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Concept Convertible Wheelchair With Ventilator And Monitoring System

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Abstract : The wheelchair is constructed in such a way that it can be passed over uneven surfaces easily. In this wheelchair one cart can be connected to other and both can travelled simultaneously. This wheelchair is designed to reduce the risk for wheelchair depending in adult pomper patients by Enzyme replacement therapy. In this wheelchair it is designed in such a way that a lifting platform device for raising or lowering of a wheelchair is provided. In this wheelchair The main objective of this system is to identify user perspectives on the issues that impact the quality of the daily lives of ventilator, assisted individuals living in the community. This wheelchair is designed in such a way that we don't need help of hands to move it. The egocentric computer vision based co-robot wheelchair so that the patient dosen't need the hands to move the wheelchair.

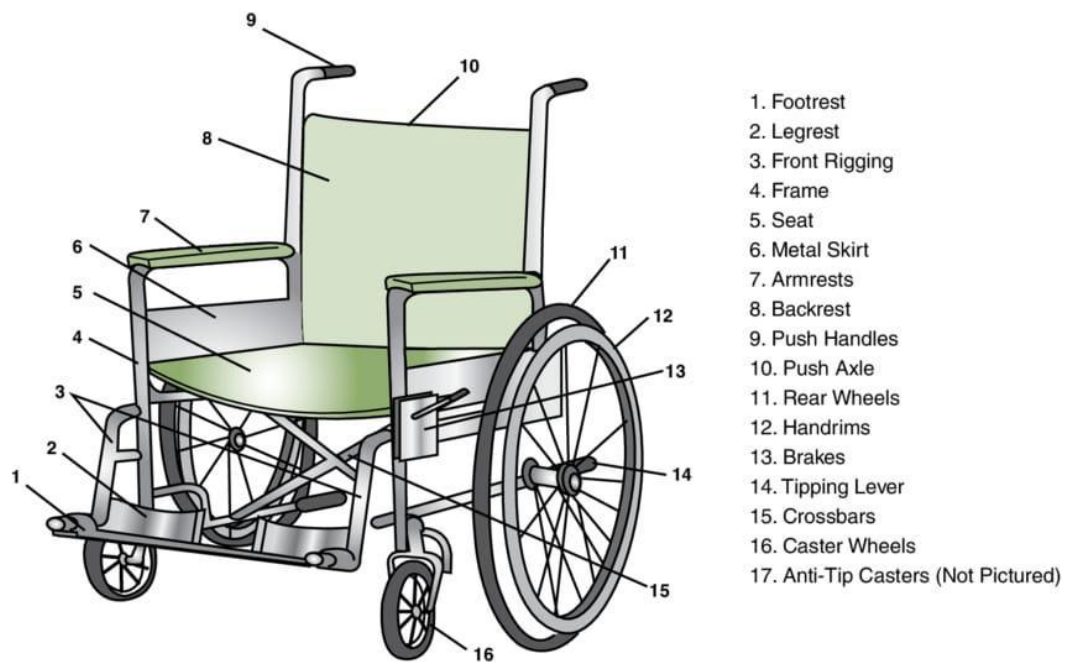
Keywords - Wheelchair, Ventilator

I. INTRODUCTION

In this situation of COVID-19 where India is suffering with second most highest patient in the world and count of corona positive cases have reached 10.3 million due to which there is lack of medical equipment's to treat them and the consequence has led to 149 thousand death in India till now. As engineers it is our duty to provide our country with latest technology to deal with this life threatening disease, so here is our group trying to create convertible wheelchair with ventilator and health monitoring system which will not only help the corona patients but also old people and physically disable person who are suffering who cannot walk and have problem with breathing.

1.1 Wheelchair

A chair with wheels designed as a replacement for walking is known as wheel chair. This is used for movement of physically disabled, elder people, children who have difficulty and are unable to walk. This device comes in many variations like self propelled, propelled by the motor or with the help of an attendee to push. Figure I.1 shows the parts of rigid frame.



"Fig: I.I : Nomenclature of a rigid frame wheelchair"

1.2 Need For New Design In Wheelchair

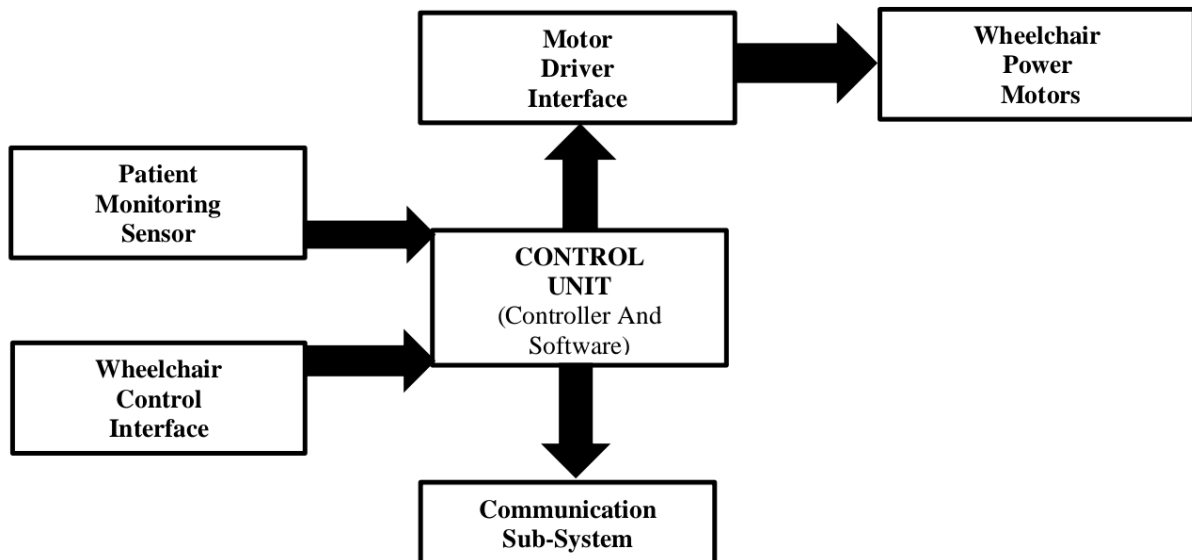
At present patients are facing problem while defecating. Patients needs to be lifted up and helped to remove the dress and make them defecate, which is discomforting to the patients in emergency condition. The design of back rest in the existing wheel chair creates repetitive stress injury if the patient is sitting for a long time. The present design of brake needs to be improved for better impact and application of brake in slope area. Arm rest creates obstruction while shifting the patient from wheel chair to vehicles, no solution in the existing design to make ease of shifting of patient to transportation vehicle.

1.3 History

The first wheel chair was invented in the 1595 called as invalids chair was made for the king of Spain called Phillip. Later in the year 1655 Stephen Farfler built a self-propelling chair on a three wheel chassis. In the year 1783 John Dawson of Bath Town England invented a wheel chair named as bath wheel chair. The chair was with two large wheels and one small one. In the year 1869 patent for a wheel chair with rear push wheels and small front casters were invented, in the year 1881 the push rims for self propulsion wheel chair was invented. In 1900 the first spoked wheel chair was invented and in the year 1916 first motorized wheel chair was invented by British Engineers. In the year 1932, Harry Jennings built the first foldable wheel chair.

1.4 System Overview

The block diagram of the system is Shown in fig I.IV



"Fig: I.IV : Block Diagram"

II. PROBLEM DEFINITION

To design and develop convertible wheelchair which is having on board ventilation system also it can monitor health parameters of the patient and give information to the doctor on a smartphone. The sensor would be works on aurdino system. While the wheelchair would be converted into stretcher with the help pneumatic cylinder, the air to the pneumatic cylinder would be provided to it with the help of an external compressor.

III. OBJECTIVE

- To provide Minimum jerk while switching from wheelchair to stretcher position.
- To provide smart ways to check health parameters of the patient.
- To provide quick response time while treating the patient.
- To provide minimum cost of the product.
- To provide a robust system.
- To provide a stable system.
- To minimize the work of doctor by providing the direct reading of patients on doctors phone display.

IV. PROPOSED METHODOLOGY

4.1 Description Of The Project

1. Wheelchair Convert To Stretcher Position

We use pneumatic cylinder to convert wheelchair to stretcher position. Pneumatic cylinder is connected to Air compressor which is placed below the sitting position of the wheelchair. Right side handle of the wheelchair we are providing one switch to convert the wheelchair to stretcher position.

2. Joystick (For Movement Of Wheelchair)

Joystick is placed on the Right side handle of the wheelchair. The command is implemented by using joystick and then the command is sent to the microcontroller where the controller ATmega328p will execute the command. After executing, the controller send the command in the form of digital signal to the motor driving IC(L293D) and the motor driving IC control the movement of the two dc motors. Thus the dc motor rotates according to the command of the joystick.

3. Temperature Sensor

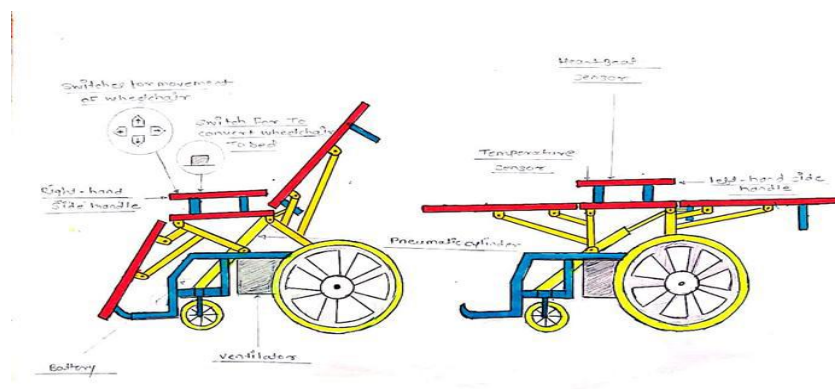
Temperature sensor is placed on the left side handle of the wheelchair. The name of the temperature sensor is LM35 Which is directly connected to aurdino and body temperature shows on display which also connected to aurdino for final reading.

4. Heartbeat Sensor

Heartbeat sensor is placed on a left side handle of the wheelchair. The name of the sensor which is Heartbeat Sensor module with probe (Finger Base) which is connected to aurdino. The heartbeat show on display which is also connected to aurdino for final reading.

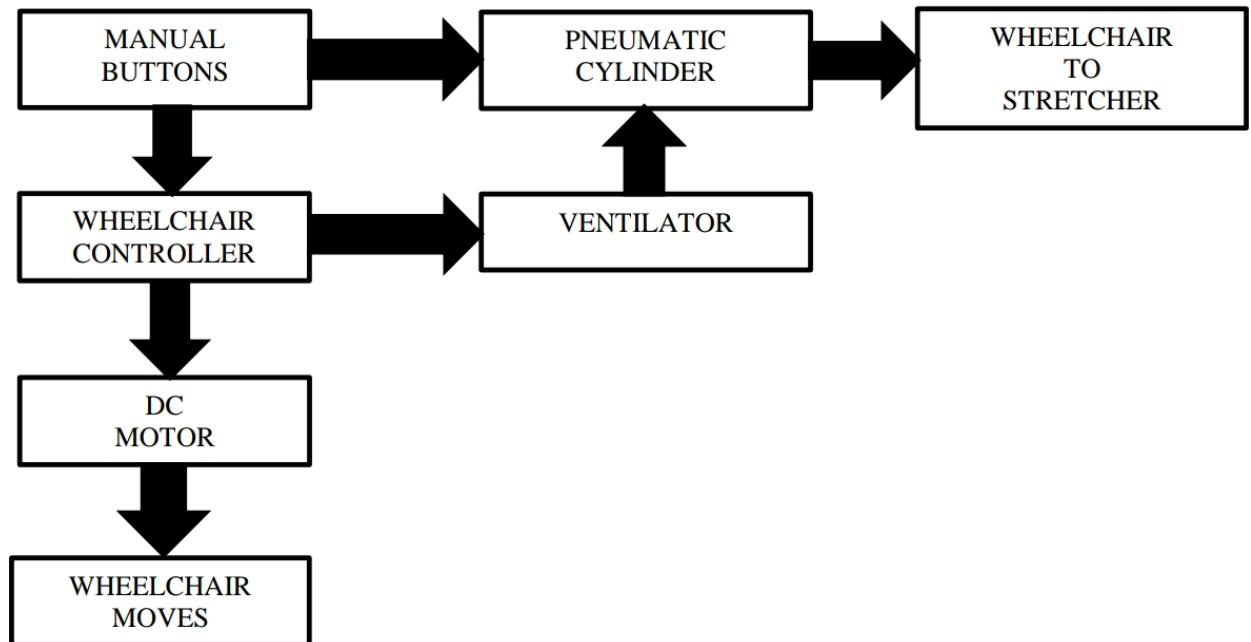
5. Battery

We are using 12 Volt DC battery. Battery is placed bottom place of the wheelchair In between empty space of two wheels. We are providing such box for the battery for safety purpose.



"Fig: IV.I : Proposed Model of the Wheelchair"

4.2 Process Flow Chart

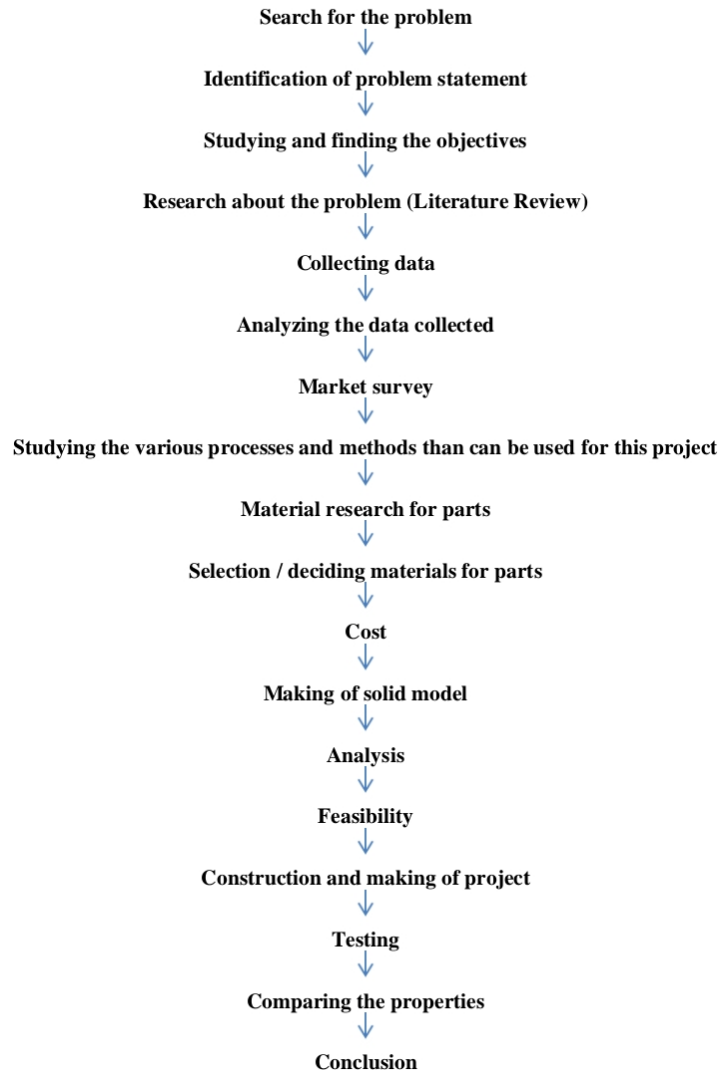


"Fig: IV.II : Flow Chart"

V. WORKING

Wheelchair converts to stretcher by using pneumatic cylinder. This cylinder helps the wheelchair to get converted into stretcher and get converted into stretcher and again back to the wheelchair position with the help of a button which is mounted on right hand rest of the wheelchair. The joystick is placed on the right hand rest of the wheelchair. The command is implemented by using joystick and then the command is sent to the microcontroller where the controller ATmega328p will execute the command. After executing, the controller send the command in the form of digital signal to the motor driving IC (L293D) and the motor driving IC control the movement of the two dc motors. This helps the wheelchair for the movement. Temperature sensor and heartbeat sensor is placed on the left hand rest of the wheelchair so we could measure the temperature and heartbeat and oxygen level of the patient. All the sensors are connected to Arduino which displays the reading on the display. The power to the Arduino would be provided with an external battery. Which is placed at the bottom of the wheelchair. The compartment for the ventilator is opposite to that of the battery compartment. For the convenience of the doctor we will be creating an software which will directly send the body temperature and oxygen level as well as the heartbeat reading every thirty minutes to the doctors smart device.

VI. METHODOLOGY



VII. MATERIAL

Before going for the calculation of the wheelchair the most important thing which comes in our mind is the type of material we will be using in our wheelchair. There are many points to consider while selecting the material some key points are listed below. Cost, Durability, Weight, Strength, Material which can be repaired or replaced easily While manufacturing any kind of equipment the first material which comes rushing in our mind is steel because of its low cost and how easy it is to manufacture components while using steel but the main drawback that counts is the weight of steel and in our wheelchair we want it to be as light as possible, hence the material which we will be using would be aluminum as it is very light as well as it is affordable and the strength to weight ratio is more than steel hence it will be having less weight as compared to steel.

VIII. CONCLUSION

At this need of time where there are shortness of the bed in the hospital this convertible wheelchair is very useful because it gets converted into bed (Stretcher) as well as wheelchair. This wheelchair is cost efficient and a need to today's society. So the designing of the wheelchair is done with proper assembly of the markets on the wheelchair. Also the market research is done on the wheelchair. These are the works done on the wheelchair. So

we are in developing mode on the wheelchair and if the product is flexible than it can be done by the starting of March.

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