

NYAHENDE PORTABLE VENTILATOR



INTRODUCTION

Mechanical ventilators are machines that act as blowers to move air in and out of human lungs, a respiratory therapist, doctor or nurse sets the ventilator to control how often it pushes air into the lungs and how much air you get. A patient may be put on a mechanical ventilator if a condition makes it very difficult for him/her to breathe or get enough oxygen into his/her blood. This condition is called respiratory failure. A respiratory failure can be caused by a disease or injury that affects your breathing such as pneumonia, opioid overdose, stroke, or a lung or spinal cord injury and Covid19. The need of mechanical ventilators has increased rapidly since the Covid19 outbreak whereby the demand has surpassed the supply world widely. African countries specifically Tanzania has highly been affected as the ventilators from the outsiders are very costly and they need experts to use them. Having that in mind, we have been working on our project focusing on making a portable ventilator that can easily be carried, doesn't need complex configurations, doesn't take so much space and doesn't need trained experts to operate it and it can be set to use either analog or digital operation. It can also use any power source such as the normal electricity or a car battery. Below are some of our objectives.

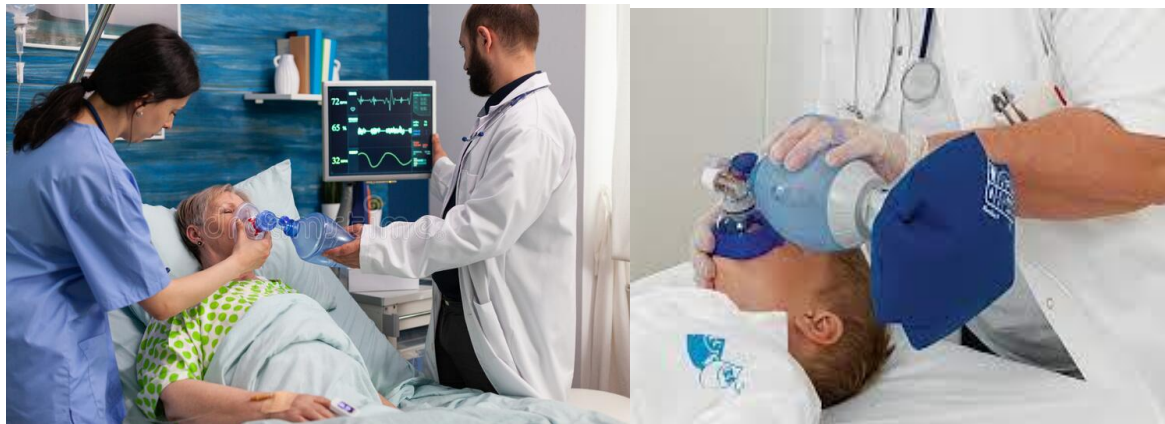
Objectives

- To manufacture a low cost portable ventilator that can easily be distributed even in interior societies and it can even use a car battery as a source of power in case of emergencies.
- To manufacture an easy to use portable ventilator that doesn't need trained professionals to operate it.

WORKING PRINCIPLE

As explained at the introduction part, the main task of a mechanical ventilator is to supply oxygen to the patient that has breathing problems. Our portable ventilator has also built in such a

way that it does that in the same safe and accurate way as the other advanced ventilators. Ambu bag has been used for a while now and in some cases it has been noted that it is being used manually to supply oxygen to the patient with breathing difficulties as shown in the pictures.



In the cases shown in the pictures above, it will require 100 doctors/nurses to serve 100 patient. Now if the disease responsible for the breathing problem is easily transmitted doctors will also easily become affected and hence increasing the number of cases.

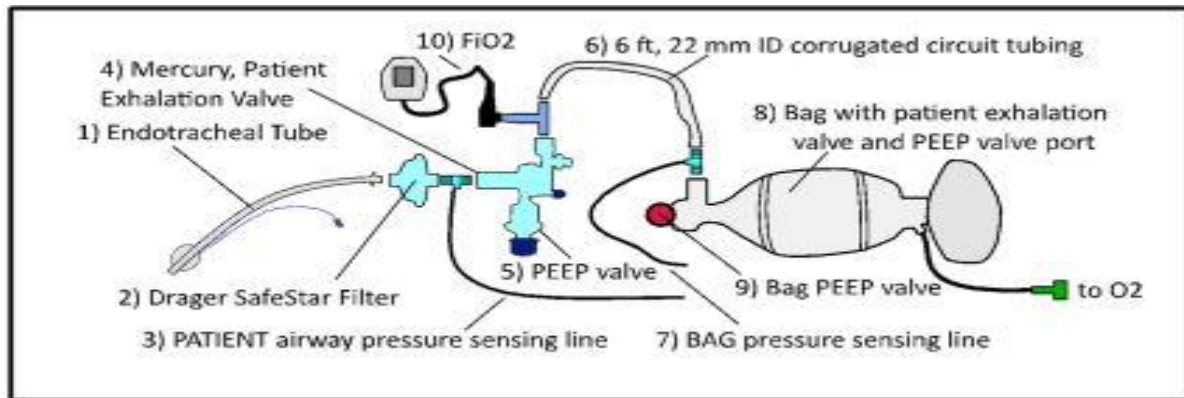
Our portable ventilator uses the same ambu bag to supply oxygen to the patient, but it does it automatically. A doctor/nurse only needs to set the oxygen supply rate of the ventilator in accordance with the patient breathing condition and that's all she/he has to do. Thus having this portable ventilator a single doctor/nurse can even serve a 100 patient at once, that is really time saving, human resource saving, capital saving and most importantly money saving.

Our portable ventilator uses the same ambu bag as the one used in hospitals.



Our portable ventilator helps doctors/nurses to press the ambu bag mechanically while letting them do other medical activities and save lives. The oxygen supply rate can either be set in analog or digital (still on progress).

Below is the schematic diagram of our portable ventilator. It is not the exact diagram but it is closely related.



- The ambu bag is pressed and released with the help of a mechanical motor.
- When it is compressed and released it sucks the oxygen/air from the oxygen tank or from the atmosphere respectively.
- The sucked oxygen/air is temporarily stored in the reservoir bag.
- When the ambu bag is compressed and released again, the temporary stored oxygen/air is now pushed into the pipe that is connected to the mask, the mask that is put onto a patient's face.
- The rate of the airflow can be adjusted using the valves that are positioned on the outside of the ventilator (analog) or can be adjusted by using a computer (digital).
- On the outside of the ventilator are only two input wires, the wire that can be connected to a switch socket during normal electricity operation and the one that can be connected to a car battery terminals on emergency use.

DISPLAY OF THE OPERATION

As the ventilator can be operated in either digital or manual there are also different display appearance.

Analog Display

In the analog mode, the display of the airflow is shown in the airflow meter. Thus the adjusting valve and the airflow meter will help the operator to achieve the required airflow rate as per patient breathing condition. Below is the picture sample of the airflow meter.



Digital Display

The digital display is shown on a computer screen in form of charts. The operator is guided by the charts on the breathing rate. Below is the picture of the digital display.



When the programming part is complete, the display of our portable ventilator will be as shown the picture above, in that an operator can set the flow rate, alarm and notifications and other related aspects.

CONCLUSION

Tanzania is among the developing countries, high percentage of the government's budget is set into development projects and living the healthy sector with little capital to import complex ventilator from the outsiders hence most hospitals especially the ones from the interior societies suffer a deficiency of these crucial medical devices. We as Tanzania entrepreneurs we have come up with a solution for that problem. Our portable ventilator is very cheap compared to the ones from the outside, less complex (easy to use) and most importantly highly portable and it can even use a car battery in case in an ambulance. We have the ability to manufacture these as per government needs but the only thing left for us is the permission of approval from the Tanzania Medical Devices and Drugs Authority so that we can start testing and supplying it in the hospitals especially those in the interior villages. We this portable ventilator we can easily fight the breathing problems in our country and save a lot of lives and a lot of time and money.

Prepared By

A handwritten signature in black ink, appearing to be 'Michael Nyahende', with a long horizontal stroke extending to the right.

Michael Nyahende

06/01/2022

Approved By

A handwritten signature in black ink, appearing to be 'George Nyahende', with a stylized 'G' and 'N'.

George Nyahende

06/01/2022