VIVA-TECH IJRI
ANNUAL RESEARCH JOURNAL
VIVA-TECH INTERNATIONAL JOURNAL FOR RESEARCH AND INNOVATION
ANNUAL RESEARCH JOURNAL
ISSN(ONLINE): 2581-7280

Low Cost Ventilator With BGM And Oximeter

Milan Madiya[1], Ashish Bharkhada[2] , Harmish Sejpal[3], Mukesh Mishra[4].
[1](Electrical, Viva Institute of Technology/ Mumbai University, India)
[2](Electrical, Viva Institute of Technology/ Mumbai University, India)
[3](Electrical, Viva Institute of Technology/ Mumbai University, India)
[4](Electrical, Viva Institute of Technology/ Mumbai University, India)

Abstract : *As we all know that shaping the robustness and functionalities of ventilator that isn't solely simply transferable still because it is extremely low value and social science friendly. it's designed beneath the essential plan of being incorporated in large human catastrophes in poorly resources enriched environments . Ventilator beneath the planned style that It functions while not human operator because it delivers breaths through the compression of associate degree orthodox bag-valve mask. It satisfies its energy wants from an electrical motor having battery power of twelve volts DC. totally different functions got to be performed for the aim of ventilation i.e. pressure and needed range of breathes per minute is managed by a simple to use input board comprising of buttons. additionally thereto it conjointly contains associate degree alarm of low battery indication system still as associate degree assist management.*

Keywords **-** *Artificial Respiration, covid-19 Pandemic, Low cost portable ventilator, Mechanical Ventilator, Mechanical Hardware, etc.*

I. INTRODUCTION

The imitation of smoke, usage of dangerous gases on large level and serial use of natural resources for the sake of mending energy wants. The sickness mentioned on top of & more sickness needs mechanical ventilation just in case of failure of lungs. This epitome can facilitate a patient to inhale and exhale therefore the exchange of dioxide and atomic number 8 can be doable and also the patient have the bogus respiration to survive. Ventilators those square measure already in use in most of privileged hospitals square measure high in value. Poor countries square measure appear unable to render such services and reason is extremely abundant clear; the high prices of effort and utilizing them. primarily based upon these circumstances it's empirical to own such a low value and economical ventilators. In Bharat once Gregorian calendar month 2020 the requirement for ventilators accumulated for the treatment of covid-19 patients. within the scenario like COVID-19 not solely Bharat however the total world is facing the shortage of ventilators. Bharat have or so nineteen large integer hospitals, ninety – 5 thousand intensive care unit beds, and forty- eight thousand ventilators solely however the population of Bharat is or so a hundred thirty five.26 crores that indicates that there's an enormous shortage of ventilators. thus we tend to set to form a conveyable ventilator of less value.

I. OBJECTIVE AND CONSTRUCTION

I.1 Objective

Human lungs use the reverse pressure generated by contraction motion of the diaphragm to suck in air for respiratory. A contradictory motion is employed by a ventilator to inflate the lungs by pumping sort motion. A ventilator mechanism should be able to deliver within the vary of ten – thirty breaths per minute, with the power to regulate rising increments in sets of two. alongside this the ventilator should have the power to regulate the air volume pushed into lungs in every breath. The last however currently the smallest amount is that the setting to regulate the time length for inhalation to exhalation magnitude relation. a section from this the ventilator should be able to monitor the patients' blood atomic number 8 level and exhaled respiratory organ pressure to avoid over/under atmospheric pressure at the same time. The ventilator we tend to here style and

develop exploitation Arduino encompasses of these necessities to develop a reliable nevertheless reasonable DIY ventilator to assist in times of pandemic. we tend to here use a Si ventilator bag coupled driven by DC motors with two aspect push mechanism to push the ventilator bag. we tend to use electric switch for switch and a variable pot to regulate the breath length and also the M.M. price for the patient. Our system makes use of blood atomic number 8 sensing element alongside sensitive pressure sensing element to watch the mandatory organ of the patient and show on a mini screen. conjointly associate degree emergency buzzer alert is fitted within the system to sound associate degree alert as presently as any anomaly is detected. the whole system is driven by Arduino controller to realize desired results and to help patients in COVID pandemic and different emergency things.

Aim of Project.

The Basic aim of the project is to supply needed quantity of atomic number 8 to the patients World Health Organization cannot afford a high value ventilator treatment privately or Government Hospitals. The model being moveable it will travel from one commit to different with none issue due being light-weight weight and fewer value the poor individuals also can afford this service which is able to facilitate in saving lifetime of poor individuals.

I.2 Operating Principle.

Patient management throughout COVID-19 faces serious problems with respiratory organ injury, and therefore the ventilators should be ready to handle things of apace dynamical respiratory organ compliance, and potential collapse and consolidation. therefore as a general concern for any ventilator style the driving pressure of the ventilator is a crucial issue for patient comforts. In explicit, once a low periodic event volume is used, the driving pressure is a vital variable to be monitored to assess the chance of loss of the patient breaths. In lightweight of the extreme importance of the pressure watching, the ventilator can target pressure-controlled. this can include: PRVC (Pressure Regulated Volume Control) mode, SIMV-PC (Synchronized Intermittent obligatory Ventilation); and in addition, a basic mode of operation: CPAP (Continuous Positive Airway Pressure). synchronic intermittent obligatory ventilation (SIMV) could be a kind of volume management mode of ventilation. With this mode, the ventilator can deliver a obligatory (set) range of breaths with a group volume whereas at a similar time permitting spontaneous breaths. Spontaneous breaths are delivered once the airway pressure drops below the end-expiratory pressure (trigger). The ventilator tries to synchronize the delivery of obligatory breaths with the spontaneous efforts of the patient. In distinction, to help management ventilation (ACV), SIMV can deliver spontaneous volumes that are 100 percent driven by patient effort. Pressure support (PS) could also be additional to boost the volumes of spontaneous breaths. SIMV was at the start developed within the Nineteen Seventies as a technique to wean patients UN agency are captivated with mechanical ventilation. SIMV gained quality and was the foremost wide used improvement mode for substitution, with 90.2% of hospitals preferring SIMV during a survey conducted within the Nineteen Eighties.

Our projected ventilator is additionally capable of Advanced synchronic intermittent obligatory ventilation (SIMV) mode and a basic non-invasive operation mode wherever a hard and fast pressure is formed on the market to the patient. Our style conjointly provides PEEP (Positive End-Expiratory Pressure), that is not a improvement mode in itself however is meant to support steady low positive pressure to the lungs.

Although international definitions vary, this corresponds to the CPAP definition from the MHRA documentation. altogether modes of operation, PEEP are on the market, that is very important for patient management to avoid alveolar collapse. Note that the ventilator style printed here isn't meant to exchange the high-end devices required for the foremost intense section of treatment, however ought to be acceptable and helpful within the hospital setting for milder symptoms or future care and recovery.

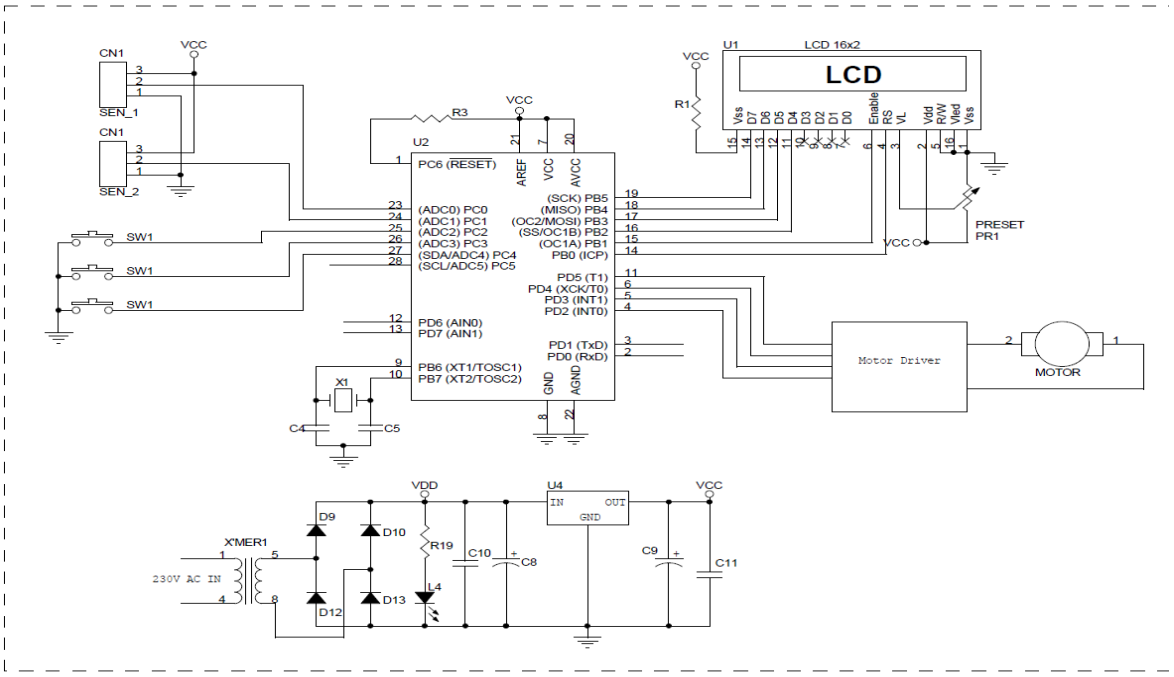

Fig. 1 Circuit Diagram.

I.3 Construction.

We describe here the abstract layout of the system. The targeted modes of operation, as explained higher than, are mainly SIMV and CPAP at the side of PEEP. the planning has the patient safety intrinsic as a priority, in order that all failure modes revert to a scenario that prioritizes patient safety. specially, if the patient stops inhaling pressure support mode, the ventilator shifts mechanically onto obligatory ventilation.

The abstract schematic is shown in figure. The unit takes as input the quality compressed or mixed air offer on the market in hospitals, in such how that one offer can be connected to many units. we have a tendency to expect that usually the pressure equipped are between two and five bar. A button feature is additionally provided for the patient that may facilitate patient to decision the doctor just in case of any discomfort/emergency. The connections conferred by the unit to external input/outputs can follow hospital standards. the availability pressure is reduced by a pressure regulator to some two hundred mbar. The system idea is predicated around a buffer volume (ambulatory bag) of roughly one.6 litres. The filling of this buffer is controlled by the input valve (valve in). By dominant of the gap time, one can do the required target pressure within the buffer when that the valve (valve in) is shut. This buffer filling happens throughout the breath a part of the breath cycle. If the buffer pressure is inside tolerance of the desired pressure, the output valve (valve out) is then opened, initiating the metabolic process cycle. The rate of respiration, breath time (corresponding to the open time of valve out) and pause time are all manageable. If a PEEP pressure is about, then the pressure within the lungs can have the minimum of the PEEP pressure. within the case wherever the periodic event volume isn't achieved at a selected pressure setting, because of changes within the patient's airway resistance this will then be bit by bit adjusted. SIMV mode can enable the patient to require spontaneous breaths, and can assist the respiration once the spontaneous breath is taken. This mode uses an extra detector for the detection of the negative pressure initiated by the patient breath. If the patient rate of respiration doesn't accomplish the target price, extra mechanical ventilation is provided by the unit. throughout the operation all the parameters are measured associate degreed displayed employing a appropriate indicator panel (operator panel) that includes an OLED board. The operator panel besides having necessary on off switches has emergency stop button further, that bring the device into halt state for any procedures to be done by the doctor. within the series configuration of the LC circuit, the inductance (L) and capacitance (C) ar connected asynchronous, as shown here. the full voltage V across the open terminals is solely the total of the voltage across the inductance and therefore the voltage across the capacitance. this I into the positive terminal of the circuit is adequate this through each the capacitance and therefore the inductance.

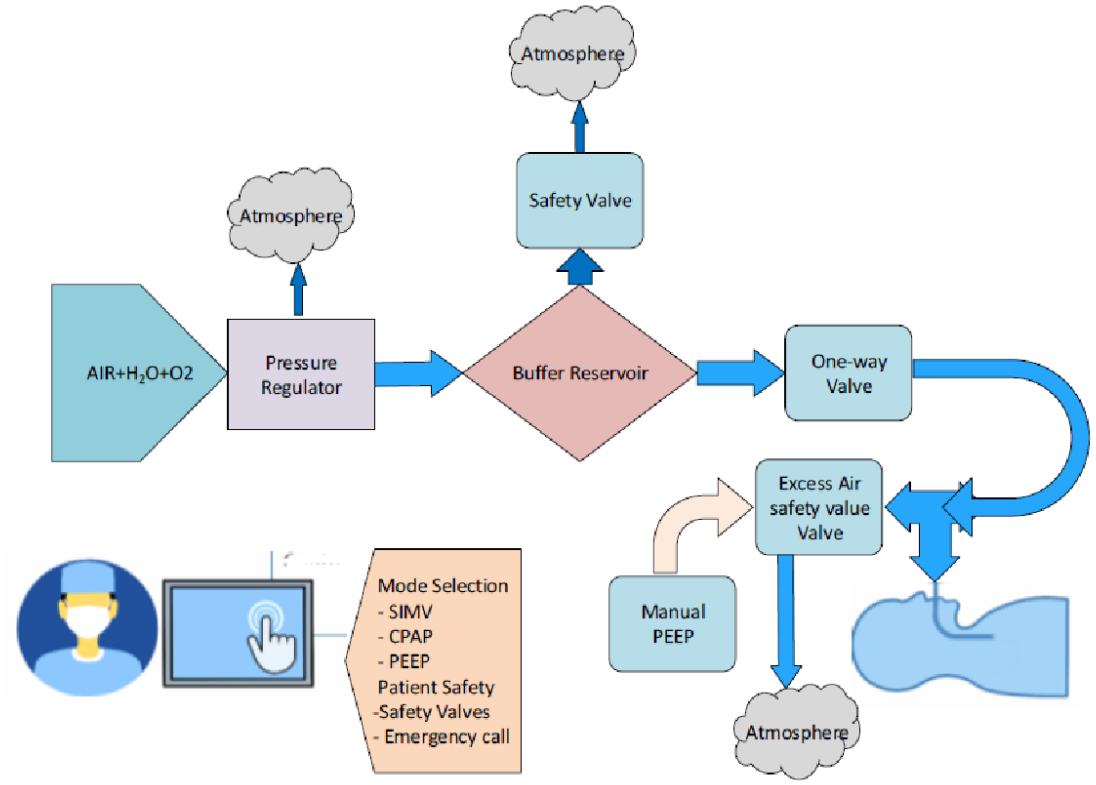

Fig.2 Construction Diagram.

II. METHODOLOGY

A ventilator mechanism should be able to deliver within the vary of ten – thirty breaths per minute, with the flexibility to regulate rising increments in sets of beside this the ventilator should have the flexibility to regulate the air volume pushed into lungs in every breath. The last however currently the smallest amount is that the setting to regulate the time period for inhalation to exhalation magnitude relation. The ventilator should be able to monitor the patients' blood O level and exhaled respiratory organ pressure to avoid over/under gas pressure at the same time. The ventilator we have a tendency to here style and develop victimisation Arduino encompasses of these necessities to develop a reliable nevertheless cheap DIY ventilator to assist in times of pandemic. we have a tendency to here use a semiconductor ventilator bag coupled driven by DC motors with two aspect push mechanism to push the ventilator bag. we have a tendency to use toggle for change and a variable pot to regulate the breath length and therefore to gain worth for the patient. Our system makes use of blood O detector beside sensitive pressure detector to watch the mandatory vital organ of the patient and show on a mini screen. conjointly associate emergency buzzer alert is fitted within the system to sound associate alert as before long as any abnormaly is detected. the complete system is driven by Arduino controller to realize desired results and to help patients in COVID pandemic and alternative emergency things.

Figure No.	Name of Figure.
Fig 1	Circuit Diagram
Fig 2	Construction Diagram

Table. List of Figures.

III. RESULT

We hope that the project explained above serves the cause it has been made for and saves a lot more lives. This project will work as artificial lungs for the people having breathing issues post surgeries or due to any other breathing issue. As the Title of the project suggest the Ventilator is of comparatively low cost and much more efficient for low to medium emergency patients which vacant the higher scaled ventilators for the severe patients.

IV. CONCLUSION

Hence, we have a tendency to square measure about to style and complete this project which might be a saving person in cases of emergency and conjointly it'll very useful just in case of any such pandemics and facilitate to strengthen the health infrastructure. The mere purpose of the project is to assist and contribute our bit to the society and other people all round the world by serving to make a lot of advanced health infrastructure. This project is formed with associate intention to avoid wasting the lives of the poor people that cannot afford high costs of the ventilator charges within the Hospitals.

Acknowledgements

We shall be failing in our duty, if we will not express our sincere gratitude to all those distinguished personalities with the help of whom we have successfully completed our project. My deep gratitude to **Dr. Arun Kumar**, PRINCIPAL, VIVA INSTITUTE OF TECHNOLOGY, who always been playing a great role in all round development of the student. My deep gratitude to **Prof. Bhushan Save**, THE HEAD OF ELECTRICAL DEPARTMENT and also our project guide and our project coordinator **Prof. Mukesh Mishra** for her valuable guidance, advice and constant aspiration to our work, teaching and non-teaching staff for their kind support, help and assistance, which they extended as and when required. Last but not the least we wish to thank my friends for providing technical and moral support . We hope that this project report would meet the high standards of all concerned people and for their continuous co-operation during the whole period of period of project that helped us in enhancement of this project.

REFERENCES

[1] L. Brochard, A. Slutsky, and A. Pesenti, "Mechanical Ventilation to Minimize Progression of Lung Injury in Acute Respiratory Failure," American Journal of Respiratory and Critical Care Medicine, vol. 195, no. 4, pp. 438–442, 2017.

[2] M. A. Hossain, A. K. M. Rahman, M. R. Rahman, M. R. Islam, and M. Ahmad, "Role of clinical engineering to reduce patient's risk factors in life support ventilator," Proc. 2nd International Conference on Electrical Information and Communication Technologies (EICT), 2015.

[3] A. Khoury, S. Hugonnot, J. Cossus, A. De Luca, T. Desmettre, F. S. Sall and G. Capellier, "From Mouth-to-Mouth to Bag-Valve-Mask Ventilation: Evolution and Characteristics of Actual Devices—A Review of the Literature," BioMed Research International, pp. 1-6, 2014.

[4] S.-W. Chiu, J.-H. Wang, K.-H. Chang, T.-H. Chang, C.-M. Wang, C.-L. Chang, … K.-T. Tang, "A Fully Integrated Nose-on-a-Chip for Rapid Diagnosis of Ventilator-Associated Pneumonia," IEEE Transactions on Biomedical Circuits and Systems, vol. 8, no. 6, pp. 765–778, 2014.

[5] A. M. Al Husseini, H. J. Lee, J. Negrete, S. Powelson, A. T. Servi, A. H. Slocum, and J. Saukkonen, Design and Prototyping of a Low-Cost Portable Mechanical Ventilator, Journal of Medical Devices, vol. 4, no. 2, 2010.

[6] S. Mojdeh, A. Sadri, M. Nabi, H. Emadian and M. Rahimi, "Designing the vocal alarm and improving medical ventilator," Iranian Conference of Biomedical Engineering, 2010. Roy G Brower, Micheal A. Matthay , Alan Morris, David Schoenfeld, B Taylor Thompson, Arthur Wheeler, The Acute Respiratory Distress syndrome Network. Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome. N Engl J Med 2000; 342: 1301-1308.

[7] Mushin WW, Rendell-Baker L, Thompson PW, Mapleson (Online) WW. Automatic ventilation of the lungs. Oxford: Blackwell Scientific; 1980.

[8] Baker AB. Artificial respiration, the history of an idea. Med Hist 1971;15: 336–351.

[9] Kacmarek RM. The mechanical ventilator: past, present, and future. Respir Care 2011;56:1170–1180.

[10] Price JL. The evolution of breathing machines. Med Hist 1962; 6:67– 72.

[11] Woollam CH. The development of aparatus for intermittent negative pressure respiration. Anesthesia 1976;31:537–547.

[12] Morch ET. History of mechanical ventilation. In: Kirby RR, Banner MJ, Downs JB, editors. Clinical applications of ventilatory support. New York: Churchill Livingstone; 1990. pp. 1–61.

[13] Sternbach GL, Varon J, Fromm RE, Sicuro M, Baskett PJ. Galen, the origins of artificial ventilation, the arteries and the pulse. Resuscitation 2001;49:119–122.