Stand on Wheels

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Abstract

This paper's objective aids in bridging the gap between the dreams of a common man to the reality. "Stand on Wheels" is an aid for the bedridden ones, mainly for those who are paralyzed down from hip. It is mainly a custom standing wheelchair which is made affordable to all sectors of society. We are lending our hands to those bedridden people who want to stand. With our technology, we have brought the cost of such existing wheelchairs down. We aimed to design a new electrical system in wheelchairs to help people stand up safely without much effort, simpler in structure, less power consuming and more economic. The standing wheelchair designed will help the people with disability to surge self-esteem, reach objects placed high, deliver speech on podium or even to start a firm on his own. It also reduces the diseases like Osteoporosis and related issues. This project is being made to bring a person back to his feet in real life.

Keyword- Wheelchair, Standing, Linear Actuator, Stability, Joystick

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I. INTRODUCTION

Most of the people and organizations pay more attention to quality of life of people with disabilities. For few decades, wheelchairs have been playing an irreplaceable role in aiding such people. Therefore, upgrading the existing type of wheelchairs and their function will be a priority for welfare of such people. There are different varieties of wheelchair is available in the market. They can be classified as manually operable and electrical controlling. Electrical controlling is of main types, but in this paper we will be discussing on standing type wheelchairs. If a person wants to reach a higher position or deliver a speech at podium, they will be willing to form a standing process. At this time, a standing wheelchair will help them.

We searched about most common kinds of wheelchairs available in market and also about their previous versions. We found that a mechanical kind of chair will require strong forearms for the person to lift his own weight. Comparing to this, an electrical wheelchair will much more helpful as far as a normal person is considered. There again we found some problems like complex control system and wastage of energy. Thus, a better version of these models is shown in this paper.

This paper is a description of the project we have done. Searching for a project on social services, we found that the above stated idea can help someone. Then a person came to us with such a need, and that he can't afford an existing type. So, we came up with our model which is cost effective without compromising the needs of the person. We aimed at having a custom type product which we think will be more effective.

II. SYSTEM DESCRIPTION

A. Block Diagram

The block diagram in Fig 1 shows the sit-stand [1] control aspects of the prescribed system. This system is controlled by a joystick by the user, where he/she can control it easily. If the user wishes to change the position from sitting to standing, then they can just push the joystick upward which will make the person to stand slowly. At its extreme standing position, the lifting process will cut off automatically. The same is done in the reverse process. The user can stop the upward or downward movement at any level just by releasing the joystick at that position. No further movement will be there unless he controls the joystick.

The command from the user (stand/sit) is given to the joystick. The joystick then gives control for the action. Suppose the user requires standing, then the command will force the actuator to push the person to a certain limit as prescribed in medical fields. The command will be continuously checked so as to ensure the user's needs. As stated above, the user can stop at any level just by releasing the joystick. At the extreme position, there is no more motion allowed and so, the command will be cut off automatically.

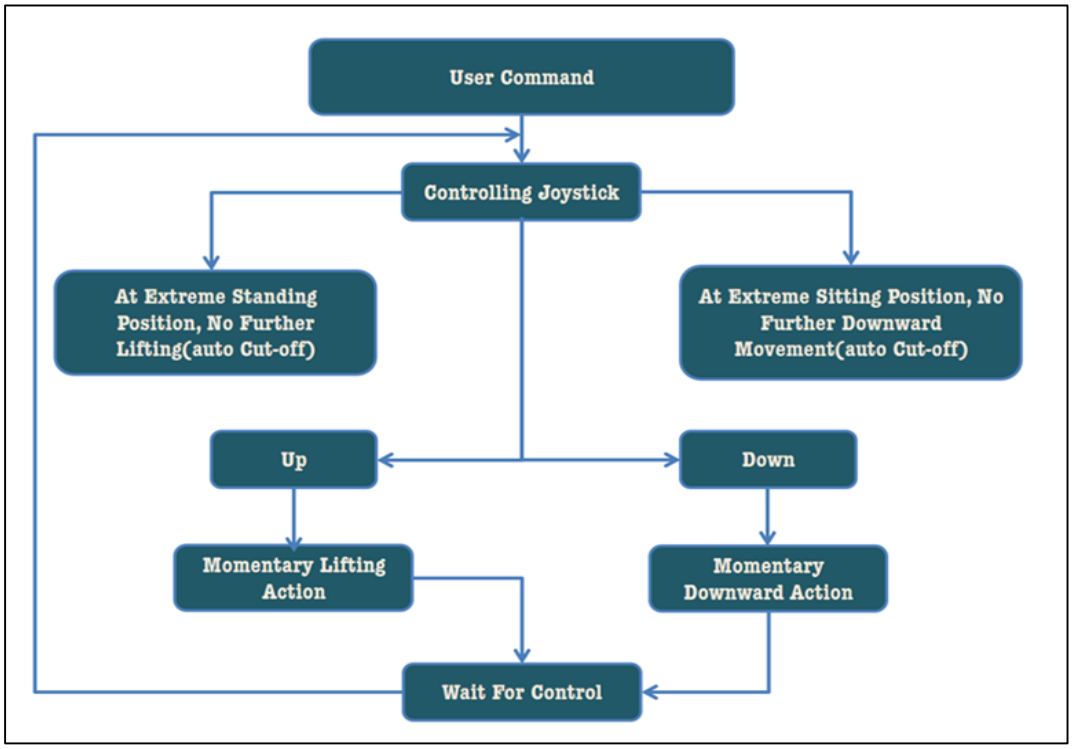

Fig. 1: Block diagram

B. Circuit Diagram

An actuator is a combination of nut and bolt motion mechanism where the bolt is coupled to motor shaft of stepper motor, and nut is combined to the moving rod. The DC stepper motor has a specification of 24V - 36V 6A at which it can deliver 8000 N of force at rated supply. The primary circuit was designed with a couple of dual relays of rating 120 V DC with a control voltage of 5V .But on rated supply a 6A current is flowing through the controller circuit which can produce a spark effect at the contacts an can lead to ac non-conductive coating on the contacts of relays and the circuit will not be complete.

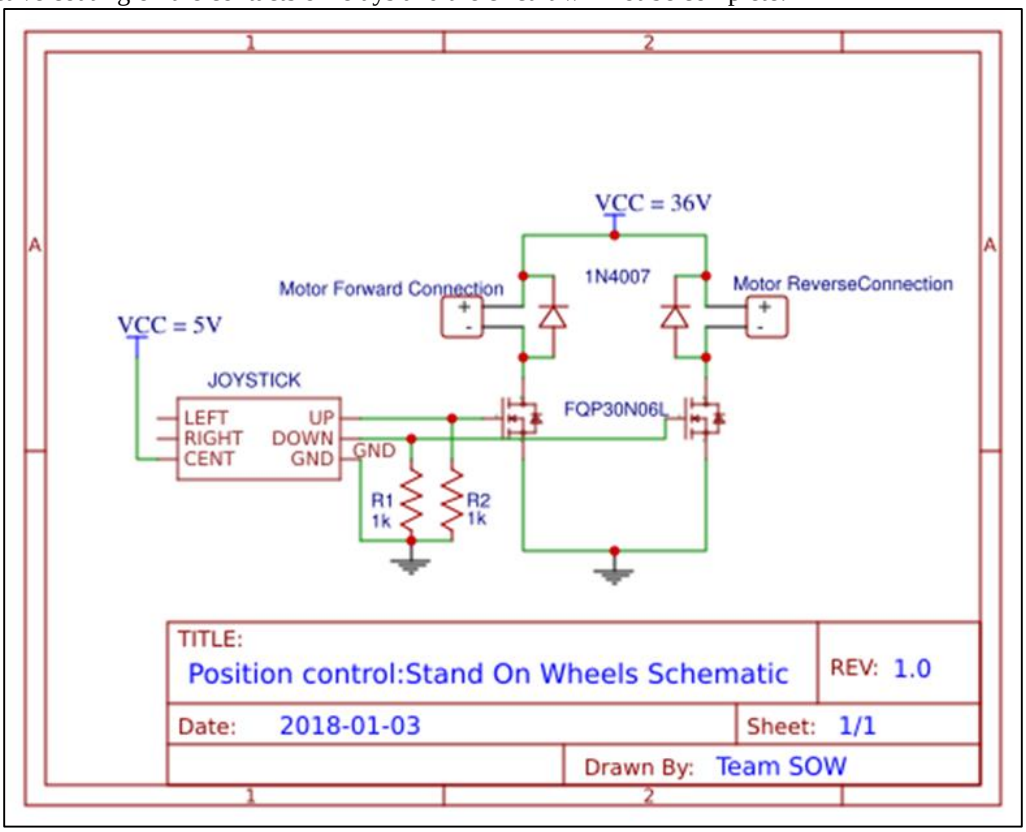

Fig. 2: Controller circuit

Hence we designed a circuit (Fig 2) which employs an N-channel MOSFET FQP30N06L with a rating of 60V 30A, so the machine can be supplied with the rated one. Here the joystick used is 4 way control but we need only 2 way control so we restricted it in UP and DOWN toggling of joystick the control input voltage is sent to control pin or center pin of the joystick and the output from the UP and DOWN is sent to gate terminal of MOSFET.

On application of 5V to the gate terminal of MOSFET the Drain to Source path is now conducting and the circuit is complete. The diode used is employed as freewheeling diode, and the resistors used are pull-down resistors.

III. HARDWARE RESULTS

The proposed system was designed and implemented as shown. This system at the prototype level consists of a 30V battery, a linear actuator, anti-tippers, footrests, extra stability criteria and safety belts. We are using a 8000N actuator [4] so that it can lift any objects easily. This proposed system can lift almost 250 Kg weights. The current rating of the proposed system at no load is 0.5A and at full load it can be up to 4.5A to 5A. But if the current rating becomes to 5A, losses gets increased and that is the reason we opted for an actuator with the above specification. So, there is no chance of losses as a normal person weighs up to 75 Kg. Also, as described, we aim at custom product, the actuator specifications can be varied according to the user.

The controlling of the proposed system can be done so easily with just the help of fingers. A joystick is connected on the arm rest of the wheelchair which is so smooth that the person doesn't feel any kind of difficulty while using. The person can lift his own weight and also even more if he carries anything with him, with the help of just one finger. He doesn't have to rely on others for help. Braking is provided so that the chair does not move while the person stands up. Anti-tippers are provided behind the chair that supports the chair from falling backwards. Also, it can help in balancing the chair to a certain extent. Extra stability mechanism is adopted so as to keep the chair stable in standing posture. This mechanism restricts falling sideways in standing posture. The working of this is like, when the person starts getting up, the footrest starts moving downwards. So, the footrest part reaches the ground, and the whole body weight will be on the ground. There are bushings provided at the tip of footrest to ensure proper grip on the floor. Safety belts are provided to hold the person on the seat throughout. The proposed system consists of chest belts, thigh straps, knee belts and heel straps.

Fig. 3: Wheelchair developed

Fig. 4: Wheelchair developed

IV. CONCLUSION

This paper reveals about how a standing wheelchair can be made for a person with disabilities. It also helps in curing almost all the problems that a spinal injured person can get [2]. The system shown here is different from existing ones in field of structure, working and cost. This system is mainly prescribed for people who have financial problems. This system is mainly a custom product so that it can be made according to the needs of users.

The system described in this paper uses very simple circuit which was necessary for the requirements of our user. This can be enhanced using programming modules and other accessories that can soothe the user's life.

Fig. 5: Standing Wheelchair

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