Abstract:

This project describes the design and prototyping of a simplified structure of a low-cost portable mechanical ventilator. The microcontroller based mechanical ventilator is integrated with a Bag-Valve-Musk (BVM) ventilation mechanism. The ventilator is design for using it in mass casualty cases and in resource-poor environments that can serve Bangladeshi COVID-19 patients in an emergency time frame. Here, an Ambu bag is operated with a “belt” that is commanded via a microcontroller and manual switches by sending a control signal to the mechanical system and according to this control signal, the “belt” simultaneously compresses and decompresses the Ambu bag. The proposed device is portable, compact, low weight, and efficient performable. It can be used in case of lack of ICU ventilators. Anyone can operate it as no need to study or training of ventilation rules like ICU ventilator.

Major Components:

We need various components and arrangements to build this design. But these are given in Table. 1 the major components for building up the required design.

Components	Specifications	Quantity	Price
1. Silicon Ambu Bag	-	1	1800
2. Rubber Belt	-	1	450
3. Arduino Uno	-	2	900
4. Model DC geared Motor	12V, 251RPM, 18Kg-cm	1	3000
5. MPX10 DP	3V-6V, 3.5 mV/KPa, 0-10Kpa	2	3000
6. Power Supply	-	1	1000
7. Motor Driver	BTS 7960, 43A, 30V	1	680
8. Gas Sensors	MQ 135 Heat Consumption<800mW	1	200

Table. 1: Bill of major Components

Methodology:

A. Flowchart of the Proposed Design:

The basic framework of the proposed research work is shown in Fig. 1.

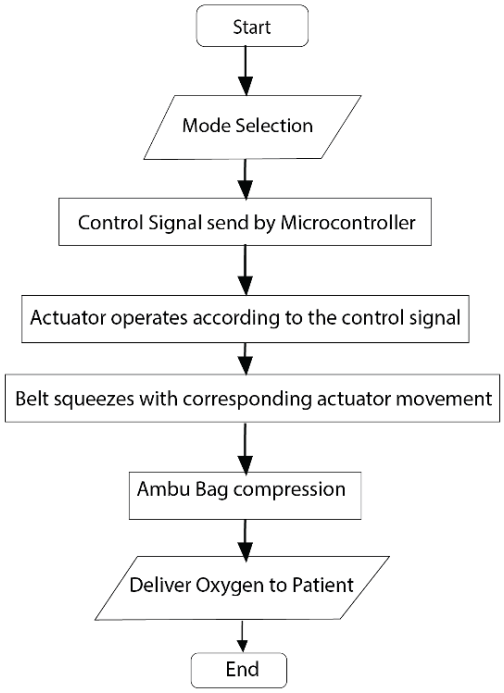

Fig. 1: Basic flowchart of the proposed design

Proposed Systems:

Our proposed system is based on roller-belt principal having some additional feature of controlling precisely with portability, battery operated, reduced size. The automation requires a microcontroller, some mechanical switches, and one geared DC motor.(ekhane description hbe j kivabe kaaj korbe)

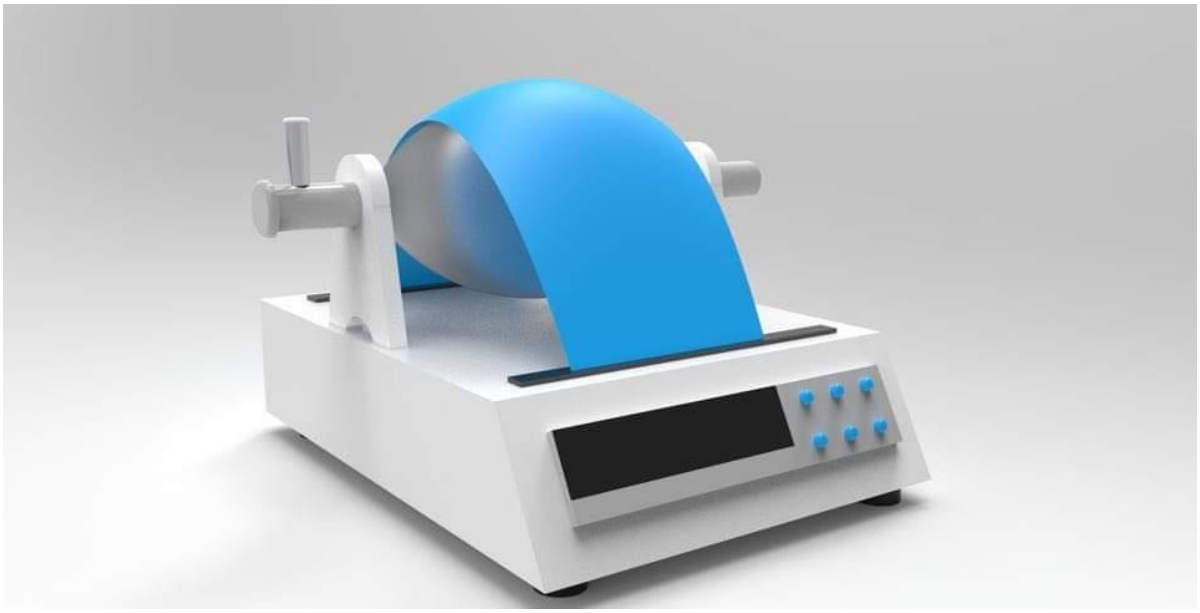

Fig: Model of proposed Ventilator

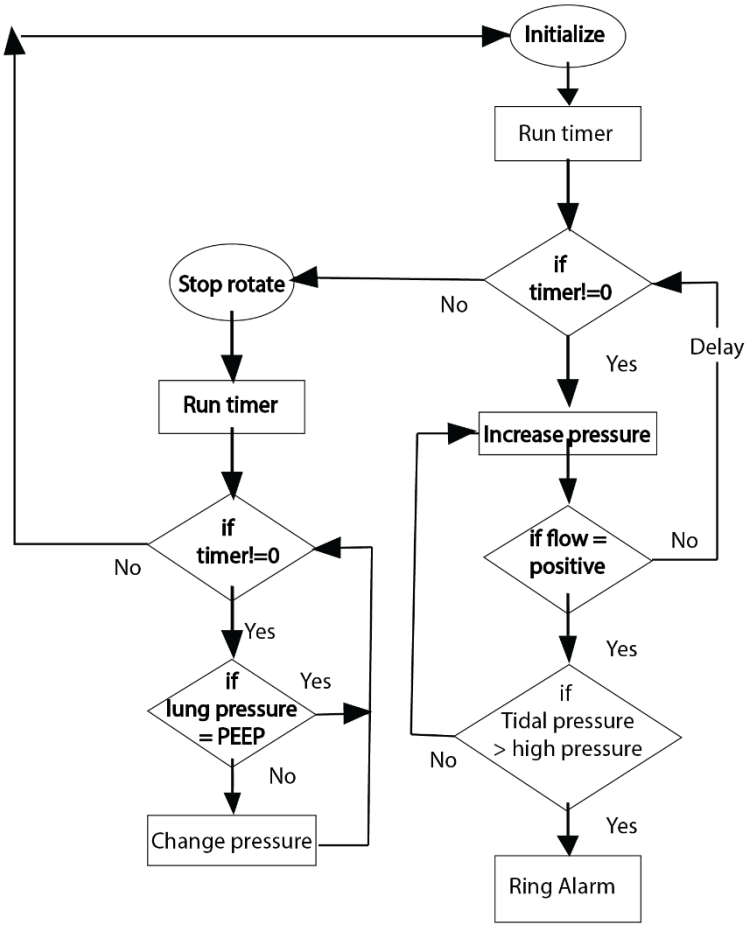

Fig. 2: Algorithm of proposed design

Facilities and Advantages:

There are some attractive facilities of the design with this proposed system. Here we need only one Ambu bag to offer treatments to different ages of patients e.g. adult, child etc. Another advantages of silicon Ambu bag is after compression when decompress it inflates itself. Here we use only one geared DC Motor with rubber belt to compress and decompress the Ambu bag for which the designed model is economic, efficient and can be made with components which are very much available around.