AUTOMATIC ELECTRIC WHEEL CHAIR FOR DISABLED PEOPLE AT ECONOMIC RATE

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Abstract : This research study has been undertaken after a review of different papers. Many of the peoples around the world are disabled and facing very much difficulties regarding wheel chair. Our project is based on providing automatic drive to the wheel chair with the help of motor plus effortless brake mechanism. Drive will be given to both rear wheels. Electromagnetic Brakes will also be provided at both rear wheels.(individually if possible).Actually automatic wheel chair is already available in the market but its cost is high. In our design of wheel chair we have made some changes which allows to reduce the effort of the driver(i.e. disabled person).

IndexTerms **– wheel chair, economical, disabled, etc.**

I. INTRODUCTION

Wheelchair is a device providing wheeled mobility and seating support for a person with difficulty in walking or moving around. Manual wheelchair is a wheelchair that is propelled by the user or pushed by another person. An Automatic/electric wheel chair is a wheel chair that is propelled by motor or by any other means. Wheelchair user is a person who has difficulty in walking or moving around and uses a wheelchair for mobility. A wheelchair must meet the user's individual needs and environmental conditions, provide postural support, and be safe and durable. The wheelchair must be available and affordable and be maintainable and sustainable in the country of use. This is not always easy, because wheelchair users are a diverse group with different requirements and environmental and socioeconomic conditions.[1]

II. TYPES OF WHEELCHAIR

No single model or size of wheelchair can meet the needs of all users, and the diversity among users creates a need for different types of wheelchair. Those selecting wheelchairs, in consultation with the user, need to understand the physical needs of the intended user and how he or she intends to use the wheelchair, as well as knowledge of the reasons for different wheelchair designs. The physical needs of users. The ability to adjust or customize a wheelchair to meet the user's physical needs will vary, depending on the type of wheelchair. Often, wheelchairs are available in at least a small range of sizes and allow some basic adjustments.

Wheelchairs designed for temporary uses (for example, to be used in a hospital to move patients from one ward to another) are not designed to provide the user with a close fi, postural support or pressure relief. Orthopedic or "hospital" wheelchairs are an example of this type. For long-term users, a wheelchair must fit well and provide good postural support and pressure relief. A range of seat widths and depths, and the possibility to adjust at least the footrest and backrest height are important in ensuring that the wheelchair can be fitted correctly.[2] Other common adjustments and options include cushion types, postural supports and an adjustable wheel position. Highly adjustable or individually modified wheelchairs are designed for long-term users with special postural needs. Such wheelchairs often have additional components added to help support the user. the wheelchair is used Wheelchair designs vary to enable users to safely and effectively use their wheelchair in the environment in which they live and work. A wheelchair that is used primarily in rough outdoor environments needs to be robust, more stable and easier to propel over rough ground. Fig. illustrates an example of a three wheeled wheelchair that would be well suited to outdoor use. In comparison, a wheelchair that is used indoors on smooth surfaces needs to be easy to manoeuvre in small indoor spaces.

III. FACTORS TO BE CONSIDERED WHILE DESIGNING MACHINE

When the designer designs the elements of the machine or the complete machine, they have to consider several important parameters. Here are some of the important factors to be considered while doing machine design:[3]

1) Cost: Cost has always been the major factor of consideration while designing the machine elements or machine and in this age of competition it has become more important. The best machine design is the one which helps get the finished product with all the major functionalities and highest possible quality at the lowest possible cost. Gone are the days when expensive and bulky materials were used for making the machine elements.[3]

2) High output and efficiency: Earlier machines used to be very heavy and consume lots of power. Now the trend is of full functional machines consuming low power and giving high output in terms of the number of the of products manufactured. Some computer-controlled machines can manufacture the components very fast and are highly efficient.

3) Strength: The machine elements or the machine should be strong enough to sustain all the forces it is designed for so that it is not damaged or permanently deformed during its life time. Right at the time of the designing the machine the designer should consider the force machine can be applied to and consider all the relevant factors that could affects its life.

4) Stiffness or rigidity: The machine should be rigid enough so that under the effect of applied forces for which it is designed there is no deformation of the machine or machine elements beyond the specified limits. If there is excessive deformation, there are chances of the failure of the machine elements and the whole machine.

5) Wear resistance: Wear is the removal of the material from the metallic surface when two surfaces rub with each other. If there is more removal of the material, the component will become weaker and eventually break. The wear of the contacting

surfaces can be reduced by the lubrication of the surfaces, increasing the strength or the hardness of the working surfaces. The effect of wear can also be reduced by increasing the surface, so that during the lifetime of the mating machine elements they will not fail even if there is some wearing between them.

IV. DESIGN PROCEDURE:

TORQUE CALCULATION:
Assume,
Gross wheelchair Weight =120 kg
Gradient = 2 degree
Max. velocity =10 km/hr

Acceleration = 2.78 m/s
CO-efficient of rolling resistance(Cr) = 0.02
Radius of wheel = 0.305m

1. Rolling Resistance: RR = GVW × Rolling Resistance Co-efficient
   = 120*0.02
   = 2.40

2. Gradient Resistance: GR = GVW × sinϴ
   = 120 × sin(2)
   = 4.19 kg

3. Acceleration Force: FA =GVW*Vmax/g*t = 120*2.78/9.81*60=0.57 kg

4. Total Tractive force: TE = RR + GR + FA = 2.40 + 4.19 + 0.57=7.17 kg

Torque Requirement at Wheel: Tw = TE × Rw × RF (resistance Factor)
= 7.17*0.305*1.15=2.5 Kgm
Torque provided by motor
Assume,
Power of motor (P) = 240 W Require max. Velocity = 2.78 m/s

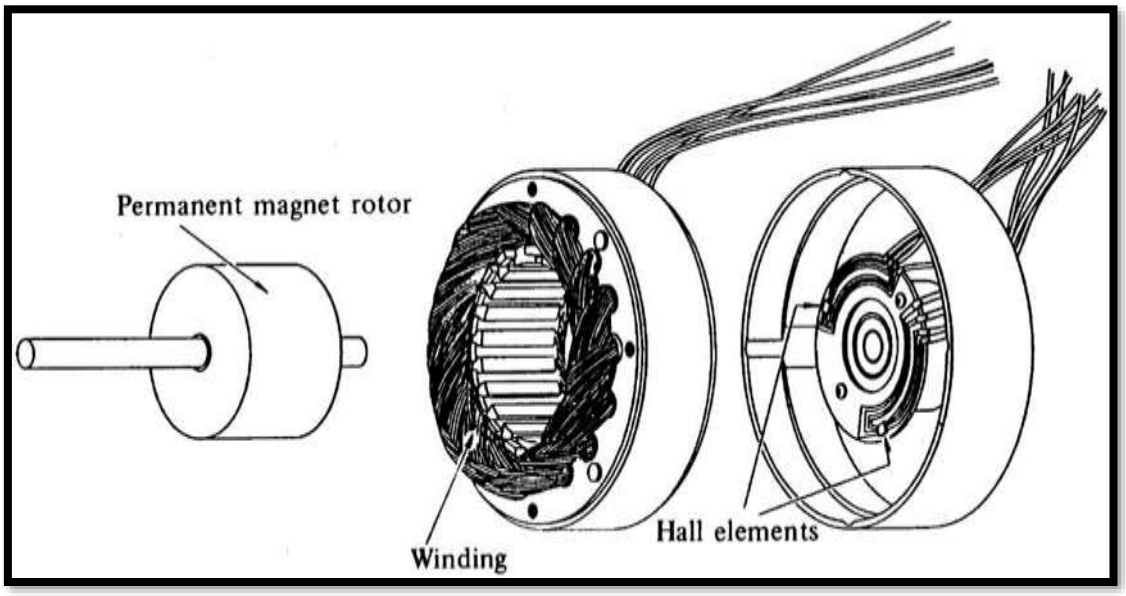
Power= force*velocity P=F*V
F=P/V=240/2.78
F=86.4 N
or F=8.80 kg Torque= force*radius
=F*R
=8.80*0.305
T=2.7 kg.m
Torque provided by 2.7 kg.m

Battery run time calculation:
Motor characteristics: V= 24 volts 14amp.

Battery characteristics:
V=24 volts
= 35Ah
Battery Run Time = 2.5hour =2hour 30 min

V. STRUCTURES AND DRIVE CIRCUITS

Basic structures The construction of modern brushless motors is very similar to the ac motor, known as the permanent magnet synchronous motor. illustrates the structure of a typical three-phase brushless dc motor. The stator windings are similar to those in a polyphase ac motor, and the rotor is composed of one or more permanent magnets. Brushless dc motors are different from ac synchronous motors in that the former incorporates some means to detect the rotor position (or magnetic poles) to produce signals to control the electronic switches as shown. The most common position/pole sensor is the Hall element, but some motors use optical sensors.



Disassembled view of a brushless dc motor

Although the most orthodox and efficient motors are three-phase, two-phase brushless dc motors are also very commonly used for the simple construction and drive circuits. Fig shows the cross section of a two-phase motor having auxiliary salient poles. When we discuss the functions of electrical motors, we should not forget the significance of windings and commutation. Commutation refers to the process which converts the input direct current to alternating current and properly distributes it to each winding in the armature. In a conventional dc motor, commutation is undertaken by brushes and commutator; in contrast, in a brushless dc motor it is done by using semiconductor devices such as transistors.[4]

VI. SPEED CONTROL OF DC MOTOR

Under Electrical Motor Speed control means intentional change of the drive speed to a value required for performing the specific work process. Speed control is a different concept from speed regulation where there is natural change in speed due change in load on the shaft. Speed control is either done manually by the operator or by means of some automatic control device. One of the important features of dc motor is that its speed can be controlled with relative ease. We know that the expression of speed control dc motor is given as, Therefore speed (N) of 3 types of dc motor – SERIES, SHUNT AND COMPOUND can be controlled by changing the quantities on RHS of the expression. So speed can be varied by changing (i) terminal voltage of the armature V , (ii) external resistance in armature circuit R and (iii) flux per pole φ . The first two cases involve change that affects armature circuit and the third one involves change in magnetic field. Therefore speed control of dc motor is classified as 1) armature control methods and 2) field control methods. Speed Control of DC Series Motor. Speed control of dc series motor can be done either by armature control or by field control.

VII. ELECTROMAGNETIC BRAKING SYSTEM

For braking purpose the Electromagnet will be covered by the brake pads which are having numbers of holes drilled in it. This so constructed Electromagnet if energized or exited will get attracted towards the cast iron disc which is mounted on the rear axle. The excitation current will be controlled by the control circuit which makes possible to control the braking force exerted by the electromagnet.

VIII. CONCLUSION AND FUTURE SCOPE

From this research study the pupils get the disabled wheel chair electric at lowest cost as possible in the market. From this research study other researchers also get the futuristic scope for the updated wheel chair. Although along with the car detachable sliding automatic wheel chair scope will be there.

IX. REFERENCES

1. Vinit D Patel, “Voice Recognition System in Noisy Environment”, California state university, Sacramento, 2011.
2. Choy Meng Onn, “Voice Recognition Home Automation System”, University Technology Malaysia, 2010.
3. Hossein Ghaffari Nik, “Hum-Power Controller for Powered Wheelchairs”, George Mason University, 2009.
4. Musa Hakan ASYALI1, Mustafa YILMAZ2, Mahmut TOKMAKC3, Kanber SEDEF4, Bekir Hakan AKSEBZEC5, Rohin MITTAL6, “Design and Implementation of a VoiceControlled Prosthetic Hand”, Turk J Elec Eng & Comp Sci, Vol.19, No.1, 2011, c_ T¨UB˙ITAK.
5. Raciel Poot, Victor Chi, Lizzie Narváez, Erika Llanes, Maximiliano Canché, “Design and Construction of a Prototype of an Electronic Wheelchair Drive for People with Motor Disabilities”, IJCSNS International Journal of Computer Science and Network Security, VOL.10 No.7, July 2010.