A SURVEY ON ELECTRONIC VALVE WITH QUANTITATIVE CONTROL AND TO AVOID REVERSE FLOW OF BLOOD

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Abstract: Automated glucose flow control and monitoring system is about monitoring the flow of glucose automatically. Whenever if patients got too much tiredness that time nurse will put the glucose for the recovery of patients. While putting the glucose bottle she only has to control the flow of glucose amount. If the glucose bottle got empty means nurse should be there to replace or remove the bottle. But this won't happen every time. Incase nurse is not there that time patients body blood will into the bottle in reverse direction.

Index Terms – **Arm controller, Wi-Fi module, Load cell, Temperature sensor**

I. INTRODUCTION

In order to achieve the function of the quantitative control in a variety of flow systems, a new type of electronic valve with quantitative control is designed. The valve collects flow pulse signal from the impeller Hall flow sensor. Micro controller chip is used to calculate the flow value and cumulate the total value. It`s also used to control relay in order to real-time control solenoid valve. Electronic valves have been widely used in production and daily life. Now electronic valves are moving towards four directions of streamlining, intelligent, generalization and customization. Except for switch function of basic solenoid valve, dedicated solenoid valves also have some kind of special function or apply to some special occasions, such as gas solenoid valves, steam solenoid valves, oil solenoid valves, refrigeration solenoid valves, high temperature solenoid valves and explosion-proof solenoid valves and so on.

In this project by interfacing a load sensor to the ARM micro controller, this load sensor will sense the weight of the chemicals and displayed it on the LCD display. In the next stage we are giving a flow input in ml/sec, in one second a particular quantity of chemical should go to the outlet this will be controlled by a solenoid valve.

II. LITERATURE SURVEY

Electro-hydraulic proportional control system is an interface linking electronic system and engineering. power system. The electronic-hydraulic converter often consists of a proportional valve and its controller. Proportional valve has been widely used in electromechanical integration systems, in which the performance of its controller plays a very important role. At present, proportional valve controller is commonly designed by separated components and operational amplifiers, which make it has complicated circuit, simple function and poor flexibility. In addition, it is more fatal that this circuit has not any interface to be led to any computer control system or network control system, so that this controller is not able to meet the new needs of modern industrial control [1].

In the medical field and in biotechnology, a new type of micro pump that can supply micro liquid flow has urgently been demanded and by developing a novel type of micro pump that has the characteristics of flexibility, driven by a low voltage, good response and safety in body. This micro pump consists of two one-way valves, a pump chamber made of elastic tube, and a casing. The overall size of this micro pump prototype is 18mm in diameter and 54mm in length. Characteristic of the micro pump is measured. The experimental results indicate that the micro pump has the satisfactory responses, and the proposed micro pump is able to make a micro flow and is suitable for the use in medical applications and in biotechnology[2].

Valveless micro pumps are extensively used in micro fluidic systems, including health care monitoring and diagnostic devices, computer devices, and so on, as it forms the critical component in the micro system for precise and controlled fluid handling. The design and development of a novel, significantly low cost, planar micro pump with piezoelectric polymer composite, consisting of lead zirconate titanate and polyvinylidene fluoride, for actuation. The novelty lies in the synthesis and use of the piezoelectric polymer composite as the actuating mechanism and the diffuser/nozzle design around the line of appreciable stall to achieve maximum flow rate for the given boundary conditions. The parametric stud on the micro pump geometry, including, chamber depth and diameter as well as diffuser/nozzle was carried out by using numerical simulations in

COMSOL multi physics, to analyze the fluid flow rate. The response of piezoelectric polymer to the applied sinusoidal voltage causes flow rectification in the micro pump. An aspect ratio (diffuser length/diffuser width) of 15 produces maximum fluid flow rate. The designed micro pump can achieve maximum fluid flow rate at low applied voltage and frequency of operation [3].

The liquid dosing system has been studied widely as it had been used in many technical and medical applications. And in recent years, the miniaturization of the liquid dosing system as well as the accuracy of liquid transfer has gradually become a hot research field. Benefiting from the feedback of sensor information, the system can self-adjust the driving voltage of the PZT(Piezoelectric Transducer) pump to precisely dispensing desired liquid volume. First, the structure and principle of the PZT pump will be introduced briefly. Secondly, the MEMS(Micro-electromechanical Transducer) flow sensor is presented. Finally, the fuzzy PID (Proportional-Integral-Differential) closed-loop control strategy is proposed to calculate and adjust the driving voltage in real-time. Finally, experiment results show that the drug delivery system could precisely delivery drug volume with error smaller than 0.01μL when desired volume is 100μL [4].

One of the applications for such a pump is in the area of micro fluidic cooling systems in electronic equipment. Currently, there is an increasing reliance of electronic equipment, especially in modern military systems. Electronic equipment relies on the flow and control of electrical current to perform a &verse variety of functions. Whenever electrical current flows through electronic components parts such as microprocessors and integrated circuits, heat is generated in that element. As the heat builds up, the temperature of the component starts to rise, unless the heat can find a flow path that carries it away from the component. Furthermore, electronic components and electronic systems are rapidly shrinking in size while their complexity and capability continue to grow at a very fast rate. This is especially true for military electronic systems as space is always considered a premium in fighter aircraft, tanks and other military vehicles. In addition, the power has been increasing while the volume of the device has been decreasing. This has produced a dramatic increase in the power density. Resulting in rapidly rising temperatures and the number of failures [5].

Micro pump is one of the essential devices for fluid/drug transport used in biomedical applications. Micro pump gives the actuation methods to transport the exacting quantity of drugs, blood, fluids, etc throughout the micro fluidic system. Piezoelectric and electromagnetic micro pumps have been developed by various researchers for micro fluidic applications. Piezoelectric micro pump shows quick reaction time and high actuation but with high working voltage. Piezoelectric micro pumps are very functional for micro fluidic applications. The structure of piezopump based on piezo material coating that is dropped on a film. The induced voltage causes a definite measure of deformation that acts as a pushing plate. This pushing plate drives out the fluid from the pump chamber [6].

In the fields of Biomedical Engineering, a new type of micro pump that can supply micro liquid flow continuously has urgently been demanded. Some researchers have proposed several kinds of micro pump, but the types of their output are mostly pulsatile. These types of output mode make some difficulties in flow rate measuring and controlling. Therefore, to develop a novel type of pulseless output micro pump that has the characteristics of flexibility, low driving voltage, good response and safety in body. The new structure and motion mechanism of the micro pump, which is driven by magnet solenoid actuator. The possibility of the micro pump is also discussed. Experiments are conducted to verify the effectiveness of the pump [7].

Presents the design of nozzle/diffuser and the use of piezoelectric effect for the actuation of diaphragm of valve-less micro pump which has application in medical field for drug delivery. A three dimensional FE(Eigen Frequency) model of nozzle/diffuser and actuator is used for numerical simulation. Fluid flow analysis of nozzle/diffuser is performed to calculate their efficiency and frequency. The simulation is performed for variable converging and diverging angle by varying their length and width to calculate steady flow rate. Analysis of actuator unit is also carried out by using the COMSOL multi-physic software. The simulation of actuator unit depends on mechanical properties of material such as Young's modulus, Poisson's ratio. The numerical result used to predict the actual behavior of actuator unit for higher frequency range which helps in proper selection of material. The comparison between analytical and numerical results is done which helps in predicting the flow rate and actual working of micro pump [8].

III. GAP ANALYSIS

In paper [1] electro-hydraulic proportional control system valve controller is commonly designed by separated components and operational amplifiers, which make it has complicated circuit, simple function and poor flexibility. In addition, it is more fatal that this circuit has not any interface to be led to any computer control system or network control system, so that this controller is not able to meet the new needs of modern industrial control.

In paper [2] the overall size of this micro pump prototype is 18mm in diameter and 54mm in length. Characteristic of the micro pump is measured. The experimental results indicate that the micro pump has the satisfactory responses.

In paper [3] the proposed system in which the results show that the performance of micro pump exhibits maximum flow rate of 11.34μL/min at zero backpressure and maximum backpressure of 350 Pa at zero flow rate.

In paper [4] the pump dosing system, an integrated MEMS flow sensor based on the measurement of pressure difference across a flow channel is presented. Finally, dispensing experiment was carried out to show that the drug dosing system could precisely delivery volume with error smaller than 0.01µL when desired volume is 100µL.

In paper [5] at the present moment, a pump measures a pump head of 105 millimeter of water has been achieved and design efforts are now focused on increasing the pressure head.

In paper [6] a numerical technique has been adopted for design optimization of piezoelectric valveless blood micro pump before fabrication because of complexities linked with modeling of micro pump. The maximum deflection of 6.808µL has been observed at applied voltage of 105V.Maximum flow rate of 501µL/min has been obtained at 200Hz with applied 105V by keeping constant membrane thickness of 0.2mm.

In paper [7] a new prototype model of a micro pump using SMS (Shape Memory Alloy) springs actuator as the servo actuator. In order to realize a kind of peristaltic motion, the flow characteristic of the micro pump is measured. The experimental results indicate that the micro pump has the satisfactory responses.

In paper [8] a micro pump delivers fluid as per the requirement in field of medical by using nozzle, diffuser, and actuator unit. The conventional methods which are used for drug delivery are not that effective foe the supply of medicine.

IV. CONCLUSION

In existing system monitoring of patient is done by manual process which might results in reverse flow of blood during drips process. When bottle get empty and the faculty are not aware of it, it might end up with reverse flow of blood. Manual process cannot achieve accuracy. To avoid these problem the proposed Electronic valve system has been implemented.

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