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Smart Wheelchair Using Advanced Mechanism

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Abstract: Freedom of mobility is a dream for every person with physical disability especially in the case of paralysis, quadriplegics. This paper focuses on the development of an advanced wheelchair for application of physically disabled persons. It helps the caregiver to avoid heavy lifting situations that put their back at risk of injury, and allow themto spend more energy at the end of the workday. The proposed concept works on the mechanical control principle whichis a friendly assisting device for the physically challenged patients who can pee without the help of caregiver. This paper presents the details about design, fabricate and testing of the device. With the outcome of this paper enhancesthe knowledge in the structural design of mechanical links. It has an advantage of exit hole for human waste; thereby it becomes advanced wheel chair. The hole can be closed and opened with the help of lead screw and dc motor. Finally, in order to validate the complete proposed advanced wheel chair, a prototype has been demonstrated and presented in this paper.

I. Introduction

A wheelchair is a wheeled mobility device in which the user sits. The device is propelled either manually or via various automated systems. Wheelchairs are used by people for whom walking is difficult or impossible due to illness, injury, or disability. People with both sitting and walking disability often need to use a wheel bench..A basic standard manual wheelchair incorporates a seat and back, two small front (caster) wheels and two large wheels, one on each side, and a foot rest.Wheelchairs are often variations on this basic design, but there are many types of wheelchairs, and they are often highly customized for the individual user's needs. The seat size (width and depth), seat-to-floor height, footrests/leg rests, front caster outriggers, adjustable backrests, controls, and many other features can be customized on, or added to, many basic models, while some users, often those with specialized needs, may have wheelchairs custom-built. Various optional accessories are available, such as anti-tip bars or wheels, safety belts, adjustable backrests, tilt and/or recline features, extra support for limbs or neck, mounts or carrying devices for crutches, walkers or oxygen tanks, drink holders, and clothing protectors. Experiments have also been made with unusual variant wheels, like the omni wheel. These allow more directional movement options.The electric wheelchair shown on the right is fitted with Mecanumwheels which give it complete freedom of movement. It can be driven forwards, backwards, sideways, and diagonally, and also turned round on the spot or turned around while moving, all operated from a simple joystick.

II. Block Diagram

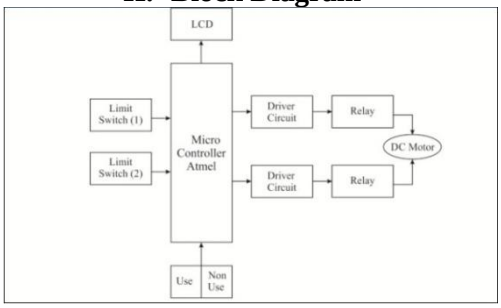

Fig 1

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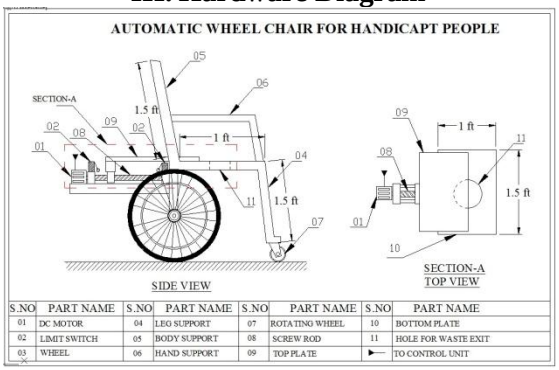
The block diagram depicts the proposed design of an advanced wheelchair. The main components involved in this project consists of screw rod, wheel, free wheel, dc motor and limit switch etc.., here we provided lead screw setup with sheet arrangement which is used to cover the exit hole. The exit hole is used for disposing human waste in the wheel chair. Here we have fabricated the wheel chair which consists of two layered seating arrangement. In that two layers, the bottom layer is provided with exit hole which is fixed over the base frame. Then the top layer which is fitted over the screw rod for closing the bottom exit hole. The screw rod is operated by dc motor which controlled by the help of microcontroller. We have provided two buttons for operating the screw rod setup that is use button and non use button. Normally the top layer sheet is in closed position, when we press the use button, the screw rod will be automatically operated which in turn opens the exit hole for human waste. At that time the patient should lift up by the help of hand rest. After opening the top layer, the patient can sit for peeing and after that patient should lift up for closing the top layer. For closing the top layer, the non use button can be pressed. This project can be implemented in hospitals for handicapped peoples in future.

III. Hardware Diagram



S.NO	PART NAME	S.NO	PART NAME	S.NO	PART NAME	S.NO	PART NAME
01	DC MOTOR	04	LEG SUPPORT	07	ROTATING WHEEL	10	BOTTOM PLATE
02	LIMIT SWITCH	05	BODY SUPPORT	08	SCREW ROD	11	HOLE FOR WASTE EXIT
03	WHEEL	06	HAND SUPPORT	09	TOP PLATE	▶—	TO CONTROL UNIT

Fig 2

2.1 WHEELCHAIR

Manual wheelchairs are those that require human power to move them. Many manual wheelchairs can be folded for storage or placement into a vehicle, although modern wheelchairs are just as likely to be rigid framed. Manual or self-propelled wheelchairs are propelled by the occupant, usually by using large rear wheels, from 20-26 inches in average diameter, and resembling bicycle wheels. The user moves the chair by pushing on the handrims which are made of circular tubing attached to the outside of the large wheels. The handrims have a diameter that is slightly less than that of the rear wheels. Skilled users can control speed and turning and often learn to balance the chair on its rear wheels - do a "wheelie". The wheelie is not just for show - a rider who can control the chair in this manner can climb and descend curbs and move over small obstacles.

2.2 DC MOTOR

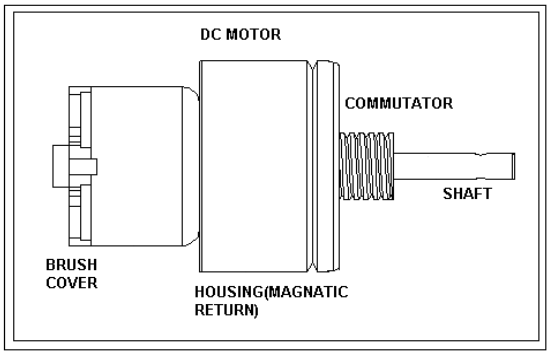


Fig 3

In any electric motor, The main operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to

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harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion. Let's start by looking at a simple 2-pole DC electric motor (here red represents a magnet or winding with a "North" polarization, while green represents a magnet or winding with a "South" polarization).

2.3 LEAD CREW

A lead screw also known as a powerscrewor translation screw is a screw used as a linkage in a machine, to translate turning motion into linear motion. Because of the large area of sliding contact between their male and female members, screw threads have larger frictional energy losses compared to other linkages. They are not typically used to carry high power, but more for intermittent use in low power actuator and positioned mechanisms. Common applications are linear actuators, machine slides (such as in machine), vises, presses and jacks. Lead screws are manufactured in the same ways other thread forms (they may be rolled, cut, or ground).

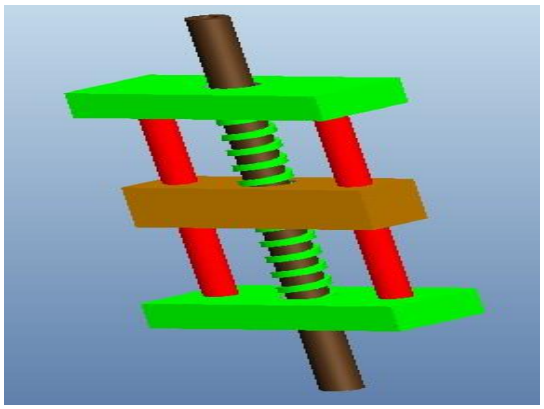

Fig 4

2.4 LIMIT SWITCH

A mechanical limit switch interlocks a mechanical motion or position with an electrical circuit. A good starting point for limit-switch selection is contact arrangement. The most common limit switch is the single-pole contact block with one NO and one NC set of contacts; however, limit switches are available with up to four poles. Limit switches also are available with time-delayed contact transfer. This type is useful in detecting jams that cause the limit switch to remain actuated beyond a predetermined time interval. Other limit switch contact arrangements includeneutral-position and two-step. Limit switches feature a neutral-position or center-off type transfers one set of contacts with movement of the lever in one direction. Lever movement in the opposite direction transfers the other set of contacts.

IV. Outcome and Achievements

The system can be used both indoor and outdoor navigation. Disabled person's location can be tracked whenever needed which will ensure additional safety. The system enables the paralysed person to move with the same ease and confidence as sighted people. Since information the system is linked with GSM module it provides the direction.Avoidsthe caregiversupport in case of emergency. This model mainly introduces the exit hole to collect the human waste.

V. Conclusion

Designing a simple and efficient advanced wheelchair system for isolated words to satisfy the motion control of an electric motorized wheelchair for handicapped persons is the interest of this paper. The project carried out would make an impressing task in hospital etc.., This paper has also reduced the cost involved in the concern and has been designed to perform the required task by taking minimum time. This paper is mainly focused to use for old age people, handicapped persons etc. It is the best innovative method to collect the human waste without caregiver support. In this proposed design mainly focuses the normal wheelchair into advanced wheelchair system.

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