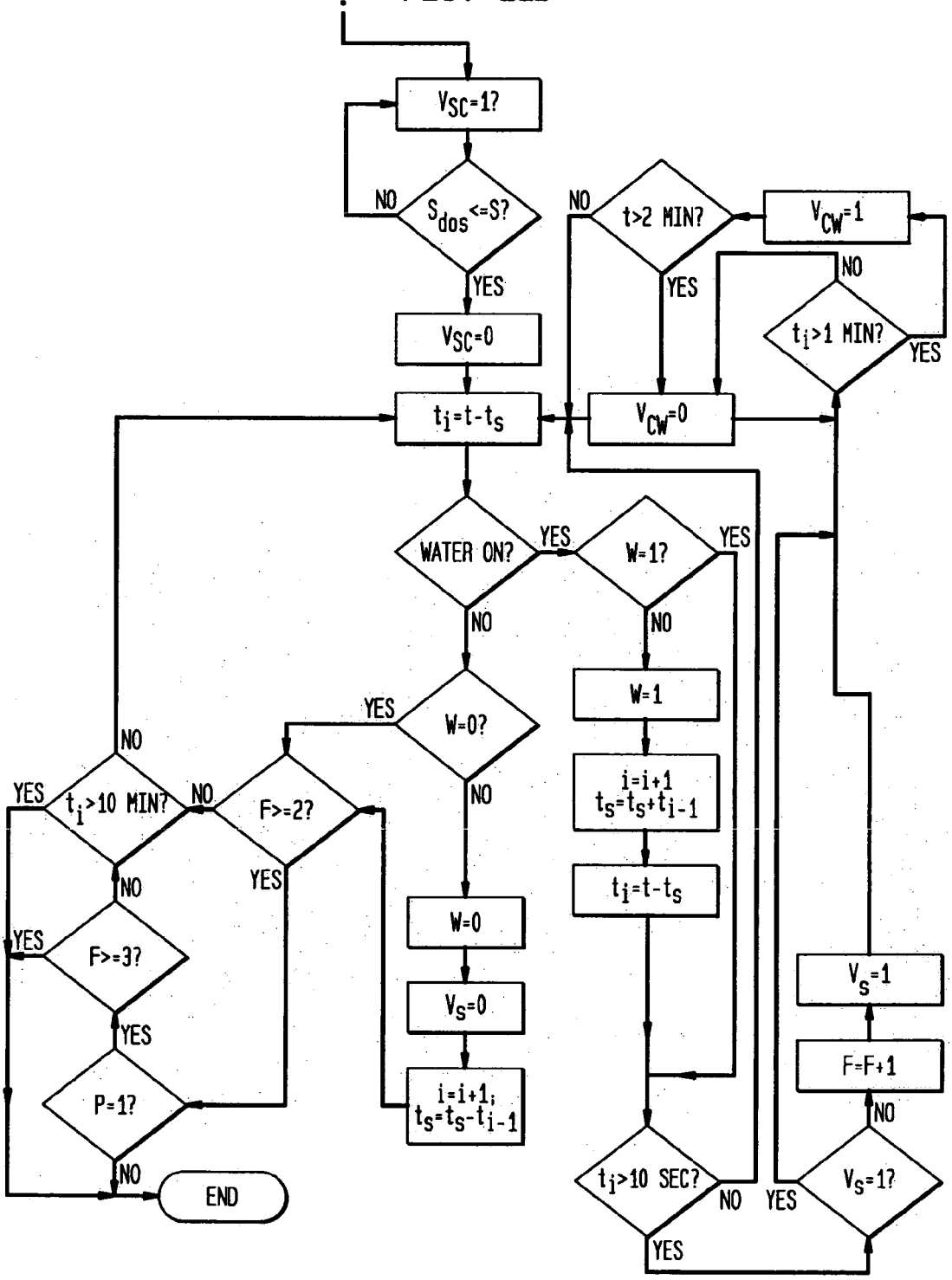

START/RESET
ALL VARIABLES=0
SET Ddef & Sdef
INPUT Ddos, Sdos ?
NO
YES
Ddos=Ddef
Sdos=Sdef
INPUT P ?
NO
YES
PREWASH ON?
NO
YES
P=1
VDC=1
Ddos<=D?
NO
YES
VDC=0
t, ti=0
WATER ON?
NO
YES
t: CLOCK ON
W=1
i=i+1
ts=ts+ti-1
ti=t-ts
WATER OFF?
NO
YES
i=i+1
ts=ts+ti-1
Vd=0
W=0
ti>10 SEC?
NO
YES
Vd=1?
YES
NO
ti>2 MIN?
NO
YES
VCW=0
VCW=1
ti>1?
NO
YES
Vd=1
F=F+1
P=0
WATER ON?
YES
NO
VDC=0
Ddos<=D?
NO
YES
VDC=1
P=0?
YES
NO
F>2?
YES
NO

FIG. 11A

FIG. 11B


V_{SC}=1?
NO
S_{dos}<=S?
YES
V_{SC}=0
t_i=t-t_s
NO
t>2 MIN?
YES
V_{CW}=1
NO
t_i>1 MIN?
YES
V_{CW}=0
WATER ON?
YES
W=1?
YES
NO
NO
W=1
i=i+1
t_s=t_s+t_{i-1}
t_i=t-t_s
YES
W=0?
NO
W=0
V_s=0
i=i+1;
t_s=t_s-t_{i-1}
NO
YES
t_i>10 MIN?
NO
F>=2?
YES
NO
YES
F>=3?
YES
P=1?
NO
END
t_i>10 SEC?
NO
YES
V_s=1
F=F+1
NO
V_s=1?
YES

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 07 6116

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y,D	US 4 981 024 A (BELDHAM ET AL) 1 January 1991 (1991-01-01) * column 4, line 54 - column 13, line 63 * * figures 1-8 *	1-15, 18-26	INV. D06F39/02 A47L15/44
Y	DE 32 36 486 A1 (ELBI INTERNATIONAL S.P.A) 5 May 1983 (1983-05-05) * page 4, line 28 - page 8, line 24 * * figures 1-5 *	1-15, 18-26	
A	FR 2 754 184 A (PARIZZI MAURICE) 10 April 1998 (1998-04-10) * page 1, line 15 - page 3, line 9 * * figures 1-6 *	1,26	
A	US 5 435 157 A (LAUGHLIN ET AL) 25 July 1995 (1995-07-25) * column 3, line 27 - column 9, line 11 * * figures 1-5 *	1,26	
A	EP 0 033 684 A (THOMSON-BRANDT) 12 August 1981 (1981-08-12) * page 3, line 31 - page 11, line 29 * * figures 1,3,4 *	1,26	TECHNICAL FIELDS SEARCHED (IPC) D06F A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	20 September 2006	Weinberg, Ekkehard

CATEGORY OF CITED DOCUMENTS

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20-09-2006

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FR 2754184 A	10-04-1998	NONE	
US 5435157 A	25-07-1995	NONE	
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		FR 2475079 A1	07-08-1981

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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- US 3982666 A **[0003]**
- US 3881328 A **[0003]**
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