The liquid medicine-prescribing apparatus for blood vessel injection

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to a liquid medicine-prescribing apparatus for blood vessel injection wherein a fixed quantity of liquid medicine can be prescribed without a bottle or a pack being placed at an upper position, which includes liquid medicine, while a constant quantity of liquid medicine is being prescribed at the time of blood vessel injection and, more particularly, to a control system for prescribing liquid medicine and a liquid medicine-prescribing system which can be used for a disposable purpose like small potable system and which can replace parts easily.

Discussion of Related Art

Generally speaking, in the case of a liquid medicine-prescribing apparatus for blood vessel injection, a liquid medicine bottle is hung on the upper position and a liquid medicine is input into a blood vessel through a liquid medicine hose, so, because when a patient moves, a liquid medicine bottle also is required to move simultaneously only at the state that the liquid medicine bottle is hung on the upper position, it is inconvenient to use it for a portable purpose, and, because of this, there has been inconvenience in that the liquid medicine should be used only in a fixed place.

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Accordingly, recently a device, which is designed for easily carrying along as well as for being injected without placing a liquid medicine bottle at an upper position, has been developed. However, most of these use either a method which uses a silicon tube, through which a liquid medicine is supplied by expansion pressure while a tube is being expanded, so a liquid medicine is input into the tube, or a method which uses electric power using an adapter and a battery, with which a liquid medicine can be input into a liquid medicine hose while a multiple axis, which circulates a curved surface, moves sequentially along a curved surface, pressurizes sequentially a liquid medicine hose, and inputs a liquid medicine. However, the disadvantage of the method which uses a tube is that there is some difference in prescribing a liquid medicine, since the beginning pressure of a tube which swelled differs from the last pressure of that and in the case of the method where a multiple axis moves sequentially by a curved surface, there are disadvantages in that it is impossible to repair partially at the time of trouble due to the complexity of manufacturing process and because of high cost, it is impossible to use it for a disposable purpose.

SUMMARY OF THE INVENTION

Accordingly, in order to overcome such drawbacks in the conventional art, it is therefore an object of the present invention to provide a liquid medicine-

prescribing apparatus for blood vessel injection, wherein a driving part, in which a motor controlled properly at the control system is accepted while being driven by an electric power of a battery, is designed to be mounted and separated by being accepted into a case and, if a driving roller is rotated, a pressurized roller, which is formed on a driving roller, pressurizes a pressurized hose sequentially, which is wound at the outside of the driving roller in the driving part which can be turned on and off by the staring part of the driving part, at the state that is pressurized by a starting part, so a fixed quantity of liquid medicine can be prescribed. This kind of supply method is made to increase the liquid medicine by proper control within a fixed time or the electric power of a battery is designed to be maintained for a long time in turning a motor on and off and prescribing a fixed quantity.

It is another object to provide the liquid medicine-prescribing apparatus for blood vessel injection wherein a fixed quantity of liquid medicine can be prescribed without a bottle or a pack being placed at an upper position, which includes liquid medicine, while a constant quantity of liquid medicine is being prescribed at the time of blood vessel injection.

It is still another object to provide a control system for prescribing liquid medicine and a liquid medicine-prescribing system which can be used for a disposable purpose like small potable system and which can replace parts easily.

To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, there is provided a liquid medicine-prescribing apparatus for blood vessel injection comprising

the lowercase 10 which is combined with two lateral faces 10a, 10b, the running part 60 which has feed the means of liquid medicine and which is inserted to be mounted and removed into the reception space 24 formed by the cover plate 20 which is open and shut by the hinge 300 of lowercase 10 and an uppercase 30 which is open and shut by the hinge 21 of a cover plate 20 and on which the lowercase 10 is combined to be open and shut while forming the reception space 33 into which liquid medicine pack is accepted.

According to another aspect of the present invention, there is also provided a liquid medicine-prescribing control circuit, wherein, with a central processing unit having a reference value according to each step, divided are a normal conversion switch NOR SW for normal operation, a switch INJ SW by which a personal conversion switch PCA MODE SW determines prescribing amount by changed value according to each step, and a switch TM SW which determines prescribing time and connection is provided through an AND gate; a safety node LOCK SW for prohibiting a personal conversion switch from being operated is connected into an input edge; a detector, with which state of a battery can be detected at any time, is connected into a control part and, in

case that a detected signal value is different from a set value which is already fixed, a motor control M/C, which control the motor operated simultaneously by battery power and the buzzer which outputs buzzer sound in order to inform outside of state, is connected with a battery.

According to another aspect of the present invention, there is also provided a liquid medicine-prescribing system comprising a step which halts all operation, in the case that, in order to make the motor to be rotated by the operation of the normal conversion switch and the personal conversion switch, the new input state waits and the battery is not enough to meet the reference value by determining whether the battery capacity is proper or not, a step which determines whether the personal conversion switch, with which the patient can increase prescribing amount of liquid medicine additionally when capacity of it is proper, had already been operated, that is, a step which determine whether it is PCA mode, a step which makes additional operation to be possible at the state that PCA mode is already input in the case that it is not required to clear it, and which determines whether existing input PCA mode should be cleared in case that it is set in PCA mode,

a step which has PCA mode, which is input already, cleared in case that it is required to clear, a step which is immediately in normal operation if a safety pin has been removed by confirming whether a safety pin was removed(or not), that is to say, by confirming whether a

safety switch is OFF (or not) in order for a patient to make it impossible to increase liquid medicine at his discretion in case that PCA mode has been cleared, a step which provides normal operation according to a reference value, in case that a reference value for normal operation has not been changed after determining whether it is changed or not, by determining whether PCA switch starts working newly when a safety pin has not been removed when PCA switch did not work, that is to say, when a personal conversion switch and a time switch did not provide the increase of capacity and time simultaneously or turned OFF, a step which works normally by a changed reference value by a normal conversion switch in case that a normal conversion switch is changed by a reference value, and a step which works in additional operation as well as normal operation under PCA mode, if an additional operation is performed by a changed value immediately after PCA mode value is input according to a changed value, in case that P.A. switch has turned ON, that is to say, in case that a personal conversion switch, a switch which determines prescribing amount and a switch which determines prescribing time has increased together.

BRIEF DESCRIPTION OF THE ATTACHED DRAWINGS

A more complete appreciation of the invention, and many of the attendant advantages thereof, will be readily apparent as the same becomes better understood by reference to the following detailed description when

considered in conjunction with the accompanying drawings in which like reference symbols represent the same or similar components, wherein:

FIG. 1 is a perspective view showing a state, wherein a lowercase and an uppercase are open and shut by a hinge.

FIG. 2 is a perspective view showing a state, wherein uppercase is fixed on lowercase.

FIG. 3 is a perspective view showing a state, wherein there is no uppercase.

FIG. 4 is a perspective view showing a state, wherein an injector is connected without the uppercase.

FIG. 5 is a perspective view showing a state, wherein a liquid medicine pack is connected without the uppercase.

FIG. 6 is a disassembled perspective view showing the combined configuration of a driving part.

FIG. 7 is a cross sectional view showing a state, wherein a motor of a driving part is combined with a gear.

FIG. 8 is a cross sectional view showing a state, wherein a connector is combined with a pressurized hose.

FIG. 9 is a partially disassembled perspective view showing a state, wherein a clip is connected to the uppercase.

FIG. 10 is a front view showing a side of the lowercase in FIG. 1.

FIG. 11 is a cross sectional view taken along the line A- A in FIG. 10.

FIG. 12 is a cross sectional view showing a state, wherein the pressurizing roller of a driving roller is mounted.

FIG. 13 is a cross sectional view of a fixed plate of a driving roller.

FIG. 14 is a cross sectional view of a cover plate of a driving roller.

FIG. 15 is a partially disassembled perspective view showing a state, wherein a connector and a driving part are mounted on a lowercase of FIG. 2.

FIG. 16 is a cross sectional view, wherein a concave groove, into which a liquid medicine hose is inserted on the uppercase, is formed

FIG. 17 is a perspective view showing a state, wherein a remote controller is formed to be used.

FIG. 18 is a cross sectional view of a connector.

FIG. 19 is a plan view of a state, wherein a safety node is formed on a board.

FIG. 20 is a perspective view showing an example, wherein a liquid medicine pack is connected into a driving part.

FIG. 21 is a block diagram of a working system according to an embodiment of this invention.

FIG. 22 is a flow chart showing the control operation of this invention.

FIG. 23 is a subroutine view of a personal conversion mode (PCA mode) shown in FIG. 21.

FIG. 24 is a subroutine view of a normal conversion mode (NOR mode) shown in FIG. 21.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

From the following, a desirable embodiment of this invention will be described in detail according to the attached drawings.

As shown in FIG. 1, this invention has a configuration; a running part 60, wherein formed is a starting part 40 which prevent a driving part 50 from being separated by pressurizing a pressurized hose 53 wound on a pressurized roller 52 which is formed on the driving roller 51 of a driving part 50 and a driving part 50 which forms both a driving roller 51 which is rotated with a reduced rotating power and a gear for reducing the rotating force of a motor M which is combined on a lowercase 10, wherein formed are a battery holder 17 and a circuit board 600, in which a circuit and a software program are input in order to control the operation of a motor A; the running part 60 is inserted to be fixed into a reception space 24 to be inserted and removed, the uppercase 33, which is open and shut by the hinge 300 of a cover plate 20, and is designed to be driven by being connected with a liquid medicine hose 70 which is accepted in reception space 33, and while being driven while the uppercase 30 is combined to be open and shut on the lowercase 10.

At this time, on a circuit board 600, as shown in FIG. 19, can be inserted and removed a safety node 601, which can block the free operation of a circuit, so it is

impossible to amend free operation or normal operation in the case that the safety node 601 should be removed.

Also, in order to open and shut the uppercase and the lowercase, with spring 13, which is inserted into a protrusion axis 12, being pressurized by the jammed plate 15 of an operation button 14, a combining protrusion 16, which is made to go in gear elastically with the combining protrusion 31 of uppercase 30, is made to be formed.

A cover plate 20, which is open and shut by a hinge 300, at the state that accepted is a running part 60 which is accepted into reception space 24 where a jammed protrusion 19 of lowercase 10 is formed, forms an elastic plate 23 where an inward groove 22 is formed to be combined with an outward protrusion 11 of a lowercase 10 in order for a running part 60 not to be removed.

In the uppercase 30 which is open and shut by the hinge 300 of the cover plate 20, a jammed part 34 is formed so that a clip 80 may be inserted into the back surface of uppercase 30 and a concave groove 32 is formed, wherein a liquid medicine hose 70 can be inserted toward a front side.

At this time, the concave groove 32 has an enough space, through which a liquid medicine hose 70 that is connected with the connector 53a of the pressurized hose 53 even at the state that the cover plate 20 is covered with the lowercase 10, can get out into the concave groove 32 of the uppercase 30.

Also, on the lateral face 10a of the lowercase 10, a circuit board 600 is mounted in an inner direction and both LCD, on which liquid medicine-prescribing status is shown and a switch SW which is connected with the circuit board, are shown in the outside.

On another lateral side 10b, a battery holder 17 is formed so that a battery may be replaced at the outside and a battery node H is exposed in the inside of the lower part of a battery holder, and they can be connected with a circuit board.

The combination of the lowercase 10 is, as shown in FIG. 15, is made since a lateral face 10a and another lateral face 10b go in gear each other by using the insertion combination method by an inserting concave groove 500 and an inserting protrusion 400, combined by being pressurized, and then fixed firmly with a screw each other, at the state that the screw protrusion 18 of a lateral face 10a is inserted together with a screw protrusion 18a of another lateral face 10b.

Also, the running part 60 for feeding liquid medicine is inserted at the upper part into a slide groove 67 on a running part 60, and the starting part 40 which is inelastic by a spring 41 and the curved protrusions 42 which is formed on the upper part of a starting part 40 are inserted between the protrusion bands 59, 59a while they pressurize the pressurized hose 53 which is wound outwardly on a pressurized roller 52 of a pressurized roller 52 formed between the protrusion bands 59, 59a of a driving part 50, so that it prevents

driving part 50 from being removed, and a driving part 50, in which a moving roller 51 is made to be rotated with the reduced rotating force of a motor M which is fixed on a running part 60, is comprised.

In order to make this configuration, the configuration of a running part 60 is configured as the following;

a motor M is accepted into a protruded lower area, into which a support plate 61 is protruded, and a hole 62 is formed so that a motor axis B may be exposed; the motor axis B which is exposed into a hole 62 goes in gear with a moving gear C, and a moving gear C goes in gear with a linked gear D; the speed of linked gear D is dwindling while the driving axis 65 goes in gear with the driving gear E in which a driving axis 65 is protruded; such moving gear C, support gear D, and driving gear E are accepted into a housing, so they are fixed with the screw 200 on a housing through the screw hole 100 on the back side of fixed plate 63 at the state that a gear axis F is inserted for making rotation possible into the rotating concave groove 64 which is formed in a housing and a fixed plate 63; the edge of driving axis 65 in driving gear E is inserted into the axis groove 66 of a housing, exposed in a front direction, and inserted into the axis groove 55 of the moving roller 51.

At this time, in order to fix a motor M, the gears C, D, and E, which go in gear with a motor axis B by fixing a motor M with a screw 200 through a screw hole which is formed on the outer circumference of a hole 62

to be exposed by the insertion of a motor axis B, are made to be rotated in exact speed; in the back direction of a housing, after blocking it with a fixed plate 63 and front direction with a cover 68,

a power connection node H for driving a motor with an opening 69 which is open in a lateral side is designed to be exposed.

Also, the driving axis 65 of a driving gear E is made a lateral face in driving axis 65 to be cut, forms a cut face 65b, and is inserted to go in gear with a cut face 55a formed on the axis groove 55 of a moving roller 51, so the driving roller 51, which is rotated simultaneously with a driving axis 65, is made to prevent a slim phenomenon, that is, a phenomenon running idle due to sliding, from taking place; also, in case that a driving axis 65 is combined with a driving gear E, at time of rotation, since driving axis 65 is rotated with a driving gear E simultaneously, in order to prevent a slim phenomenon form taking place, by forming a screw protrusion 65a, which has a concave-convex shape on the part which is inserted into a driving gear E, a screw protrusion 65a is combined with a driving gear E while it is being input under pressure.

Also, with a spring 41 becoming elastic, a slide protrusion 44 is formed on the starting part 40 which intermits driving part 50 so that the starting part 40 may not be removed from the driving part 60 as the starting part 40 is inserted into the slide groove 67 of a driving part 60 and moves up and down. The curved

protrusion 42 for preventing a driving part 50 from being removed as the spring 50 is placed between the protrusion band 59, 59a of a driving part 50 is formed on top, on which a hanging jaw 45 is formed inwardly so that a spring 41 may not be separated. Also a support concave groove 43 is formed toward its lower part so that the lower part of a protrusion band 59 is made to be placed on the lower part.

A driving part 50, which accepts a moving roller 51 in which formed is an axis groove 55 having the same cut plane 55a in order to be inserted to go in gear with the cut face 65b of a driving axis 65, is constituted with two bodies 50a, 50b; a protrusion plate 57, in which an inserting hole 56 is punched, is formed so that on the body 50a of a lateral side may be inserted a pressurized hose 53, into which a connector 53 is inserted in the lateral edge, to be fixed; in the case of being combined with another side of body 50b, the protrusion plate 57 is made to be placed on the lower part of an insetting groove 54; in the lateral side of a protrusion plate 57, the extended partition 58 is formed and in another lateral face, a partition 58 with which a space 57a is made, is formed so that another side edge of a pressurized hose 53 may be inserted, so the pressurized hose 53, which is wound externally on the side of a pressurized roller 52, is exposed toward the outside.

At this time, the cut groove 50c is formed on the upper of the lateral face in the body 50a and is inserted

to be combined into the inserting protrusion 60a of the driving part 60.

A pressurized hose 53, which is wound on a pressurized roller 52 which is inserted with a pin G in order to make a moving roller 51 be rotated, is combined for a connector 53a, 53b to be exposed

by connector 53a and 53b being formed in both a lateral edge of pressurized hose 53, at state that it is stuck to pressurized roller 52 so that it may hang on an inserting groove 54 of a driving part 50 and a pressurized hose 53, which are wound, at the state that it is stick to the pressurized roller 52, is pressurized by a curved protrusion 42 of a starting part 40.

With a moving roller 51 being placed between protrusion bands 59, 59a, a curved protrusion 42 of a starting part 40 pressurizes only a pressurized hose 53 which is wound on a pressurized roller 52 of a moving roller 51.

The protrusion band 59a of a lateral body 50a forms a jaw 59b and has a hole; a moving roller 51 is protected, with the other side of a body 50b being blocked; the jaw of a fixed plate 51b goes in gear to be combined with each other on a jaw 59b, which is formed on a protrusion band 59b of a side body 50a; also in the case that two bodies 50a, 50b is combined with a screw, a moving roller 51 is made not to be removed between protrusion band 59, 59a,

As shown in FIG. 12 and FIG. 14, the method that the pressurized roller 52 is combined with a pin G, is

that in order to prevent a pin G from being removed, a fixed plate 51b, on which a protrusion axis 51a is formed, is designed to be combined with a cover plate 51c, a concave groove 51d is formed toward the inside of a cover plate 51c and a fixed plate 51b, and a pin G is inserted into a concave groove 51d between a cover plate 51c and a fixed plate 51b, and then a pressurized roller 52 is inserted into a pin G.

In the methods how a cover plate 51c is combined with the protrusion axis 51a of a fixed plate 51b, there are both a method by pressurizing and a method by blending, mounting and adhesion, and, at the center of a protrusion axis 51a, an axis groove 55, on which a cut face 55a is formed, is formed.

Also, without the uppercase 30 and the lowercase 10 being fold and unfold by a hinge 300, as shown in FIG. 15, by protruding the combing protrusion 90 toward the top of the lowercase 10, the combining protrusion 90 goes in gear to be combined in the uppercase 30. As shown in FIG. 3 and FIG. 5, by forming the lowercase 10 without the uppercase 30, in the direction crossing directly the cover plate 20 which is folded and unfolded by the hinge (it is not shown in the drawing.) into the top of the lowercase 10, another cover plate 20a, which is folded and unfolded by the hinge 300, is formed and by forming the hole 25 which can expose a liquid medicine hose into the top of the above cover plate 20a, various applications can be achieved. Also, as seen in FIG. 17, a remote controller can be connected.

As shown in FIG. 15, after forming a guide groove 10c in other lateral face 10b of lowercase 10 and after inserting the safety pin 10d through the above guide groove 10, the safety pin 10d is made to be placed between the supporting concave groove 43 of the starting part 40 and the protrusion band 59 of the driving part 50 for preventing the pressurized hose 23 from being pressed before using the goods.

Accordingly, in the case that a driving part 60 should be made on the lowercase 10, if pushing an operation button 14, which is mounted on the lowercase 10, toward a lateral side, a jammed plate 15 pressurizes a spring 13 and the combining protrusion 31 of the uppercase 30, which goes in gear with the combing protrusion 16, is separated, so the uppercase 30 is made to be open. At the state that the uppercase 30 is open, if pressurizing the elastic plate 23 of the cover plate 20, the inward groove 22 of the elastic plate 23 is removed from the outward protrusion 16 of the lowercase 10 and the cover plate 20 is open and a reception space 24 is exposed, so after accepting the running part 60 into the reception space 24, in which an inserting protrusion 19 is formed, by using a node H which is exposed into the lower area of a running part, it is connected with a circuit board 600.

At the state that is connected as the above, after accepting the liquid medicine pack into the reception space 33 of the uppercase 30, the liquid medicine hose 70, which is connected with the liquid medicine pack, is

designed to be connected with a side of the connector 53a of the pressurizing hose 53 which is exposed into the top of the driving part 50 and, in another side, is made to be connected with the injection needle in order to inject into blood vessel by using a liquid medicine hose.

After that, if pausing a switch SW, as the motor A starts driving, and since the moving roller 51, which is inserted into the driving axis 65 of the driving gear E, is being rotated, the pressurized roller 52 of the moving roller 51 as well is rotated simultaneously and at the state that the pressurized hose 53 which adheres closely to the pressurized roller 52 begin to be pressurized at regular intervals by the pressurized roller 52 which is formed at the regular intervals, and the liquid medicine, which is filled in the liquid medicine bottle or the liquid medicine pack which is connected with the pressurized hose 53, flows in a side according to the liquid medicine hose 70.

As shown in FIG. 2, at the state that the uppercase 30 is fixed on the lowercase 10 and in order to pour the liquid medicine into the liquid medicine pack at the state that the liquid medicine pack is accepted into the reception part 33 of the uppercase 30, since it is inserted to be mounted into a side of the lowercase 10 at the state that the connector 71 branches off into two branches 73, 74 and an inlet 72 which is exposed into the outside of the connector 71, as shown in FIG. 15, the liquid medicine flows through an inlet 72 if a liquid medicine is injected by using an injection needle through

the inlet 72 of the connector 71, so a branch 73 is connected with a liquid medicine pack and another branch 74 is connected with the pressurized hose 53, and since the pressurized hose is pressurized by a curved protrusion 42 formed on the top of the starting part 40, liquid medicine is prevented from flowing into another branch 74 and flows only into the liquid medicine pack 75 through a branch of a side.

At this time, the pressurized hose connected with the branch 74 of another side is connected with a patient's blood vessel by being connected with an injection needle for injection through the liquid medicine hose 70 and since a silicon rubber is inserted into the inlet 72 of the connector 71, air is shut off in the case that an injection needle comes in and out.

Accordingly, by using this principle, various applications are possible; at the state that the liquid medicine pack is accepted into the reception part 33 of the uppercase 30 or without the uppercase 30 at the state that the liquid medicine is exposed in the outside, or in the case that slow injection is required by being connected with an injection needle, or in the case of the disposable use or in the case of the recharging use. In the case of the disposable use, since the driving part 50 is removed from the starting part 40, it is possible to replace only the driving part 50 and use it again.

After using it as the above, in the case that the running part 60 is to be replaced, easy replacement is

possible by opening the cover plate 20, separating the node H of a motor A from the circuit board, and remove the running part 60. In the case that only the pressurized hose 53 of the driving part 50 is to be replaced, the starting part which is elastic and is supported with a spring if lowering the starting part 40 downward, goes down and the curved protrusion 42 of the starting part 40 is getting out of between the protrusion band 59, 59a of the moving roller 51; also, if the moving part 50 is separated from the driving axis 65, the pressurized hose 53 which is wound on the pressurized roller 52 of the moving roller 51 can be easily replaced by separating the body 50a, 50b of the moving part 50.

Accordingly, at the separated state, if the moving part 50 which is constituted with two bodies 50a, 50b is to be separated, the pressurized hose 53 which is wound on the external side of the pressurized roller 52 of the moving roller 51 can be removed and after removing it, new pressurized hose 53 can be connected in use.

Also, this operation is the driving of a motor M by applying an electric power due to the conversion of a personal conversion PCA MODE switch SW and a normal conversion switch SW which are formed outwardly in the lowercase 10, since the motor, which is connected with a circuit board, is controlled by the circuit which is arranged on the circuit board. This driving performs automatic operation by free operation with changed value for increasing a prescribing amount freely in addition to normal operation which is done by a reference value.

Accordingly, in the central processing unit C.P.U., as shown in FIG. 21, if an electric power is applied by a normal conversion switch, the step goes into the first step which detects the applying of an electric power in the central processing unit, makes clear a changed value and a reference value stored in memory for normal operation and free operation in advance and, after passing the first step which stands by a new input state, at the second step which, first of all, determines the appropriateness of a battery, if the battery is not proper to use, all the operations are ended and if appropriate, the step goes into the third step which determines whether a personal conversion switch is working or not (whether it is PCA mode or not) with which a patient can freely add to the prescribing amount of liquid medicine and if it is set in PCA mode, the step goes into the fourth step which determines whether the PCA mode which is previously input should be cleared or not, so if it should not be cleared, the step goes into the ninth step which is operated at the free operation which is previously input and in the case that it is required to be cleared, the step goes into the fifth step which makes clear the PCA mode, which is previously input.

As the above, in the case that PCA mode is cleared at the fifth step, after passing through the second and the third steps, the step goes into the sixth step which confirms the safety pin-removing state and, if the safety pin was removed(that is to determine whether a safety

node is off in order for a patient to make free operation impossible about the increase of liquid medicine), the step goes into the twelfth step which is operated normally according to a reference value, and if the safety node is not removed, the step goes into the seventh step which determines whether PCA switch is newly working, and if PCA switch is not working (that is, when the capacity and the time of a personal conversion switch are not pressurized at the same time or turned off), the step goes into tenth step which determines whether the reference switch for normal operation was changed or not, and if not changed, the step goes into the eleventh step which is working normally according to the reference value, and, if the normal conversion switch was changed according to the reference value, the step goes into the eleventh step which is operated by the reference value which was changed by normal conversion switch and the twelfth step which is normally operated.

state, isAlso, at the seventh step, if PAC switch turns on (that is, when, in a personal conversion switch, a prescribing amount-determining switch and a prescribing time- determining switch as well are pressurized at the same time), the step goes into the eighth step which starts the working of free operation at the same time as soon as normal operation comes to an end in PCA mode and if free operation is working, the normal operation does not work during the time which is previously set and the mount which is freely prescribed, and after free

operation, if free operation is finished, free operation is changed into normal operation.

Also, the normal operation according to the reference value performs rotation for a constant time which is input with a reference value at intervals of thirty seconds by the reference value input from the normal conversion switch which is divided into nine steps and, for the remaining time, performs the stop operation for the motor. The changed value in PCA mode, which is input simultaneously with the prescribing time switch and the prescribing amount switch, is designed to be free operation so that the prescribing amount may be prescribed additionally at intervals of the prescribed time by dividing the prescribing time switch and the prescribing amount switch into nine steps respectively. These operations are effective only for one time and, in the case of free operation, normal operation is suspended.

Accordingly, the routine for normal operation is controlled as shown in FIG. 24.

In the routine in the case of normal operation, since the reference value of the first step is set as 250ms if the normal conversion switch which is divided into nine steps is set the same as the first step, the motor performs normal operation according to the 100th step immediately and deducts the normal operation time according to a reference value from the 101st step and at

this time the time interval which is counted is designed to be counted per 10ms and 50ms.

Accordingly, the motor M which is normally operated by the 100th and the 101st steps go into the 102nd step which determines whether the value is zero or not as a result of

deduction and if the value does not reach zero, the step goes into a circulating loop which is alteration the 101st step with the 100th step, so repeated operation is made; if the value reaches zero, the step goes into the 103rd which determine whether a normal conversion switch for normal operation has been changed or not; if it was changed, the step goes into the 100th step which is working immediately at the state that was changed; if it was not changed, the step goes into the 104th which makes the motor stopped.

After that, in case that 30 seconds have not passed after being operated at the 105 step, it becomes alteration the 104th step with the 105th step, so it forms a circulating loop in which a motor continues to stop; in the case that 30 seconds are passed, the step goes into the 100 step, so normal operation is performed.

At this time, in this invention, the driving time of a motor is set to be 30 seconds, but according to the characteristic of liquid medicine which should be prescribed, it can be adjusted; as for the counting time, in this invention, it is set to be 10ms and 50ms units for counting time, but it also can be adjusted according to use condition.

That is to say, since a normal conversion switch is divided into nine steps, if rotating it into the 1st step from OFF state, immediately after that, the motor M is rotated and since, at this time, the reference value of the motor M for rotation is set to be 250 ms at the 1st state, the motor M can be rotated for 250ms which is a reference value and, for the remaining time of 29.75, the motor stops.

Also, the PCA mode which is freely operated by personal conversion switch, contrary to the repetitive driving at the normal operation, operation is effective only once. For example, in the case that the motor M is rotated by normal operation, if the mode is changed into PCA mode at the state that the motor stops or is being rotated, normal operation is done only for 250 ms set at normal operation state and after that, at the state that the mode is changed into PCA mode, normal operation stops during one time operation and in the case that PCA mode is canceled, normal operation is performed immediately.

The PCA mode routine for this is the same as FIG. 23.

First of all, in order to work in the PCA mode and in order to make be operated only when the changed value of the prescribing interval time and the changed value of the prescribing amount, which are classified into nine steps respectively, are input simultaneously, at the 200th step which determines whether the changed value of the prescribing amount and the prescribing time are input simultaneously by make the prescribing amount and the

prescribing time input, if input is not done simultaneously, PCA mode is not working, but working in normal operation state. If input is done simultaneously, at the 201 step which determines whether a motor for normal operation is being rotated before working in PCA mode, if a motor is being rotated, PCA mode is in waiting state at the 202 step for a while. At the waiting state, at the state which determines whether the rotating motor stopped or not, if the motor is being rotated, the step goes into the 202 step, so a circulating loop is formed. If the motor stopped, the step goes into the 204 step, so PCA mode is performed immediately.

Also, in the case that the motor is not rotated at the 201th step, the step goes into the 204th step immediately to be performed in PCA mode.

If operation begins, the time value according to the prescribing amount at the 206th step is deducted and, whether the result of deduction became zero is determined and if it did not become zero at the 206th step, the step goes into the 205th which forms a circulating loop and the motor continues to be driven. If it became zero, the step goes into the 207 step, in which the operation of the motor stops in the PCA mode. If the motor stops, the step goes into the 208th step, in which the changed value of the prescribed interval time is deducted.

After that, the step goes into 209 step which determines whether the result of deduction for the prescribing interval time became zero and if it did not become zero, the step goes into the 208th step which

forms a circulating loop. If it became zero, the step goes into 210 which cancels PCA mode and immediate normal operation is performed.

Also, in the case that PCA mode is working, even in the case that, for the second time, operation is made to be performed in PCA mode, operation is made to stop. That is to say, only when PCA mode is canceled, a new input signal can be accepted.

At this time, the motor is rotated for the time for the prescribing amount the same as normal operation and the motor stops during the remaining time which deducts the time for the prescribing amount, that is, the prescribing interval time.

Accordingly, as the motor M is rotated continuously, the pressurized roller of the moving roller does not pressurize the pressurized hose continuously, but operation is working during the time for the value given within the constant range of time, so not only the expected life span of the motor can be extended, but also the long time use of a battery can be achieved. Also, in order for the patient to increase the prescribing amount, a fixed quantity can be prescribed by the choice of a button.

This invention having the above configuration is disposable and portable liquid medicine-supplying apparatus with which a patient can take directly for portable use by putting on it while walking. Also, it is possible for a patient to use it over and over again

according to multiple injection only for the patient who has to use the same liquid medicine.

Also, this invention not only minimizes the causes which interfere with daily life, but also increase the effectiveness according to the medical treatment of liquid medicine. This invention has another benefit in that a fixed quantity of liquid medicine is input as well as the prescribing amount of the liquid medicine can be adjusted for a patient to maintain the good shape. That is to say, this invention offers an extensive prescribing range.

Accordingly, this invention offers the features such as the convenience of its use, good liquid medicine-prescribing speed, no error in the liquid medicine-prescribing amount due to outside temperature change, safety and reliability, and no maintenance fee is required.

It will be apparent to those skilled in the art that various modifications can be made in *The liquid medicine-prescribing apparatus for blood vessel injection* of the present invention, without departing from the spirit of the invention. Thus, it is intended that the present invention cover such modifications as well as changes thereof, within the scope of the appended claims and their equivalents.

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What is claimed is:

1. A liquid medicine-prescribing apparatus for a blood vessel injection comprising;

a lowercase 10 which is combined with two lateral faces 10a, 10b,

a running part 60 which has feed means of liquid medicine and which is inserted to be mounted and removed into a reception space 24 formed by a cover plate 20 which is open and shut by a hinge 300 of lowercase 10 and;

an uppercase 30 which is open and shut by a hinge 21 of a cover plate 20 and on which the lowercase 10 is combined to be open and shut while forming reception space 33 into which liquid medicine pack is accepted.

2. The liquid medicine-prescribing apparatus for a blood vessel injection according to claim 2, wherein a cover plate 20a, on which a hole 25 is punched toward an upper side of a lowercase 10, can be open and shut by a hinge 300.

3. The liquid medicine-prescribing apparatus for blood vessel injection according to claim 1, wherein an inlet 72, in which silicon is supplied into a lowercase 10, and a connector 71 from which two branches 73, 74 branch off, are inserted on an axis, and an uppercase 30 is combined by the combining protrusion 90 of a lowercase 10.

4. The liquid medicine-prescribing apparatus for a blood vessel injection according to claim 1, wherein, in order to open and shut uppercase and lowercase, with

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spring 13, which is inserted into a protrusion axis 12, being pressurized by jammed plate 15 of an operation button 14, a combining protrusion 16, which is made to go in gear elastically with combining protrusion 31 of uppercase 30 is made to be formed.

5. The liquid medicine-prescribing apparatus for a blood vessel injection according to claim 1 and claim 3, wherein, after forming guide groove 10c in other lateral face 10b of lowercase 10 and after inserting safety pin 10d through above guide groove 10, a safety pin 10d is made to be placed between supporting concave groove 43 of a starting part 40 and a protrusion band 59 of a driving part 50 for preventing a pressurized hose 23 from being pressed before using the goods.

6. The liquid medicine-prescribing apparatus for a blood vessel injection according to claim 1 and claim 2, wherein a cover plate 20, which is open and shut by a hinge 300, at state that accepted is a running part 60 which is accepted into reception space 24 where a jammed protrusion 19 of lowercase 10 is formed, forms an elastic plate 23 where an inward groove 22 is formed to be combined with an outward protrusion 11 of a lowercase 10 in order for a running part 60 not to be removed.

7. The liquid medicine-prescribing apparatus for a blood vessel injection according to claim 1 and claim 3, wherein formed is a jammed part 34 so that a clip 80 may be inserted into a back surface of uppercase 30 and formed is a concave groove 32, into which a liquid medicine hose 70 can be inserted toward a front side.

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8. The liquid medicine-prescribing apparatus for a blood vessel injection according to claim 1, wherein a running part 60 for feeding liquid medicine is inserted at upper part into a slide groove 67 on a running part 60, and a starting part 40 which is inelastic by a spring 41 and the curved protrusions 42 which is formed at upper part of a starting part 40 are inserted between protrusion bands 59, 59a while they pressurize a pressurized hose 53 which is wound outwardly on a pressurized roller 52 of a pressurized roller 52 formed between protrusion bands 59, 59a of a driving part 50, so that it prevents driving part 50 from being removed, and a driving part 50 in which a moving roller 51 is formed to be rotated with a reduced rotating force of a motor M which is fixed on a running part 60 is comprised.

9. The liquid medicine-prescribing apparatus for a blood vessel injection according to claim 1, claim 2, and claim 3, wherein a lateral face 10a and another lateral face 10a of a lowercase 10 is combined with a screw each other, at the state that a screw protrusion 18 of a lateral face 10a is inserted together with a screw protrusion 18a of another lateral face 10b.

10. The liquid medicine-prescribing apparatus for a blood vessel injection according to claim 8, wherein, in case of a running part 60, a motor M is accepted into protruded lower area, into which a support plate 61 is protruded, and a hole 62 is formed so that a motor axis B may be exposed; motor axis B which is exposed into a hole 62 goes in gear with a moving gear C and a moving gear C

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goes in gear with a linked gear D; speed of linked gear D is dwindling while driving axis 65 goes in gear with a driving gear E in which a driving axis 65 is protruded; such moving gear C, support gear D, and driving gear E are accepted into a housing, so they are fixed with a screw 200 on a housing through screw hole 100 on the back side of fixed plate 63 at the state that a gear axis F is inserted for making rotation possible into rotating concave groove 64 which is formed in a housing and a fixed plate 63; an edge of driving axis 65 in driving gear E is inserted into axis groove 66 of a housing, exposed toward front direction, and inserted into axis groove 55 of moving roller 51.

11. The liquid medicine-prescribing apparatus for a blood vessel injection according to claim 8, wherein, with a spring 41 becoming elastic, a slide protrusion 44 is formed on starting part 40 which intermit driving part 50, curved protrusion 42 is formed on top, on which a hanging jaw 45 is formed inwardly so that a spring 41 may not be separated, and a support concave groove 43 is formed toward its lower part.

12. The liquid medicine-prescribing apparatus for a blood vessel injection according to claim 8, wherein a driving part 50, which accepts a moving roller 51 in which formed is an axis groove 55 having same cut plane 55a in order to be inserted to go in gear with cut face 65b of a driving axis 65, is constituted with two bodies 50a, 50b; a protrusion plate 57, in which an inserting

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hole 56 is punched, is formed so that on a body 50a of a lateral side may be inserted a pressurized hose 53, into which a connector 53 is inserted in the lateral edge, to be fixed; in case of being combined with another side of body 50b, protrusion plate 57 is made to be placed on the lower part of an insetting groove 54; in a lateral side of a protrusion plate 57, extended partition 58 is formed and in another lateral face, a partition 58 with which a space 57a is made, is formed so that another side edge of a pressurized hose 53 may be inserted, so a pressurized hose 53, which is wound externally on a side of a pressurized roller 52, is exposed toward outside.

13. The liquid medicine-prescribing apparatus for a blood vessel injection according to claim 10, wherein, in order to fix a motor M, gear C, D, and E, which go in gear with a motor axis B by fixing a motor M with a screw 200 through a screw hole which is formed on outer circumference of a hole 62 to be exposed by insertion of a motor axis B, are made to be rotated in exact speed; in the back direction of a housing, after blocking it with a fixed plate 63 and front direction with a cover 68,
a power connection node H for driving a motor with an opening 69, which is open laterally, is designed to be exposed.

14. The liquid medicine-prescribing apparatus for a blood vessel injection according to claim 14, wherein a driving axis 65 of a driving gear E is made a lateral face in driving axis 65 to be cut, forms a cut face 65b, and is inserted to go in gear with a cut face 55a formed

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on an axis groove 55 of a moving roller 51, so a driving roller 51, which is rotated simultaneously with a driving axis 65, is made to prevent a slim phenomenon(that is, a phenomenon running idle due to sliding) from taking place; also, in case that a driving axis 65 is combined with a driving gear E, at time of rotation, since driving axis 65 is rotated with a driving gear E simultaneously, in order to prevent a slim phenomenon form taking place, by forming a screw protrusion 65a, which has a concave-convex shape on the part which is inserted into a driving gear E, a screw protrusion 65a is combined with a driving gear E while it is being input under pressure.

15. The liquid medicine-prescribing apparatus for a blood vessel injection according to claim 10, wherein a pressurized hose 53, which is wound on a pressurized roller 52 which is inserted with a pin G in order to make a moving roller 51 be rotated, is combined for a connector 53a, 53b to be exposed

by connectors 53a and 53b being formed in both a lateral edge of pressurized hose 53, at state that it is stuck to pressurized roller 52 so that it may hang on an inserting groove 54 of a driving part 50 and a pressurized hose 53, which is wound, at the state that it is stick to the pressurized roller 52, is pressurized by a curved protrusion 42 of a starting part 40.

16. The liquid medicine-prescribing apparatus for a blood vessel injection according to claim 12, wherein with a moving roller 51 being placed between protrusion bands 59, 59a, a curved protrusion 42 of a starting part

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40 pressurizes only a pressurized hose 53 which is wound on a pressurized roller 52 of a moving roller 51.

17. The liquid medicine-prescribing apparatus for a blood vessel injection according to claim 12, wherein a protrusion band 59a of a lateral body 50a forms a jaw 59b and has a hole; a moving roller 51 is protected, with other side of a body 50b being blocked; a jaw of a fixed plate 51b goes in gear to be combined with each other on a jaw 59b, which is formed on a protrusion band 59b of a side body 50a; and in case of two bodies 50a, 50b is combined with a screw, a moving roller 51 is made no to be removed between protrusion band 59, 59a,

18.The liquid medicine-prescribing apparatus for a blood vessel injection according to claim 12, wherein, in a method how pressurized roller 52 is combined with by a pin G, a fixed plate 51a, in order to prevent a pin G from removed a fixed plate 51b, on which a protrusion axis 51a is formed, is combined with a cover plate 51c, a concave groove 51d is formed toward inside of a cover plate 51c and a fixed plate 51b, and a pin G is inserted into a concave groove 51d between a cover plate 51c and a fixed plate 51b, and then a pressurized roller 52 is inserted into a pin G.

19. The liquid medicine-prescribing apparatus for a blood vessel injection according to claim 12, wherein, in methods how a cover plate 51c is combined with a protrusion axis 51a of a fixed plate 51b, there are a method by pressure and a method by blending, mounting and adhesion, and, at center of a protrusion axis 51a, an

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axis groove 55, on which a cut face 55a is formed, is formed.

20. The liquid medicine-prescribing apparatus according to claim 12, wherein an incising groove 50c is formed on top of a body 50a of a side and is combined to be fixed by being inserted into an inserting protrusion 60a of a running part 60.

21. The liquid medicine-prescribing control circuit, wherein, with a central processing unit having a reference value according to each step, divided are a normal conversion switch NOR SW for normal operation, a switch INJ SW by which a personal conversion switch PCA MODE SW determines prescribing amount by changed value according to each step, a switch TM SW which determines prescribing time; and connection is provided through an AND gate; a safety node LOCK SW for prohibiting a personal conversion switch from being operated is connected into an input edge; a detector, with which state of a battery can be detected at any time, is connected into a control part and, in case that a detected signal value is different from a set value which is already fixed, a motor control M/C, which control a motor operated simultaneously by a battery power and a buzzer which outputs buzzer sound in order to inform outside of state, is connected with a battery.

22. The liquid medicine-prescribing system comprising;

a step which halts all operation, in case that, in order to make a motor to be rotated by operation of a

normal conversion switch and a personal conversion switch, a new input state waits and a battery is not enough to meet reference value by determining whether a battery capacity is proper or not,

a step which determines whether a personal conversion switch, with which a patient can add to prescribing amount of liquid medicine additionally when capacity of it is proper, had already been operated(that is, a step which determines whether it is PCA mode)

a step which makes additional operation to be possible at the state that PCA mode is already input in case that it is not required to clear it, and which determines whether existing input PCA mode should be cleared in case that it is set in PCA mode,

a step which has PCA mode, which is input already, cleared in case that it is required to clear,

a step which is immediately in normal operation if a safety pin has been removed by confirming whether a safety pin was removed(or not), that is to say, by confirming whether a safety switch is OFF (or not) in order for a patient to make it impossible to increase liquid medicine at his discretion in case that PCA mode has been cleared,

a step which provides normal operation according to a reference value, in case that a reference value for normal operation has not been changed after determining whether it is changed or not, by determining whether PCA switch starts working newly when a safety pin has not been removed when PCA switch did not work, that is to

say, when a personal conversion switch and a time switch did not provide increase of capacity and time simultaneously or turned OFF,

a step which works normally by a changed reference value by a normal conversion switch in case that a normal conversion switch is changed by a reference value, and

a step which works in additional operation as well as normal operation under PCA mode, if an additional operation is performed by a changed value immediately after PCA mode value is input according to a changed value, in case that PCA switch has turned ON, that is to say, in case that a personal conversion switch, a switch which determines prescribing amount and a switch which determines prescribing time has increased together.

23. The liquid medicine-prescribing system according to claim 23, comprising

a step, in which if a normal conversion switch is controlled for normal operation, a motor M is operated normally and counts normal operation time by a reference value and determines whether value is " 0 " and if value became zero, operation of a motor M halts, and

a step, in which if value is not zero, a motor is operated up until value becomes zero; such a motor which halts after it worked well determines whether 30 seconds are passed after first rotation (or not) and, if not passed, confirms whether a normal conversion switch is changed (or not) once more and, if changed, immediately a motor is rotated at changed state,

wherein if time is passed, immediate repetition operation is performed.

24.The liquid medicine-prescribing system comprising,

a step in which operation is possible only when both changed value of prescribing amount and changed value of prescribing intervals which are divided into nine steps respectively for free operation are input simultaneously,

a step in which PCA mode is operated immediately in case of a halt state by deciding whether a motor, which is under rotation, is halted at waiting state and waiting operation is done for a short time in PCA mode in case of rotation at step which determines whether a motor for normal operation is under rotation before operation of PCA mode if input is performed simultaneously,

a step in which operation of a motor by PCA mode is halted in case that result value of deduction which deducts time value by prescribing amount becomes zero, when operation starts, and;

a step which is normally operated immediately after PCA mode is canceled in case value which comes from deduction changed value of prescribing interval time if halted