A ventilator with a blood oxygen sensor circuit controlled by an Arduino

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A device or system that assists you in breathing when you are unable to do so on your own is known as a lifesaving ventilator. Your physician may refer to this as a "Mechanical Ventilator" at times. In this paper, a cheap ventilator is produced. Here, we cut the cost of the machining materials. Cutting sheets for acrylic panels have been utilised in place of creating the body. We employ a self-recursive Silicon Ambu bag to lower power consumption. In this pandemic scenario, the lack of a ventilator has resulted in deaths outside of hospitals. For a patient with respiratory difficulties to survive, a ventilator is essential. This has also been referred to as a "respirator" or "breathing machine" by some. When caring for someone with a serious or contagious illness, hospitals and medical staff wear respirators, which are masks. A ventilator sits beside the machine and is connected to your airways via a tube via your nose. When your lungs take oxygen (breathe out), they also exhale carbon dioxide. The body has the power to generate the opposite pressure, which is inhaled and expelled. The air flows down our windpipe and via the pipes in our lips. Depending on the situation or illness, we can utilise an automated ventilator or do it manually.

I. INTRODUCTION

The ventilator can use the emergency tin if a patient is unable to take in air on his own. In a worldwide epidemic, the novel coronavirus causes respiratory infections, pneumonia, lung infections, and drug overdoses. The tidal volume refers to the amount of air that does not move in and out during normal breathing when a patient requires an automatic ventilation. As a result, many people perished around the world owing to a lack of ventilators. This virus enters your airways and causes an infection in the pulmonary system, making it difficult to breathe at times when ventilation is needed. We are creating a low-cost ventilator that is appropriate for everyday folks. Our goal is to save countless lives during subsequent outbreaks.

The illness is still spreading over the world. In this situation, one out of every five people required a ventilator for respiration. If you are unwell or wounded and are sitting for a functioning, you are going to have high oxygen air pumped in the lungs. It may additionally assist you expel carbon dioxide from your system as well. You might require a breathing machine for a number of days, weeks, or months.

If you suffer from a sickness or injury that makes breathing difficult, you cannot breathe on your own. A ventilator that is mechanical may additionally assist you breath during a surgery or if you are seriously ill. Ventilation systems serve as breathing machines which assist with your lungs function. It can't fix or cure health problems, but it can help you breathe while you recuperate from a sickness or ailment.
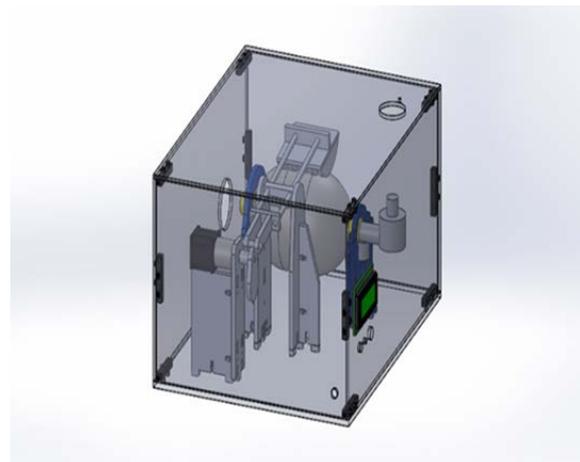

Fig. 1. Proposed Diagram Ventilator

It has the potential to save lives and is an essential component of treatment for people of any age, including kids, adults, and adolescents. The length of your stay on the ventilator is determined by the length of time you require assistance breathing and the underlying disease that must be treated. Depending on the situation, some people may only require a ventilator for a few hours or less. You and your family's physician can decide whether using a breathing machine in the outdoors is best for you and your health.

II. . METHODOLOGY

The voltage of the power supply for the ventilator that works is 12 to 32 volts. A rectifier maintains a constant flow of electricity in just one channel. The regulator is what manages the flow of air. within the schematic of the procedure's flow. The microcontroller manages the programmed devices and establishes memory needs. Three categories of modality of choice are used in the second step: babies, adults, and

children. An electrical signal is produced from a mechanical signal by a transducer, such as a pressure sensor.

The lungs receive air from a machine that circulates via the air, which can lead them to breathe on themselves as well. The control panel on the screen or a display board can be utilised for controlling the oxygen flow. The cam operation of the ventilation structure, which uses a pressure-volume-proportional system, lessens noise. The Arduino board, knobs, and servo motor can all be used to help with the controls. The plunger's arm is pressed by the revolving camshaft and the Ambu sack.
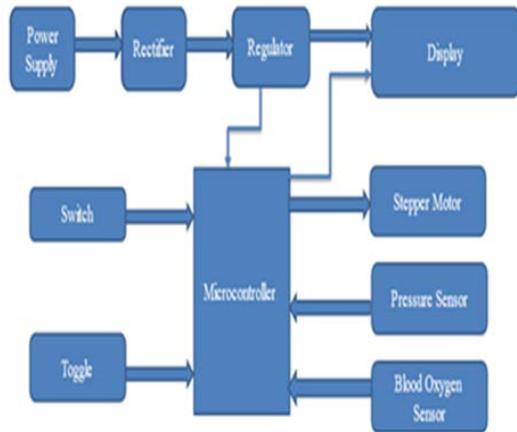

Fig. 2 Block Diagram Ventilator

The engine is joined. In particular, the arm is an upward and down movement converter from rotational to linear movement. As a result, air is released in the airways and the Ambu bag contracts.

III.   ARDUINO

The boards made by Arduino provide an environment for both software and hardware experimentation that is simple to use and Programme.
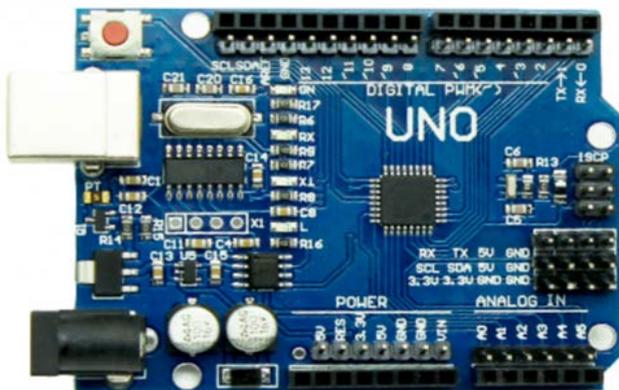

Fig. 3 Arduino Board

The Arduino Boars board is a multifunctional device that gathers data from sensors—such as light—and buttons—by pressing the tips of fingers, then transfers the information to an outlet. Both turning on the motor and turning on the light

bulbs are the functions. With the use of an a microcontroller every input are routed via several sets of commands. The Arduino IDE (Integrated Development Environment) and the board's cabling are the foundations upon which Arduino is built. Throughout decades, Arduino has chosen to focus primarily on free software, making its contributions easier to find to consumers worldwide.

Its IDE software is incredibly user-friendly for novices or experts. When coding in C++, they can be utilised with the well-known Arduino chip.

IV.   ATMEGA MICROCONTROLLER

This ventilator with motor makes use of the ATmega 328 microcontroller. this 32k, 8-bit a microcontroller that is built on the AVR platform. With its 28 pins, the microcontroller can be used with a 28 pin AVR developer boards. It is a controlled microcontroller with a processor and configurable storage. The majority of microcontrollers utilised on boards such as Arduino are programmed using a computing device.
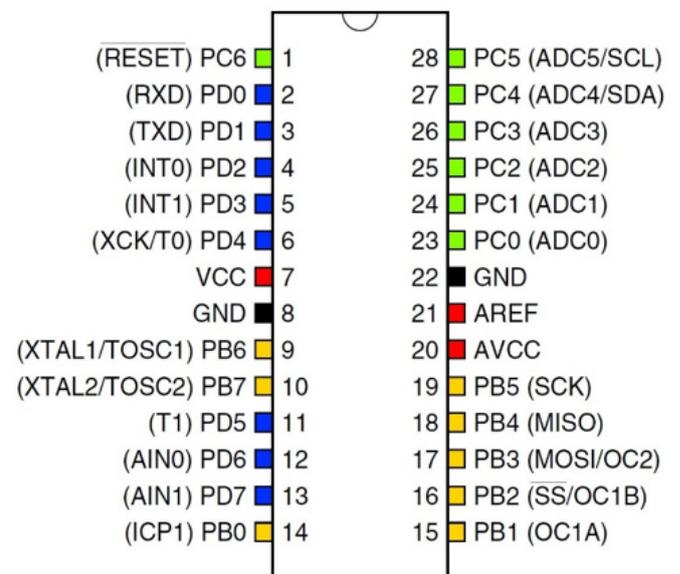
Because of its minimal consumption of electricity, we utilise the ATmea 328p microcontroller in this situation. We may conserve energy as a result, which will also result in more ventilator runs. 8-bit and 16-bit processors are easy to utilise. It's prepared to function as a ventilator.

V.   PULSE OIXYMETER HEART RATE SENSOR

One common sensor in the COVID-19 pandemic is the oximeter. It gauges the body's saturation in oxygen level. It is cheap, highly dependable, and simple to use. A pulse oximeter is additionally useful to assess your heart rate and, in certain cases, fitness-related alerts when working out. The pulse oximeter's rhythm sensor is depicted in Fig. 3. It has an optical sensor installed in it. Once the fingertip is touched to the oximeter, the photodetector detects the ultraviolet (UV) wavelength that are entering the circulatory system and the mix of colours provides the results

Fig. 3. Pulse Oximeter Heart Rate Sensor

. VI. LIQUID CRYSTAL DISPLAY

Here, we're employing an LCD to show the ventilator's alert function. A display made of liquid crystals is an LCD screen or flat surface that runs on liquid particles. It is cheap, lightweight, easily accessible on the marketplace, and uses less electricity. There are three lines in Fig. 4: RW, EN, and RS. Enabled line is what's known as line EN. LCD data that originates from the command line.
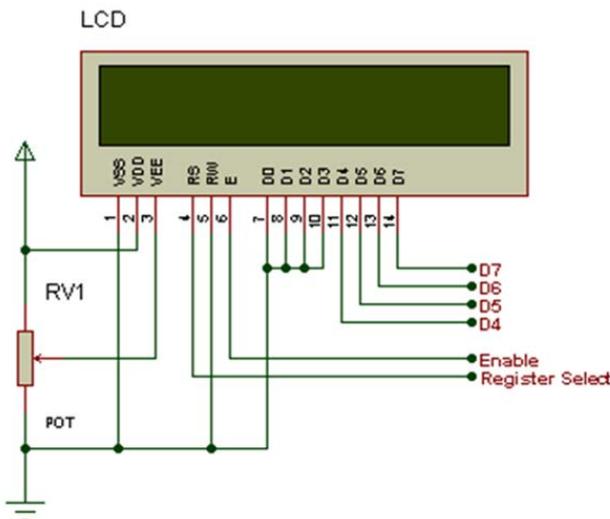

Fig. 4 LCD Background

The Programme makes sure that the other two control lines send data to the bus and that the send to the data LCD line is low to zero. When the other lines are prepared, EN becomes high1, so you must wait for them to change the LCD's data. Additionally, it ends with a low zero across LCD to LCD. Write the query in the information bus between DB0 and DB7, and all other places.

VII. CIRCUIT DIAGRAM

An electrical connecting diagram that may be created and exported to an image format. The positive terminals of the voltage source are the source of these connections, and the circuit is any loop that conducts operations for a circuit made of electronics. a circuit employed primarily for voltage and current regulation. The circuit is finished when the current

goes from the positive terminal to the carrying voltage source before returning back to the negative terminal.

The hardware requirement is as follows:
1) Atmega-Microcontroller
2) Blood Oxygen Sensor
3) PCB boards
4) Presser Sensor
5) Servo Motor
6) Breather Mask
7) Valves & Joints
8) Air Breather Bag
9) Push Rods
10) Connector Rods
11) Gear Mechanism
12) LCD Display
13) Capacitors
14) Diodes
15) Transistor
16) Push Buttons
17) Buzzer

IX. CONCLUSION

A breathing apparatus is made to be user-friendly and straightforward. Our top goal is to save as many lives as possible during pandemics, which is why we developed our device portable, low-cost, more reliable, and power-efficient. We made it simple, free of risk, and all parts are recyclable in order to address the environmental issue.

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