AKTU IDEATHON 2020

PORTABLE VENTILATOR

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PROBLEM STATEMENT:

- With the increase in the number of COVID 19 patients day by day, India is facing a major challenge due to lack of number of ventilators available.
- Even with the addition of a hundred thousand more mechanical ventilators, we do not have the capacity to ventilate this many patients, forcing physicians to make the impossible decision—who receives mechanical ventilation to continue to fight COVID-19 and who will not. How might we increase the capacity of hospitals to provide mechanical ventilation to those infected?
- The portable ventilator has been designed in order to meet the growing demand of ventilators in India as the number of Covid 19 patient's increases day by day in a cost effective way.

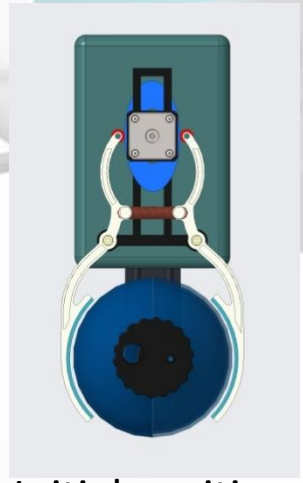
DESIGN:

- The design has been developed keeping in mind the 3D printing technology. The design of the portable ventilator works on the principle of an automatic clamping Machine. The main idea behind the concept is the use of ambubag. Ambubag, as described by Wikipedia:
- *"A bag valve mask, sometimes known by the proprietary name Ambubag or generically as a manual resuscitator or "self-inflating bag", is a hand-held device commonly used to provide positive pressure ventilation to patients who are not breathing or not breathing adequately."*

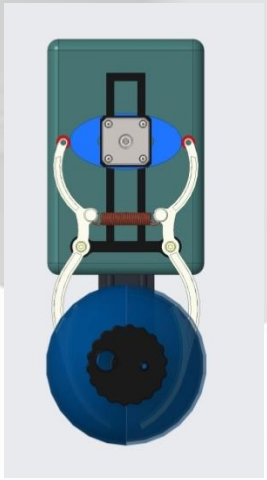
Source: Google Images

WORKING:

1. The portable ventilator uses a NEMA 17 stepper motor for providing the power to the mechanism.
2. The NEMA 17 stepper motor is driven by a 12V rechargeable battery and controlled by an Arduino UNO control unit chipset for controlling its RPM.
3. Motor rotates at 6rpm to provide 12 respirations/min to an adult and at 10rpm to provide 20 respirations/min to a child *(this data is taken from WHO guidelines for using ambubag for respiration).*
4. The stepper motor drives a shaft which is coupled with a Cam-Follower mechanism.
5. The Cam-Follower mechanism actuates two levers which then compresses the Ambubag.
6. The levers are brought to their original position by using the extension spring (LeeSpring-LEM180DF 03 extension spring).



Initial position



Extreme position