THIAGARAJAR POLYTECHNIC COLLEGE

[Govt. Aided|Autonomous|AICTE-CII Awards Winner|Platinum Category]

[NBA Accredited for the period from 2018-19 to 2023-24 for Civil, Mech, EEE, Prodn & Textile]

DEPARTMENT OF MECHANICAL ENGINEERING

ELECTROMAGNETIC MOBILE FLOOR SCRAP COLLECTING MACHINE

PROJECT REPORT

2018-2019

SUBMITTED BY

YASVANTHRAHUL S (A1602070)

UNDER THE GUIDENCE OF

Mr. A.KANNAN. B.E.,M.E.,

Lecturer / Mechanical Engineering

Submitted in partial fulfillment of the requirement of the award of diploma in Mechanical engineering of state board of technical education, Chennai, Tamilnadu.

2018-2019

THIAGARAJAR POLYTECHNIC COLLEGE, SALEM – 636 005

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DEPARTMENT OF MECHANICAL ENGINEERING

ELECTROMAGNETIC MOBILE FLOOR SCRAP COLLECTING MACHINE

Certified that this is the Bonafide Certificate for Project Work done by

Mr. YASVANTHRAHUL S Register No A1602070 of III Year / VI Semester

Diploma in Mechanical Engineering during the academic year 2018-2019

SIGNATURE
Mr.A. KANNAN B.E, M.E.,
Faculty guide, Lecturer/Mechanical
Department of Mechanical Engineering

SIGNATURE
Mr.A. KANAKARAJ B.E,M.E.,
Head of department
Department of Mechanical Engineering

Certified that the candidate was examined in the viva-voce examination held on .....

.....
(Internal Examiner)

25/4/19
.....
(External Examiner)

K. SELVARAJU

ACKNOWLEDGEMENT

I would like to express our sincere thanks to the management and our beloved principal Dr.V.KARTHIKEYAN M.E., Ph.D., MCMI(UK),F.I.E for providing necessary facilities for doing this project.

I also express grateful thanks to the Head of Department Mr.A.KANAKARAJ B.E, M.E,for his encouragement during the project.

I also grateful and convey my sincere thanks to our guide Mr.A.KANNAN B.E, M.E, Lecturer/Mechanical Engineering for his valuable suggestions and innovative ideas during the course of professional Pratice and Mini Project.

I am very grateful to thank industrial mentor Mr.T.ANNAMALAI B.E., Managing Director,M/s. Micro Minerals Pvt Ltd., salem for guiding and providing permission and a wonderful support to the projectwork.

I express my sincere thanks to all my teaching and Non-teaching staffs of the department of Mechanical engineering.

I also express my thanks to my group members, classmates and parents for their affectionate support,loving and Co-operation at all stages of this academic venturte.

CERTIFICATE OF PROJECT COMPLETION

To whom so ever it may concern

This is to certify that the following students studying III year Diploma in Mechanical Engineering in Thiagarajar Polytechnic College, Salem has completed their project **"Fabrication of ELECTROMAGNETIC MOBILE FLOOR SCRAP COLLECTING MACHINE** "successfully under my guidance.

S.No	Name of the Student	Register Number
1	RIYAZ MOHAMED S	C1702005
2	YASVANTHRAHUL S	A1602070
3	RAGAVAN N	E1702014
4	MEGANATHAN D	E1702013
5	JAGATHEESH R	E1702012
6	THANZIL M	A1602065

The project has been satisfactorily completed and the project became very effective due to a well co-ordinated and seamless effort of the project team.

This project work is the record of the authentic work carried out during the academic year 2018 – 2019 under my guidance and results are based on the research done by them.

Place : SALEM

Date :

Signature of the Project Mentor

Name : Mr.T.ANNAMALAI B.E.,

Designation : MANAGING DIRECTOR

Seal : MICROFINE MINERALS
Reg. Off:.3/4-22, Pulavan Street,
THARAMANGALAM (PO)
SALEM (502. T.N.

CONTENT:

INTRODUCTION

- In our project we are eliminating the need of manually collecting the scrap in heavy industries.
- For this purpose we are designing automatic scrap collecting vehicle controlled by micro processor. In the available methods of scrap collecting man power and fuel power

- Vehicle's is used. The existing vehicle's pallet trucks, trolley's uses Petrol or diesel as fuel for running and for operating them we use the manpower.

- These types of vehicles consume liter of fuel for a period of one hour. By the end of 2020 fuel deposit in the world will completely depleted.
- To avoid this type of problems and reduce manpower requirement we need other type of automation that is sensor operator automatic scrap collecting vehicle.
- So, we are sure that our project automatic scrap collecting vehicle will help us to collect the scrap automatically without the help of any labour or any other vehicles.

- The pneumatic power used for lifting purpose Movement to vehicle. The speed of rotation of dc motor.velocity of vehicle is controlled by the microprocessor controller.
- Pneumatic power assembled on the vehicle is easily replaceable and detachable and used for charging the vehicle, while the vehicle is under roof, path programmed for the vehicle in a micro controller chip be altered when required.
- The vehicle is having a vacuum blower which is used to collect the scrap automatically.
- The intention of this mechanical engineering project is to fabricate a **scrap collecting robot**. Since complete automation is very complex and even research facilities haven't come up with one, you better design one that is operated via a remote control which is either wireless or not.
- This is a working project and as usual requires the help of electronics students for the control systems.
- This robot is 4 wheeled with an arm to collect scrap materials. It also can move over small obstacles with the support of the arm.

- The automatic scrap collecting vehicle is designed to remove glass scraps from the work station to the disposal area with the help of electronic sensors and a rail.
- The use of this automated vehicle system reduces human efforts and and the chances of hazard.
- The automated scrap collecting vehicle system consists of :

  1.Acollectingworkstation

  2.Arailmodule

  3. A disposal station.
- The collecting work station consists of the work room, two conveyors and a glass shattering machine.
- The big glass scraps from the work area is collected by a conveyor and is brought to a glass shattering machine to reduce its size.
- This shattered glass scraps are brought away from the machine to the to the rail module thorugh a conveyor for disposal.
- The second phase consists of a rail module and a vehicle module, the rail module for guiding the vehicle. This is disposed between the collecting work station and the disposal station.
- The glass scraps are disposed in the disposal area.
- The whole process is automated to minimize human efforts and to attain better productivity

ABSTRACT:

- In this project we are fabricate the electro magnetic mobile scrap collecting machine.
- This concept we are using the vehicle model, electro magnet, handle and control unit to make the equipment.
- The electro magnetic scrap collecting machine is operated through less electrical power and the cost is less.
- So it is suitable for small scale industries and workshops to collect the scrap. The pneumatic power used for lifting purpose Movement to vehicle. The speed of rotation of dc motor.velocity of vehicle is controlled by the microprocessor controller.
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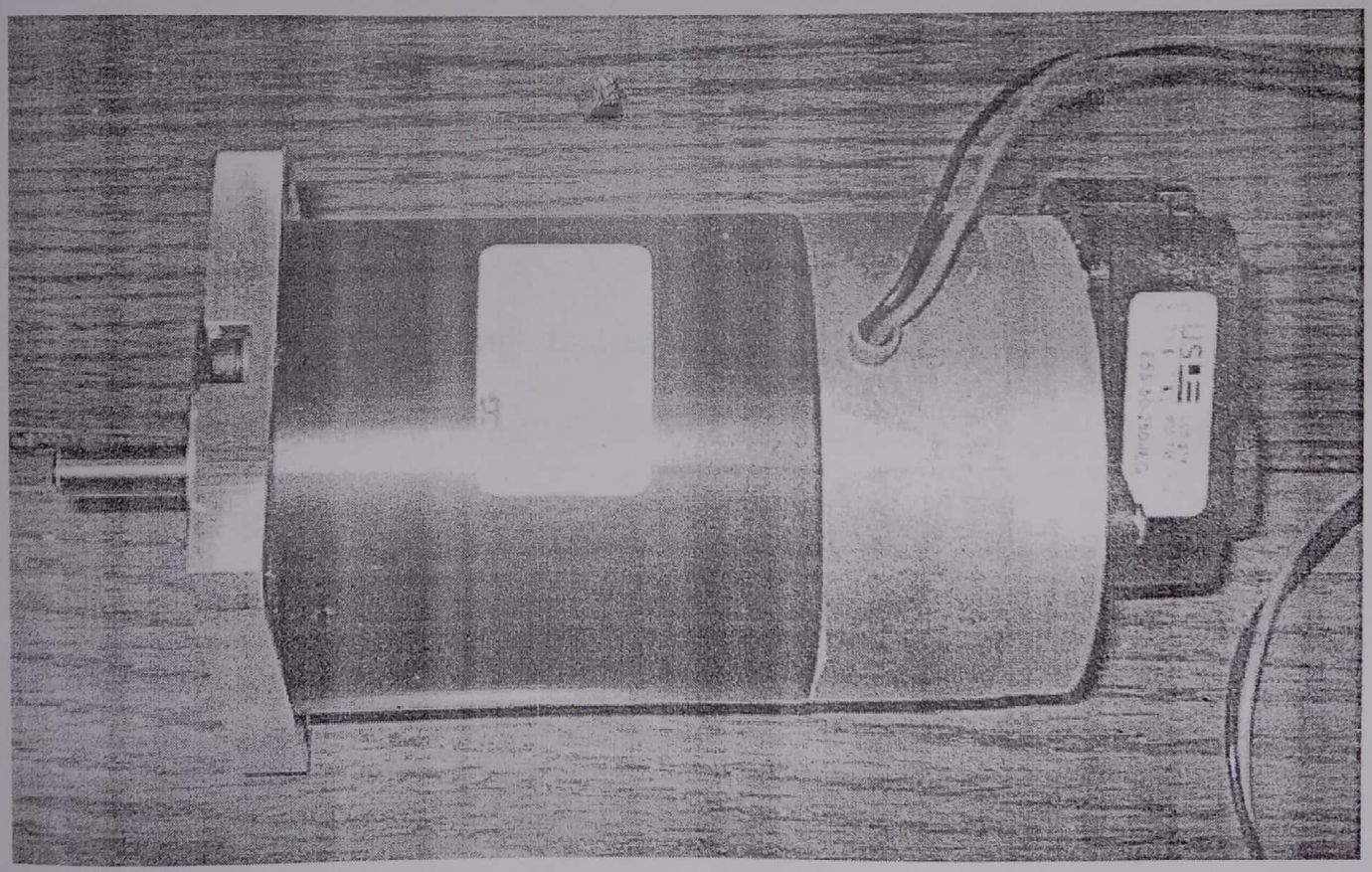
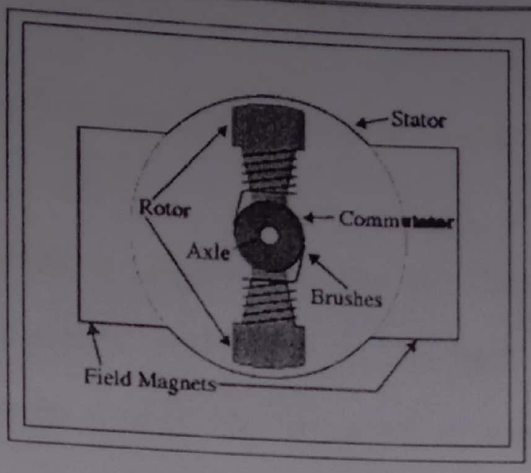
DC MOTOR



- In any electric motor, 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 harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

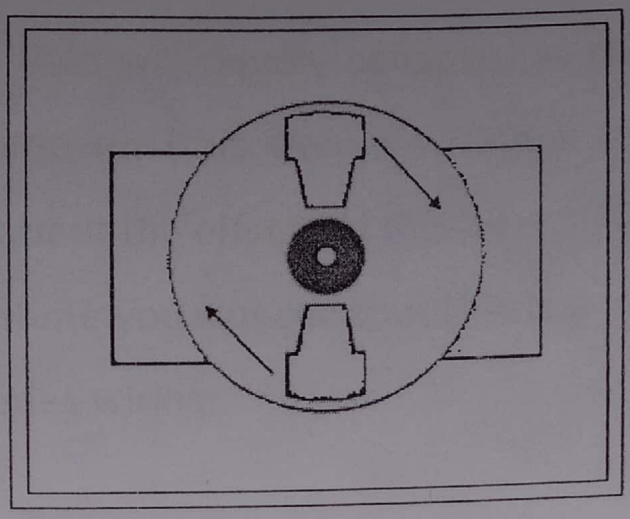
- Let's start by looking at a simple 2-pole DC electric motor (here red represents a magnet or winding with a "North" polarization, while green represents a magnet or winding with a "South" polarization).



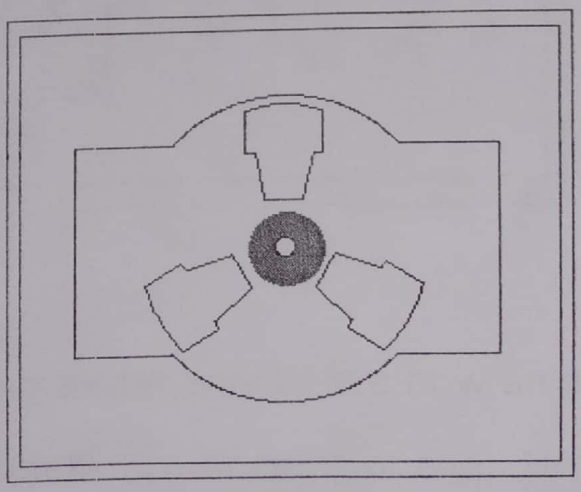
- Every DC motor has six basic parts -- axle, rotor (armature), stator, commutator, field magnet(s), and brushes.
- In most common DC motors, the external magnetic field is produced by high-strength permanent magnets. The stator is the stationary part of the motor -- this includes the motor casing, as well as two or more permanent magnet pole pieces.
- The rotor (together with the axle and attached commutator) rotate with respect to the stator. The rotor consists of windings (generally on a core), the windings being electrically connected to the commutator. The above diagram shows a common motor layout -- with the rotor inside the stator (field) magnets.
- The geometry of the brushes, commutator contacts, and rotor windings are such that when power is applied, the polarities of the energized winding and the stator magnet(s) are misaligned,

- And the rotor will rotate until it is almost aligned with the stator's field magnets.
- As the rotor reaches alignment, the brushes move to the next commutator contacts, and energize the next winding. Given our example two-pole motor, the rotation reverses the direction of current through the rotor winding, leading to a "flip" of the rotor's magnetic field, driving it to continue rotating.

- In real life, though, DC motors will always have more than two poles (three is a very common number). In particular, this avoids "dead spots" in the commutator.
- You can imagine how with our example two-pole motor, if the rotor is exactly at the middle of its rotation (perfectly aligned with the field magnets), it will get "stuck" there. Meanwhile, with a two-pole motor, there is a moment where the commutator shorts out the power supply.
- This would be bad for the power supply, waste energy, and damage motor components as well. Yet another disadvantage of such a simple motor is that it would exhibit a high amount of torque "ripple" (the amount of torque it could produce is cyclic with the position of the rotor).

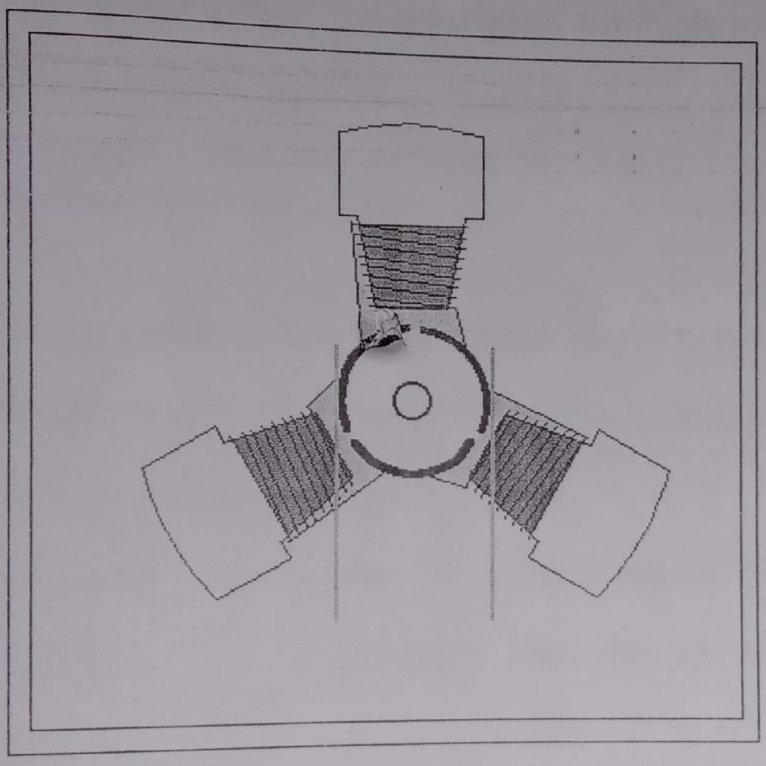


- So since most small DC motors are of a three-pole design, let's tinker with the workings of one via an interactive animation (JavaScript required):



- A few things from this -- namely, one pole is fully energized at a time (but two others are "partially" energized).

- As each brush transitions from one commutator contact to the next, one coil's field will rapidly collapse, as the next coil's field will rapidly charge up (this occurs within a few microsecond). We'll see more about the effects of this later,
- But in the meantime you can see that this is a direct result of the coil windings' series wiring:



- There's probably no better way to see how an average DC motor is put together, than by just opening one up. Unfortunately this is tedious work, as well as requiring the destruction of a perfectly good motor.

- The guts of a disassembled Mabuchi FF-030-PN motor (the same model that Solarbotics sells) are available for (on 10 lines / cm graph paper). This is a basic 3-pole DC motor, with 2 brushes and three commutator contacts.
- The use of an iron core armature (as in the Mabuchi, above) is quite common, and has a number of advantages. First off, the iron core provides a strong, rigid support for the windings -- a particularly important consideration for high-torque motors. The core also conducts heat away from the rotor windings, allowing

- The motor to be driven harder than might otherwise be the case. Iron core construction is also relatively inexpensive compared with other construction types.
- But iron core construction also has several disadvantages. The iron armature has a relatively high inertia which limits motor acceleration. This construction also results in high winding inductances which limits brush and commutator life.
- In small motors, an alternative design is often used which features a 'coreless' armature winding. This design depends upon the coil wire itself for structural integrity. As a result, the armature is hollow, and the permanent magnet can be mounted **inside** the rotor coil. Coreless DC motors have much lower armature

inductance than iron-core motors of comparable size, extending brush and commutator life.

- The coreless design also allows manufacturers to build smaller motors; meanwhile, due to the lack of iron in their rotors, coreless motors are somewhat prone to overheating.

- As a result, this design is generally used just in small, low-power motors. Beamers will most often see coreless DC motors in the form of pager motors.

- Again, disassembling a coreless motor can be instructive -- in this case, my hapless victim was a cheap pager vibrator motor.
- The guts of this disassembled motor are available (on 10 lines / cm graph paper). This is (or more accurately, was) a 3-pole coreless DC motor.

STATOR

- The stator is the stationary part of an electric generator or electric motor. The non-stationary part on an electric motor is the rotor.
- Depending on the configuration of a spinning electromotive device the stator may act as the field magnet, interacting with the armature to create motion, or it may act as the armature, receiving its influence from moving field coils on the rotor.
- The first DC generators (known as dynamos) and DC motors put the field coils on the stator, and the power generation or motive reaction coils are on the rotor.
- This was necessary because a continuously moving power switch known as the commutator is needed to keep the field correctly aligned across the spinning rotor.
- The commutator must become larger and more robust as the current increases.
- The stator of these devices may be either a permanent magnet or an electromagnet. Where the stator is an electromagnet, the coil which energizes it is known as the field coil or field winding.

ROTOR

- The rotor is the non-stationary part of a rotary electric motor or alternator, which rotates because the wires and magnetic field of the motor are arranged
- So that a torque is developed about the rotor's axis. In some designs, the rotor can act to serve as the motor's armature, across which the input voltage is supplied.

ELECTROMAGNETIC COIL

- An electromagnetic coil is formed when a conductor solid copper wire is wound around a core or form to create an inductor or electromagnet. One loop of wire is usually referred to as a turn, and a coil consists of one or more turns.
- For use in an electronic circuit, electrical connection terminals called taps are often connected to a coil. Coils are often coated with varnish and/or wrapped with insulating tape to provide additional insulation and secure them in place.

- A completed coil assembly with taps etc. is often called a winding. A transformer is an electromagnetic device that has a primary winding and a secondary winding that transfer's energy from one electrical circuit to another by magnetic coupling without moving parts.
- The term tickler coil usually refers to a third coil placed in relation to a primary coil and secondary coil. A coil tap is a wiring feature found on some electrical transformers, inductors and coil pickups, all of which are sets of wire coils.
- The coil tap are points in a wire coil where a conductive patch has been exposed. As self induction is larger for larger coil diameter the current in a thick wire tries to flow on the inside. The ideal use of copper is achieved by foils.
- Sometimes this means that a spiral is a better alternative. Multilayer coils have the problem of interlayer capacitance, so

- when multiple layers are needed the shape needs to be radically changed to a short coil with many layers so that the voltage between consecutive layers is smaller.

BATTERY

- Battery is use for storing the energy produced from the solar power.
- The battery used is a lead-acid type and has a capacity of 12v; 2.5A.the most inexpensive secondary cell is the lead acid cell and is widely used for commercial purposes.

- A lead acid cell when ready for use contains two plates immersed in a dilute sulphuric acid (H_2SO_4) of specific gravity about 1.28.the positive plate (anode) is of
- Lead –peroxide (PbO_2) which has chocolate brown colour and the negative plate (cathode) is lead (Pb) which is of grey colour.

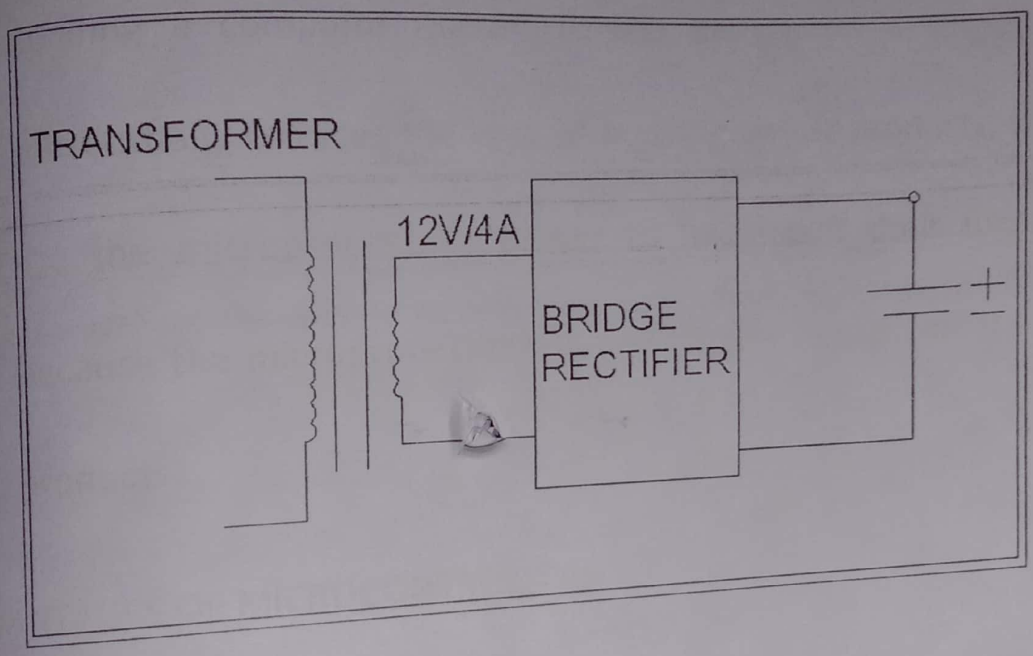
- When the cell supplies current to a load (discharging), the chemical action that takes place forms lead sulphate ($PbSO_4$) on both the plates with water being formed in the electrolyte. After a certain amount of energy has been withdrawn from the cell,both plates are
- Transformed into the same material and the specific gravity of the electrolyte (H_2so_4) is lowerd.the cell is then said to be discharged.there are several methods to ascertain whether the cell is discharged or not.
- To charge the cell, direct current is passed through the cell in the reverse direction to that in which the cell provided current.
- This reverses the chemical process and again forms a lead peroxide (PbO_2) positive plate and a pure lead (Pb) negative plate. At the same time,(H_2so_4) is formed at the expense of

water,restoring the electrolyte (H_2SO_4) to its original condition.

The chemical changes that

- Occur during discharging and recharging of a lead-acid cell.

BATTERY CIRCUIT DIAGRAM:



CONTROL UNIT

- Microcontroller is a computer on a chip. Micro suggests that the device is small, and controller tells you that the device' might be used to control objects, processes, or events.
- Another term to describe a microcontroller is embedded controller, because the microcontroller and its support circuits are often built into, or embedded in, the devices they control.

- It is temporary storage unit. A microcontroller is a complete microprocessor system built on a single IC. Microcontrollers were developed to meet a need for microprocessors to be put into low cost products.

- Building a complete microprocessor system on a single chip substantially reduces the cost of building simple products, which use the microprocessor's power to implement their function, because the microprocessor is a natural way to implement many products.

ADVANTAGES OF MICROCONTROLLERS:

- If a system is developed with a microprocessor, the designer has to go for external memory such as RAM, ROM or EPROM and peripherals and hence the size of the PCB will be large enough to hold all the required peripherals.
- But, the micro controller has got all these peripheral facilities on a single chip so development of a similar system with a micro controller reduces PCB size and cost of the design.

- One of the major differences between a micro controller and a microprocessor is that a controller often deals with bits , not bytes as in the real world application,

- For example switch contacts can only be open or close, indicators should be lit or dark and motors can be either turned on or off and so forth.

WHEEL

- A wheel is a circular device that is capable of rotating on its axis, facilitating movement or transportation or performing labour in machines.
- A wheel together with an axle overcomes friction by facilitating motion by rolling. In order for wheels to rotate a moment needs to be applied to the wheel about its axis, either by way of gravity or by application of another external force.
- Common examples are found in transport applications. More generally the term is also used for other circular objects that

- rotate or turn, such as a Ship's wheel and flywheel. The wheel most likely originated in ancient

- The wheel is a device that enables efficient movement of an object across a surface where there is a force pressing the object to the surface. Common examples are a cart drawn by a horse, and the rollers on an aircraft flap mechanism.

- The wheel is not a machine, and should not be confused with the wheel and axle, one of the simple machines.

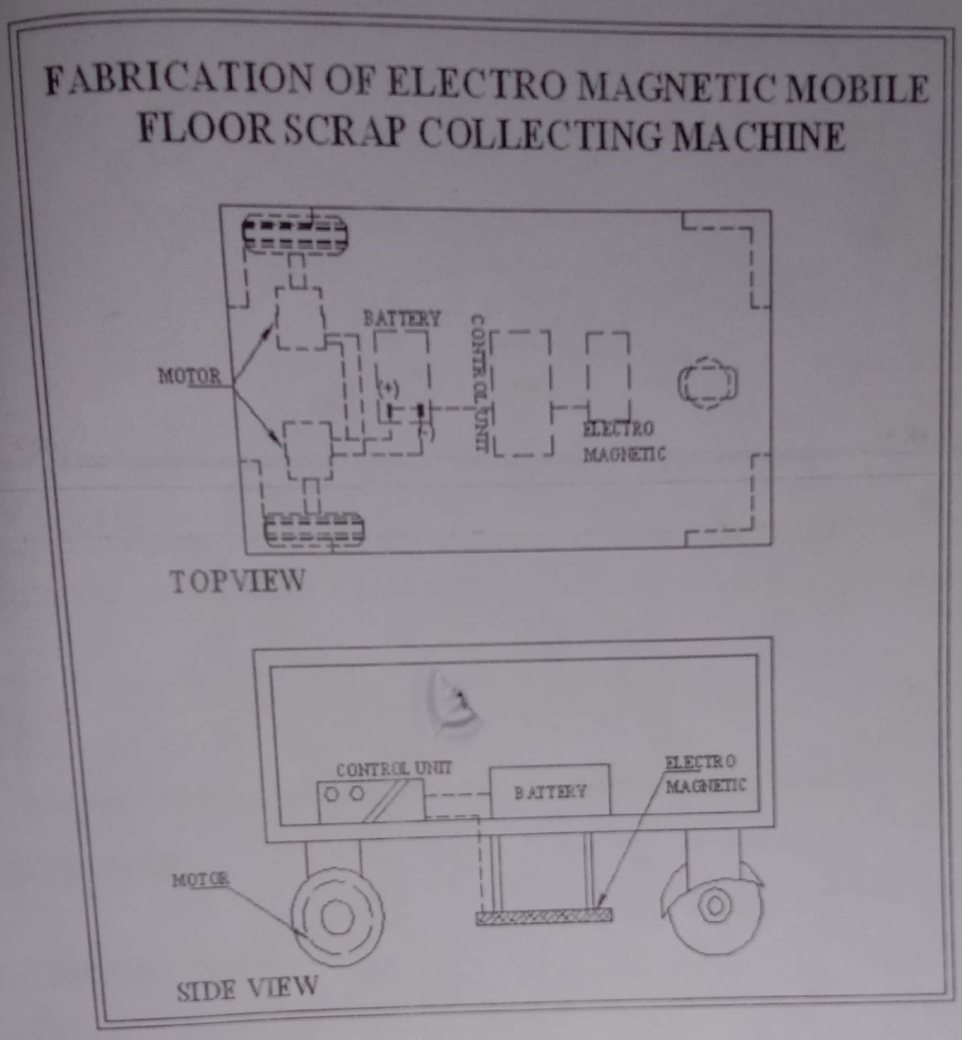
- A driven wheel is a special case, which is a wheel and axle. Wheels are used in conjunction with axles, either the wheel turns on the axle or the axle turns in the object body.

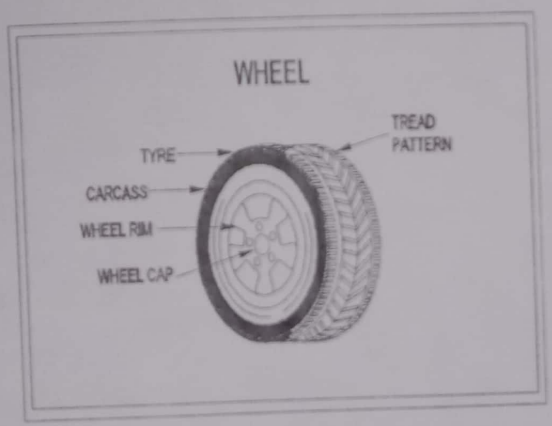
- The mechanics are the same in either case. The normal force at the sliding interface is the same. The sliding distance is reduced for a given distance of travel. The coefficient of friction at the interface is usually lower.

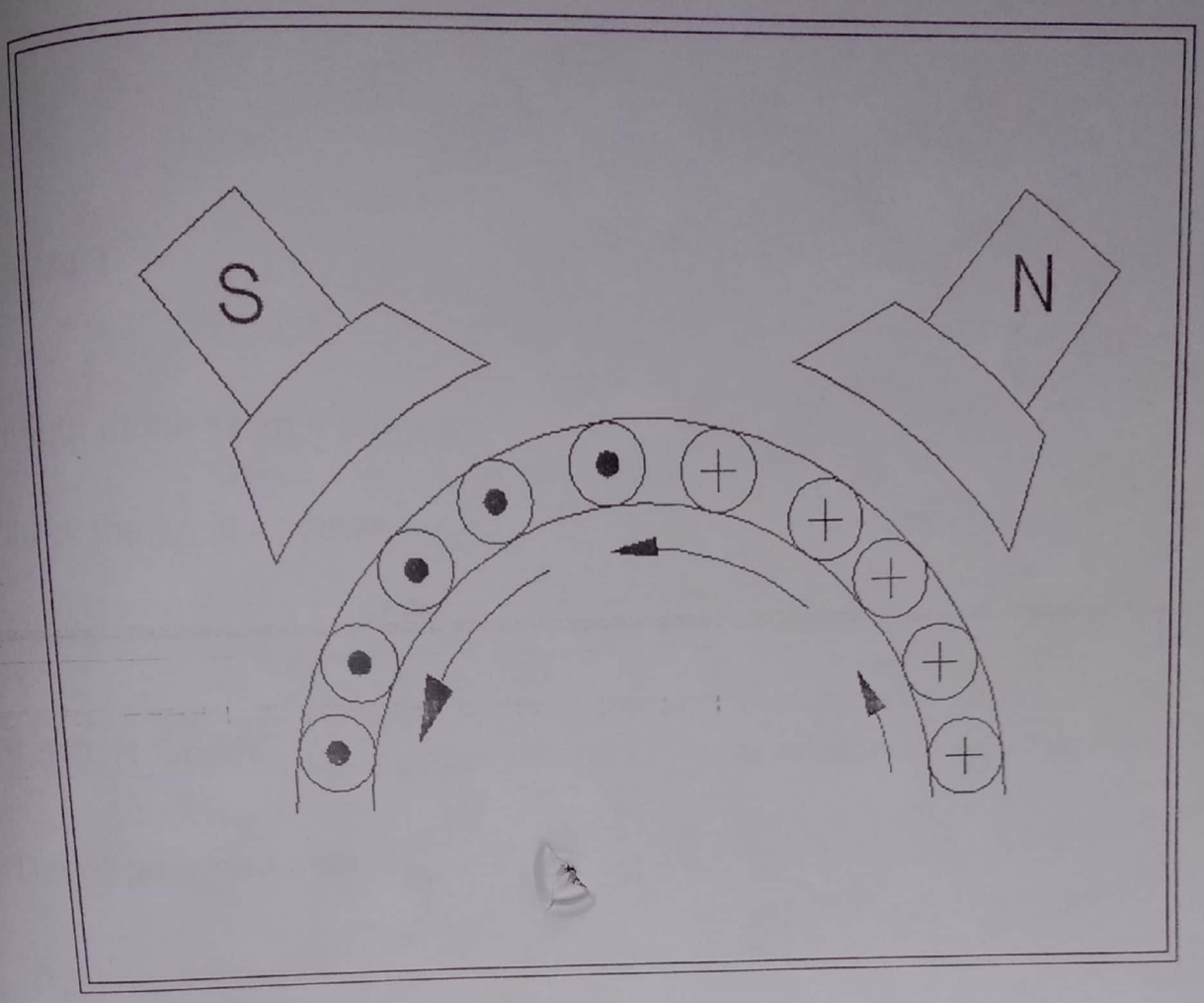
WORKING PRINCIPLE

- The portable mobile vehicle model contains three wheels on the robot.
- The keypad arrangements are fixed on the vehicle model. The electro magnet in this equipment is fitted in the center of the vehicle model and also very close to the ground level. The electro magnet is controlled through the control unit.
- The control unit has a switch to on/off the electro magnet. The worker switch on the electromagnet the electromagnet get magnet. The electro magnet collect the scrap, the worker moves the vehicle in the required area to collect the scrap in the workshop (or) industry with the help of the keypad which fix in the robot which moves front, back, left, and right. After completing the collecting process the collected scrap is poured to the dust bin by just switch off the electro magnet.
- The electro magnet in this equipment is easily controlled through the keypad. This equipment is less cost and good efficient.

- This equipment is well suitable for small scale industries and workshops.







1.DC MOTOR

TECHNICAL DATA:

Voltage =12v DC

Rpm =10

Watts =18w

Length of the motor =170mm

Outer dia of motor =Ø 60mm

Quantity =2

4.SHAFT

Length of the shaft =160mm

Dia of the shaft =10mm

5.SPUR GEAR

Dia of gear =ø30mm

Thickness =10mm

Material =nylon

MERITS

ADVANTAGES

- Easy to operate
- Less maintenance
- Less power requirement
- Low cost
- Good efficient

DISADVANTAGES

- Vehicle is operated by manually

APPLICATION

The various physical properties concerned are melting point, thermal Conductivity, specific heat, coefficient of thermal expansion, specific gravity, electrical conductivity, magnetic purposes etc.

The various Mechanical properties Concerned are strength in tensile, Compressive shear, bending, torsional and buckling load, fatigue resistance, impact resistance, eleastic limit, endurance limit, and modulus of elasticity, hardness, wear resistance and sliding properties.

The various properties concerned from the manufacturing point of view are,

- Cast ability
- Weld ability
- Surface properties
- Shrinkage
- Deep drawing etc.

2. Manufacturing case:

Sometimes the demand for lowest possible manufacturing cost or surface qualities obtainable by the application of suitable coating substances may demand the use of special materials.

3. Quality Required:

This generally affects the manufacturing process and ultimately the material. For example, it would never be desirable to go casting of a less number of components which can be fabricated much more economically by welding or hand forging the steel.

4. Availability of Material:

Some materials may be scarce or in short supply. It then becomes obligatory for the designer to use some other material which though may not be a perfect substitute for the material designed. the delivery of materials and the delivery date of product should also be kept in mind.

5. Space consideration:

Sometimes high strength materials have to be selected because the forces involved are high and space limitations are there.

6. Cost:

As in any other problem, in selection of material the cost of material plays an important part and should not be ignored.

Some times factors like scrap utilization, appearance, and non-maintenance of the designed part are involved in the selection of proper materials.

CONCLUSION

- The project carried out by us made an impressing task in the field of production and manufacturing industries.

- It is very useful for having the scrap collecting vehicle, because they need not take any risk for park the vehicle.

- This project will reduce the cost involved in the concern. Project has been designed to perform the entire requirement task at the shortest time available.