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Department of ECE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India

A Low-cost Smart AMBU Bag Compressing Ventilator based on Crank Shaft Mechanism using Android Application

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ABSTRACT: Recently, after the global spread of the new corona virus (known as COVID-19), the demand for large numbers of ventilators has increased in hospitals and health centers. In fact, providing a large number of these devices is difficult, in addition to their high cost and providing a suitable place for them. We propose the design of a ventilator which can be easily manufactured and integrated into the hospital environment to support COVID-19 patients. This device can be used in ambulances, health centers or hard to reach remote places. The device is considered as a wireless device that can be accessed by a specialist to update the parameters according the patient's health condition.

KEYWORDS: Motor driver, LCD display, Sensors, Ventilator

I. INTRODUCTION

The most pressing shortages facing hospitals during the Covid-19 emergency is the lack of ventilators. A ventilator is generally needed when a person can no longer naturally breathe on his/her own. In the last two years the need of the ventilator is increased due to the pandemic situation prevailing across the globe. The ventilator can also quite a lot and also will require a lot of space. a person or a respiratory therapist may be needed to operate a ventilator and monitor continuously. The main objective of this project is to use it in emergency situations and for people with respiratory problems. This ventilator will be portable and also cost effective. It has compressible self-refilling ventilation bag for non-rebreathing person valve with pressure limitation valve to minimise the risk of over inflation. This ventilator can be life saving for people with severe respiratory symptoms.

II. RELATED WORK

[1] L. Brochard, A. Slutsky, and A. Pesenti "Mechanical Ventilation to Minimize Progression of Lung Injury in Acute Respiratory Failure," 2017. The manual resuscitator is an artificial breathing unit that delivers air to the patient having lung-related problems. Mechanical ventilation is generally considered to be a supportive therapy and is often a life-saving technique.

[2] M. R. Islam, M. Ahmad, M. S. Hossain, M. M. Islam, and S. F. Uddin Ahmed Designing an Electro-

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Mechanical Ventilator Based on Double CAM Integration Mechanism," 2019. The circuit diagram consists of resistors, microcontroller, servo motors, switches, LCD, barometric pressure sensor, LED, buzzer, Bluetooth module, connecting wires, and power supplies. The input pins and output pins are set to the digital pin of the microcontroller.

[3] S. P. Lalwani, M. K. Khurana, S. J. Khandare, O. U. R. Ansari, D. S "IoT Based Industrial Parameters Monitoring and Alarming System using Arduino - A Novel Approach," 2018. The hospital ambulance integrates with a normal transport portable ventilator where O₂ is the only source of a ventilation system. It is an emergency ventilator where 100% of O₂ is supplied. In many cases patient not need such saturated O₂ instead of environmental N₂ and other gas mixture. The main challenge of this research is to overcome this problem efficiently. Another challenging task is to identify the leakage of the bain circuit used in anesthesia. The proposed research will overcome this problem too using the principle of ideal gas law with simple and significant technology. A digital sensor that provides air parameters like pressure and temperature in real-time and makes the output with a microcontroller unit. The LCD shows the real-time output value.

III. METHODOLOGY

The circuit diagram consists of the core components they are 12V Power supply, AC/DC Bridge Rectifier, DC voltage maintainer, controlling board pro mini, HC-05 device, Temperature sensor, L293-H bridge driver, 50RPM gear motor, AMBU bag and LCD display. 12v Power Supply is given to voltage maintainer for voltage regulating 12v to 5v then 5v supply is given to microcontroller(pro-mini). It is connected to the Bridge driver and Bluetooth module. Temperature Sensor(LM35 IC) and Heart Beat Sensor are connected to pro-mini microcontroller. The L293 and RPM gear motor are connected and produce tidal with the help of Crank-shaft Mechanism. LCD displays the value of Temperature and HeartRate of the patient which is measured.

IV. EXPERIMENTAL RESULTS

This project will be used to measure the Temperature and Heart rate of the patient and also will supply required amount of oxygen to the patient with the help of the self-refilling AMBU bag and the data can be successfully implemented and will be displayed in LCD.

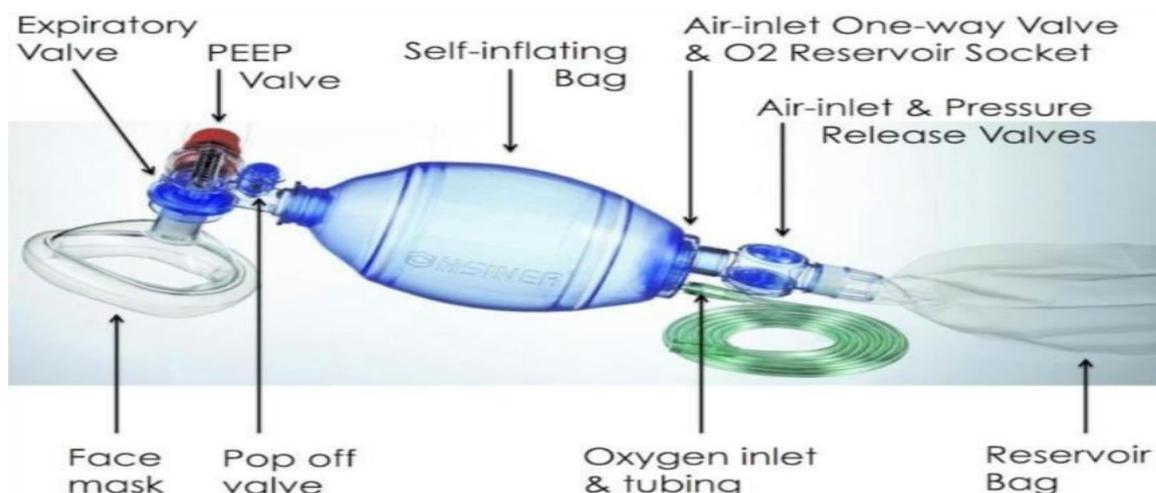


FIGURE : Ventilator with self-refilling AMBU Bag

VI. CONCLUSION

In this project, a portable ventilator has been successfully developed and implemented. The device uses the microcontroller pro-mini and two sensors which are LM35 IC sensor and HeartBeat sensor. This system is cost efficient and portable compared to the existing ventilators which are stationary and costly. It is convenient to be used by people and also can be used anytime and anywhere in emergency situations.

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