DT/03/08/24 THE BATTERY Chapter-1

Introduction

1→ The "battery" is one of the most important components of electrical system and may be described as the heart of the electrical system of a vehicle.

It performs following function:

1→ To supply current to operate the starting motor and ignition system when the engine is being started

2.→ To act as voltage stabilizar by supplying currents for the lights, radio and other electrical accessories when the alternator is not handling the load.

3.→ The battery is an electrochemical device.

4.→ This means it uses chemical to produce electricity.

5.→ The amount of electricity it can produce is limited.

6.→ As the chemical in the battery are 'used' up the battery runs down or is discharged.

5. → It can be recharged by supplying it with electric current from a battery charger, or from the vehicle alternator.

6. → The "used up" chemical are then returned to their original condition. So the battery become recharged.

* → The term cell and battery are used interchangeably by incorrectly.

* → A battery means a group of interconnected cells. Thus a cell is one unit of battery.

* → Types of Batteries

The batteries are of the following

1. Lead acid battery → Nickel-iron type
2. Alkaline battery → Nickel-cadmium type
3. Zinc-air battery

* Types of automotive batteries

(i) → This battery has caps which can be removed to check the battery state of charge and to add water if need.

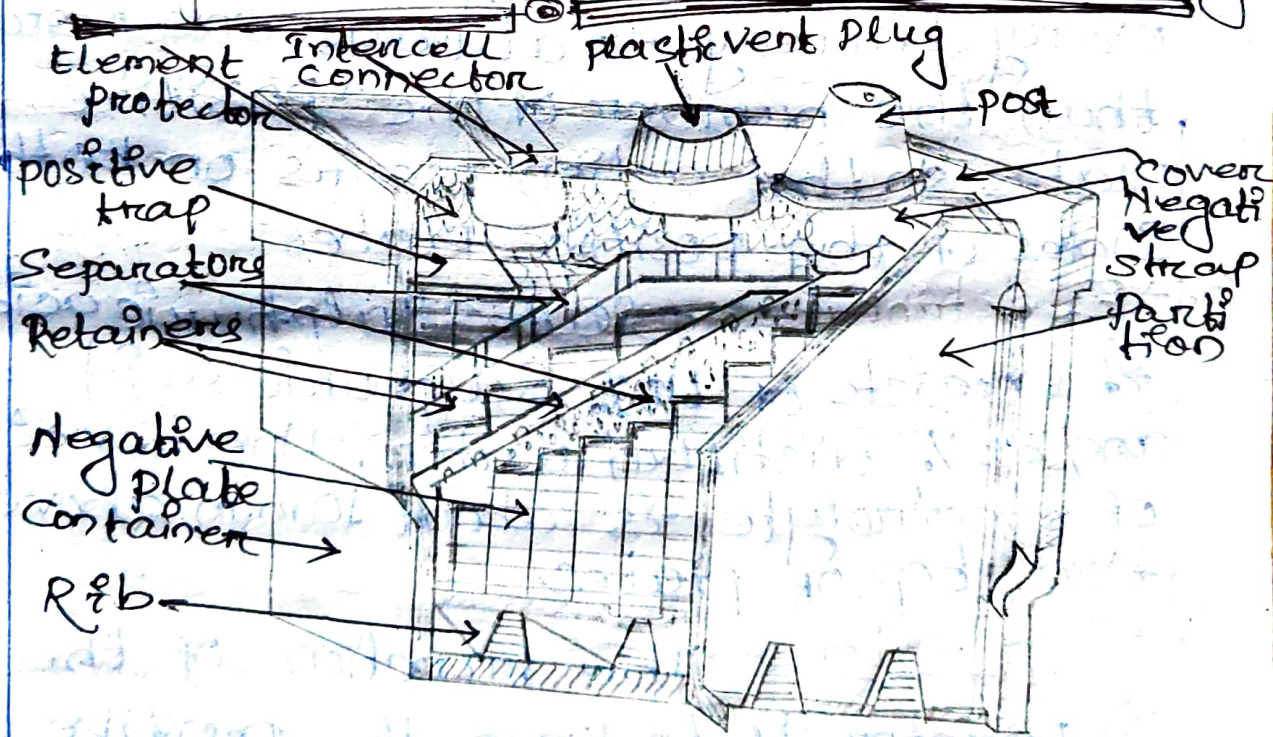
(ii) → This type of battery with side terminal is a sealed Maintenance-free type and requires no water

The charge indicator in the top shows the state of charge of the battery.

* Lead Acid Battery

1. → The lead acid battery is most widely used on all passenger cars.
2. → Due to it's economical and eletrical advantages, the lead acid battery is in general use for many purposes. The most common of which is for starting, ignition and lighting the Modern automobile.

* Components of a lead acid battery



Lead Acid battery

1. Positive plate:- PbO_2 (lead peroxide) deposite on a grid frame of antimony lead alloy. (when the battery is in fully charged condition. the positive plate is dark brown in colour.)

2. → Negative plate:- Pb (porous spong lead) deposited on a grid frame (similar to the grid frame of positive plate) when the battery is in charged condition, the negative plate is grey in colour.

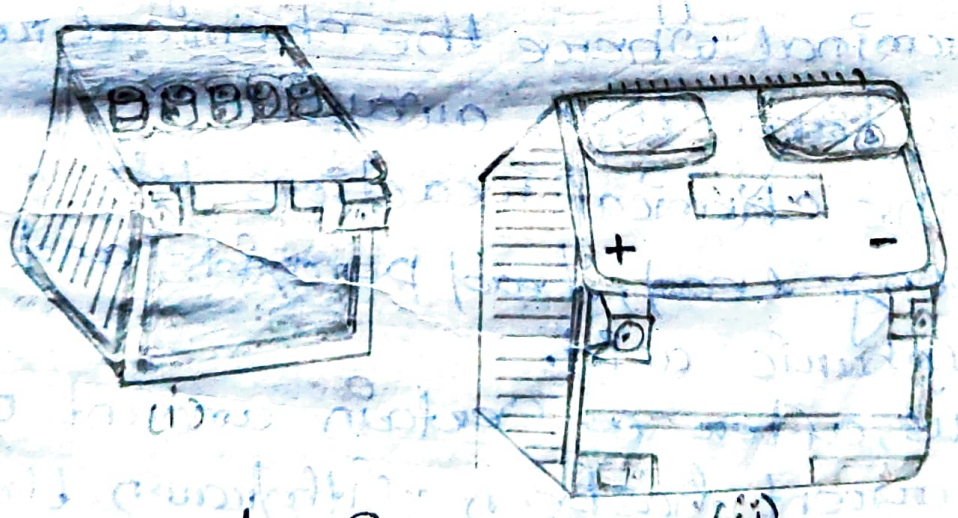
→ The Number of negative plates in every battery is always one more than the number of the positive plates so that action occurs on both sides of the positive plate.

3. → Electrolyte:- Dilute Sulphuric acid it consist of 40% Sulphuric acid and 60% distilled water. the level of electrolyte is about 10 m.m above the top of plates.

4. → Separator:- The function of the separator is to keep the positive and negative plates electrically apart. The separators are usually made of specially treated wood,

hard, rubber, resin, impregnated fibre alone or in combination with rubber or mats of glass fibres.) Some batteries it's have separators Made of polyvinyl chloride or polyethylene saturated cellulose.

5. → Container :- The container is Made of hard glass or hard rubber or other Acid resistant Materials. It Must withstand extreme of heat and cold as well as Mechanical shocks and Must be resistant to the absorption of Acid.



(i) (ii)

Charging indicator

→ No green spot all dark (Battery) need charging

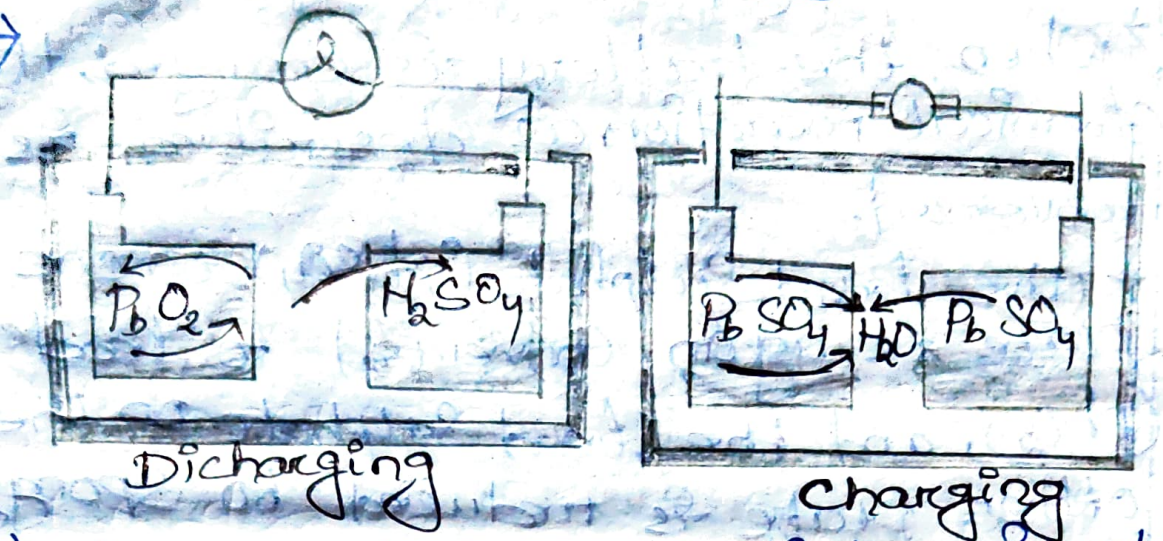
Green spot in dark area Battery OK

→ Area all light (Battery) need replace

CHEMICAL REACTION

1. → The chemical reactions take place between the three chemicals in the battery.
2. → In the presence of Sulphuric acid the electron from one Group of plates collect on the other group of plates.
3. → This transfer of electrons is continue until there is sufficient imbalance of electrons to create a 2 Volts pressure between the two ~~groups plates~~ terminal are connected by a circuit the electrons (current) will flow.
4. → They flow from terminal where the chemical reaction has collected them through the circuit to the terminal where the chemical reaction has taken them away.
5. → The chemical reactions use up the Sponge lead, lead peroxide and Sulphuric acid.
6. Thus, after a certain amount of current has been withdrawn, the battery is discharged or dead or run-down.
7. When it is discharged, it is not capable of delivering any additional current.

8. → It may then be recharged.

9. → 

9. → when the battery is discharging the Sulphuric Acid (H_2SO_4) is broken up into two parts - hydrogen (H_2) and Sulphate (SO_4).

10. → The hydrogen is liberated at the lead oxide (PbO_2) which combines with parts of Sulphuric Acid to form lead Sulphate ($PbSO_4$) and water (H_2O).

11. → The Sulphate is liberated at the spongy lead plates (Pb) and combines with them to from lead Sulphate ($PbSO_4$).

12. → During this process the electrolyte becomes dilute because of the absorption of SO_4 by the Sponge lead plates.

$$\underset{\substack{\text{lead peroxide}\\(+)}}{(PbO_2)} + \underset{\substack{\text{Sulphuric Acid (-)}\\\text{Electrolyte}}}{2H_2SO_4} + \underset{\text{lead}}{Pb} = \underset{\substack{\text{lead Sulphate}\\(+)}}{PbSO_4}$$

$+2H_2O$ + $PbSO_4$ + Q
Water lead sulphate (−) Energy

13. → When the battery is charged, the chemical reaction as described is reversed.

14. → The Lead Sulphate ($PbSO_4$) on one plate is again converted to lead (PbO_2), and the lead sulphate on the other plate is reduced to spongy lead (Pb).

15. → The electrolyte becomes concentrated because of increased amount of Sulphuric Acid.

* Thus, the battery cell is a means of converting electrical into chemical energy during charging and chemical energy into electrical energy during discharging.

* CHARGING PROCEDURE

1. → Check the level of the electrolyte in the battery. If it is below the top edge of the plates, add more electrolyte so level is about 10m.m above the top edge of the plates. Also note the Specific Gravity and temperature of the electrolyte.

2. → Connect the negative and positive terminals of the battery to the respective terminals of the battery Charger. The battery charger is simply a source to supply direct Current.

3. → Adjust Value of charging Current. This is usually kept half, in amperes, of the number of plates in the cell.
Ex → 17 plates battery, the charging Current would 8.5 amperes.

4. → Continue the charging till the Passing begins, then decrease the charging Current and continue till there is no further increase in the Specific gravity of the electrolyte and cell voltage reading from three hours.

5. → If the temprecture of the electrolyte during the charging process exceeds 45c discontinue the charging for sometime so that it cools to normal temprecture then again start the charging

6. → Check the specific gravity of the electrolyte hourly during the chargin process.

7. → Avoid overcharging which Many damage the battery, particularly the positive plates.

CHECKING THE STATE OF CHARGE

* Specific gravity of the electrolyte is the most common check for the state of battery charge. Cell voltages is also measured to indicate the state of battery charge. Following readings of specific gravity are the general indication for the charged battery.

* **BATTERY CHARGING :-**

→ Necessity for recharging a battery.

1. The battery under normal operation is kept fully charged by the car generator.
2. → The rate of changing from the generator to the battery depend upon the battery, i.e. high rate will be there for discharge battery and and low rate for a charge battery.
3. → Normally, there is no necessity for changing battery from external source, but under certain condition the need for recharging a battery arises:-

(i) when the vehicle is parked for long periods with parking lights on;
(ii) use of accessories such as heater, fan car radio when the vehicle is stationary
(iii) frequent use of car starter that draws heavy current.

* Methods of battery charging

followings three Methods

1. Constant current charging
2. Constant Voltage or potential charging
3. Quick charging } Slow charger Methods
4. Only direct Current (D.C) used for charging battery.

* Constant Current charging

*1 In the slow charge Method battery is supplied with a relatively small amount of current Ex → at a relatively slow Rate (1 ampere per positive plate or in amperes equal to 70% of his ampere-hour rating) for a long period depending on how much battery is discharged.

2. In the quick charger Method the battery is supplied with a high current (as much as 100 temp 6-volt battery and 50 amperes for 12-volt battery) for a sort period of time (about 1 hour)

2. In this Method, the current input to the battery is adjusted to the value as recommended by the battery Manufacture.

* The charging is continued until the battery is gassing freely and there is no rise in gravity for two hours.

* **Constant current chargers :-**

→ usually employ a "rectifier" to convert A.C to D.C and a flow stat to adjust current flow to the battery.

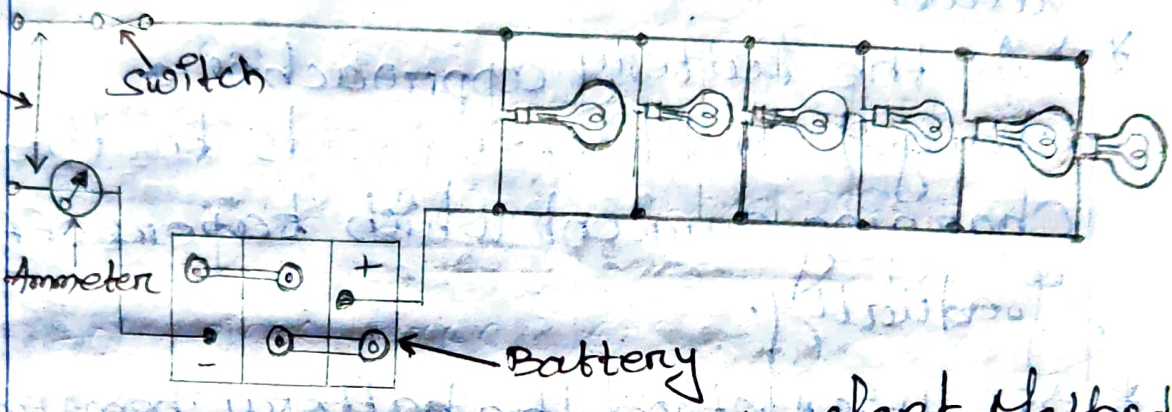
(i) → Remove filler plugs, check electrolyte level and add distilled water if the level is low.

(ii) connect battery to the chargers, If more than one battery is to be charged, Connect the batteries in "Series" upto capacity of charger.

(iii) → Switch on the charger and Adjust the charging rate.

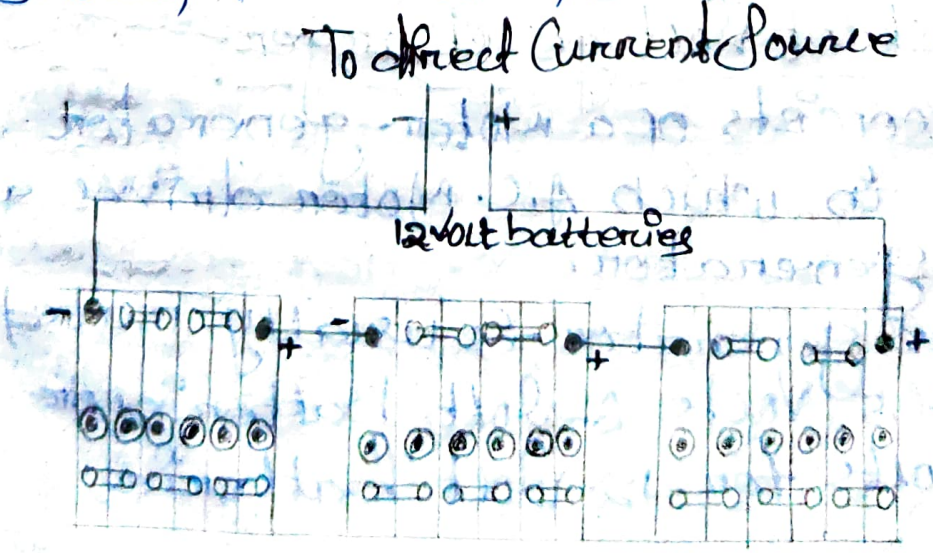
(iv) → check gravity of batteries by means of 'hydrometer' every two hours until there is no rise in Specific Gravity.

(v) → If battery boils violently or overheats, remove it from the charging line and check up the defect.



→ Battery charging by constant Method

1. When charging on series (constant current) line, connect the batteries in series and charge at the rate which is safe for smallest battery.
2. → Continued charging at high rate will result in high temperature, which should be avoided.



2. Constant voltage or potential charging

• → In this Method, the charging voltage is kept constant at a constant value.

* → As the battery approaches a charged condition, it resists to the charging current which tapers off gradually.

* → In this Method the battery tempreture remain within limits,

* → If the tempreture of battery electrolyte rises high, battery resistance shall fall down and the battery shall be damaged due to overcharging.

* → In such a case the battery should be remove from the charging line to avoid damage.

* constant voltage charger:-

1. → It consists of a Motor-generator set in which A.C. Motor drives a D.C generator.

* → The generator is usually rated at 7.5 Volts 6-Volt batteries are 15 Volts for 12-Volt batteries

followed charge batteries with Constant Voltage charger.

(i) → Remove filler plugs.

(ii) → check electrolyte and distilled water if the level is low.

(iii) → Connect battery to the charger. If More than one battery is to be charged, Connect the batteries in "Parallel"

(iv) → Keep watch on battery boiling and tempreture as there is posibility of overheating in this Method. If the battery boils or overheats, remove it from the line.

(v) → Stop charging when the gravity shows no further rise after an hour of charging.

3. Quick charging :-

1. → In this Method, the battery is supplied with high current as Much as 100 amperes for 6-Volt battery and 50amp for 12-Volt type battery for a short Period of time.

2. → The battery can be substantially charged or boosted but for bringing a battery to a fully charged Condition the charging cycle Must be Completed

by charging at a low normal rate.

* Quick chargers or booster

1. → The supply current to the battery at high rate and work on the theory that the battery will be brought upto a charged condition before excessive battery temprecture are reached.

* → But as a rule the quick chargers can't bring a battery up to full charge in a sort time.

* → The battery can be substantially charged or boosted but for bringing a battery to a fully charged condition, the charging cycle must be completed by charging at a low normal rate.

- Quick charge following conditions exists with battery

(i) → If the electrolyte is discoloured with a brownish segment, the quick charging method may produce an internal sort and ruin the battery

(ii) → If the specific gravity readings are not uniform the cell showing

low reading may have an internal defect. During quick charging considerable heat developed may ruin the battery.

(iii) → If the has been badly overcharged then a battery may quickly fail if placed on quick charge.

(iv) → If the battery is badly sulphated then it will get overheated during quick charging. Such a battery requires charging half the normal shows charge rate from 60 to 100 hours to reconvert the crystaline lead sulphate into active material.

(v) → The cell voltage and colour of the electrolyte should be checked few minutes after the battery has been put on a quick charging method. If the voltage readings are not uniform within 0.2 volt or if the electrolyte has become discoloured with brownish sediment, the quick charging stop immediately. further charging of the battery may be continued by the slow charge method. open up and leak Acid.

4. → Leaking acid corrodes terminals and cables and makes high resistance battery connections, thereby weakening the battery power and shortening its life.

* → Hold-down on the other-end can be too tight, distort or cracks the container and loosen sealing compound, allowing loss of acid from the cells, and this may cause loss of battery capacity.

5. Excessive loads:- A battery should never be used to propel the car by the use of the starting Motor with clutch engaged except in a great emergency. This may produce extremely high internal battery temperature and damage the starting Method Motor.

6** Freezing of electrolyte

→ Electrolyte of a battery in various stages of charge will start to freeze at temperature indicated below

Sp Gravity at 27°C	freezing temprecture
1.280	−71°C
1.230	− 40°C
1.200	−26.5°C
1.150	− 15°C
1.100	−7°C

1. → This given temprecture indicate the approximate points at which the first ice crystals begin to appear in the solution.

* → The solution does not freeze solid until a lower temprecture is reached. Solid freezing of the electrolyte may crack the container and damage the positive plates.

* A 75% charge battery is in no dagger of damage from freezing.

* therefore keep batteries better than 75% charged. Specially in winter

* Battery Faults/Troubles

1. → Rapid Loss of electrolyte :- This can be caused by overcharging, solution of plates or the battery being fitted in a position exposed to excessive engine heat.

* Distilled water should always be used to topping up the correct level and proper gravity.

2. Sulphate plates:- Followings the reasons:,

(i) leaving the battery idle when discharged.

(ii) using a battery for long periods in an undercharged state.

* → Symptoms of Sulphation are a low specific gravity, high temprecture and voltage on charging, reduced capacity and low output. other cause may be insufficient electrolyte in the battery.

• → If Sulphation is not too severe it may be removed by giving the battery a slow charge for a period of two or three times the normal, otherwise the only remedy is to replave the battery.

3. Internal short circuit:-

→ This results from conducting Material lodging between positive and negative or from faulty or damaged Separation

that allow the plates to touch, resulting in a constant internal discharge of current. It also causes sulphation of plates.

* If the battery is otherwise in good condition the clean the battery.

4. **Open Circuit:-**

* → This defect can be there due to broken cell bridge to which the plates are welded or by a loose cell connector.
* It results in making the whole battery dead.
* → Sometime the fault is intermittent and it becomes difficult to locate it.

5. **Reversed Polarity:-**

→ This types of fault is not common. It is caused by one cell becoming discharge before the reminder, when the discharge current from other cells charge the faulty one in reverse direction. It results in the overall battery voltage being reduced.

* → The remedy is to give a long charge from an external source. It will revert the cell to its normal polarity.

6. Cracked Container or Jar:-

→ Cracks can be develop in the container due to Mechanical shock and vibrations when the car moves on a rough road. Cracks can also develop due to rough handling of the vehicle.

→ Two types of cracks may occur one on the outer wall of the container and other on the interior walls. The electrolyte will leak through the outer wall. A crack in the interior wall of cell will cause the short circuting of the plates of the two adjoining cells.

*→ It is worthwhile to replace the cracked container than to do any repair.

7. Deterioration of plates of the cells

→ The following factors can cause the deterioration of the plates of the cell and may damage them

(i) Very high specific gravity of the electrolyte.

(ii) Very high rate of battery charging

(iii) freezing of electrolyte in the container of the battery.

(iv) The level of electrolyte in the container is not proper one.

8. Mechanical faults:-

→ The Mechanical faults may be as follows:-

(i) Loose terminal posts, which require the fitting of a new cell top.

(ii) → Cracks in the cell tops or casing, which can be repaired using a Properitory battery Sealing Compound.

5 Electric Horn 22/08/24

* Construction

1) It Consists of a Laminated Magnet having a wound Core.

2) The armature is attached to a central spindle which is supported at one end by a guide spring.

3) The spindle is supported at the other end by a diaphragm

4) There is second diaphragm called the tone disc.

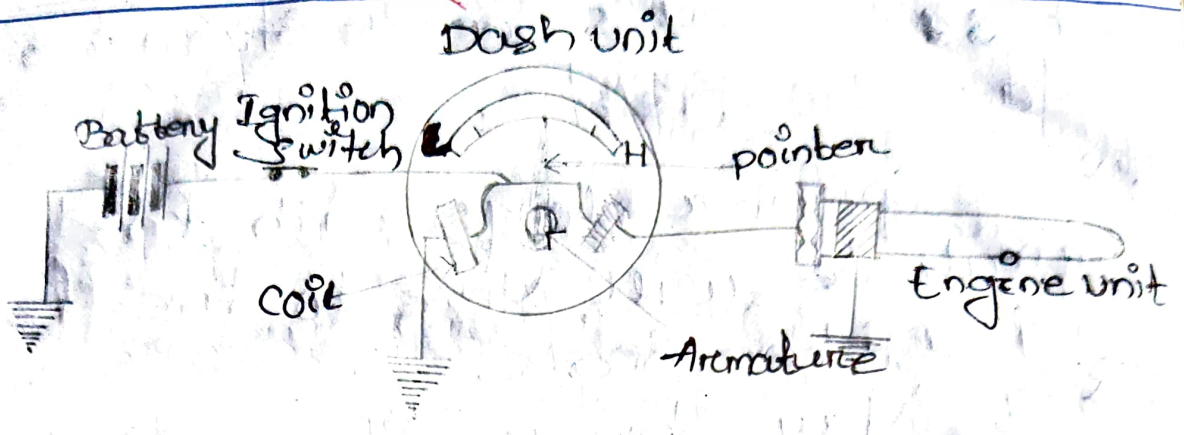
5) This disc is fitted only at its Centre.

6. In this horn system, there is a contact breaker, which is in series with the solenoid.

* Working

1. When the horn switch is pressed the current flows through the contact breaker and solenoid.
2. The circuit is completed through an earthed terminal
3. When this circuit is completed the laminated core is magnetised.
4. The magnet attracts the armature which then moves towards the magnet.
5. There is a protruding plate on the armature. This plate separates the contact points.
6. Immediately after, the magnetic flux collapses and the armature then returns to its normal position due to the action of the spring.
7. This cycle of operation takes places at a high frequency
8. Consequently vibration develop in the armature and the diaphragm is the sound of the horn is produced.

WATER TEMPERATURE GAUGE



1. The operating current is supplied from the battery through the ignition switch.
2. In this case, throughout the operation of the gauge, the current flowing through the left coil is constant whereas the current flowing through right coil changes, depending upon the resistance of the pellet.
3. When the water is cold, the battery current flows to the earth through the left coil.
4. This causes the pointer and the armature to swing to the cold side of the temperature scale.
5. When the water begins to heat up, thus heating the engine pellet, it's resistance diminishes thereby increasing the current through the right coil.

6. this results in a stronger Magnetic field.

7. → the pointer along with the armature will Move to the hot end of the Scale.

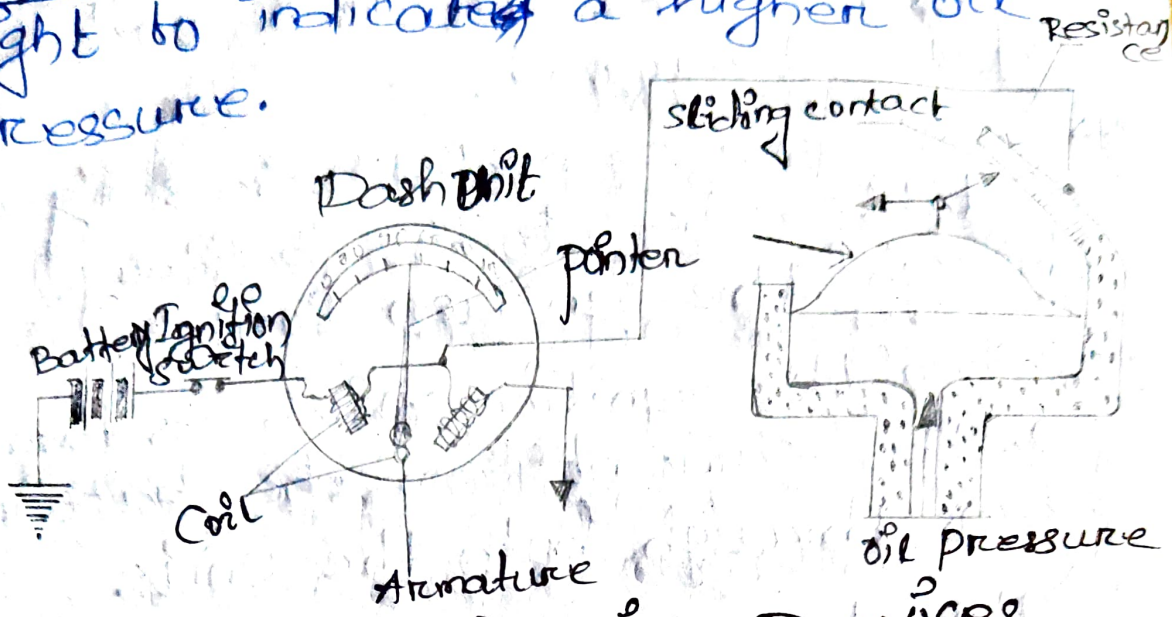
8. → It May be remembered that the armature responds to the resultant of the two Magnetic pulls.

* Oil Pressure Gauge

* → It consists of two units, namely the dash unit and the engine unit

1. → A Variable resistance is incorporated in the engine Unit.
2. → An increase in the oil pressure causes the diaphragm to get pushed outward.
4. → This results in increase in the resistance at the engine unit, thus Making the right-hand coil of the dash unit relatively Magnetically Stronger then the left-hand coil.
5. → consequently, the armature and the pointer swing towards the

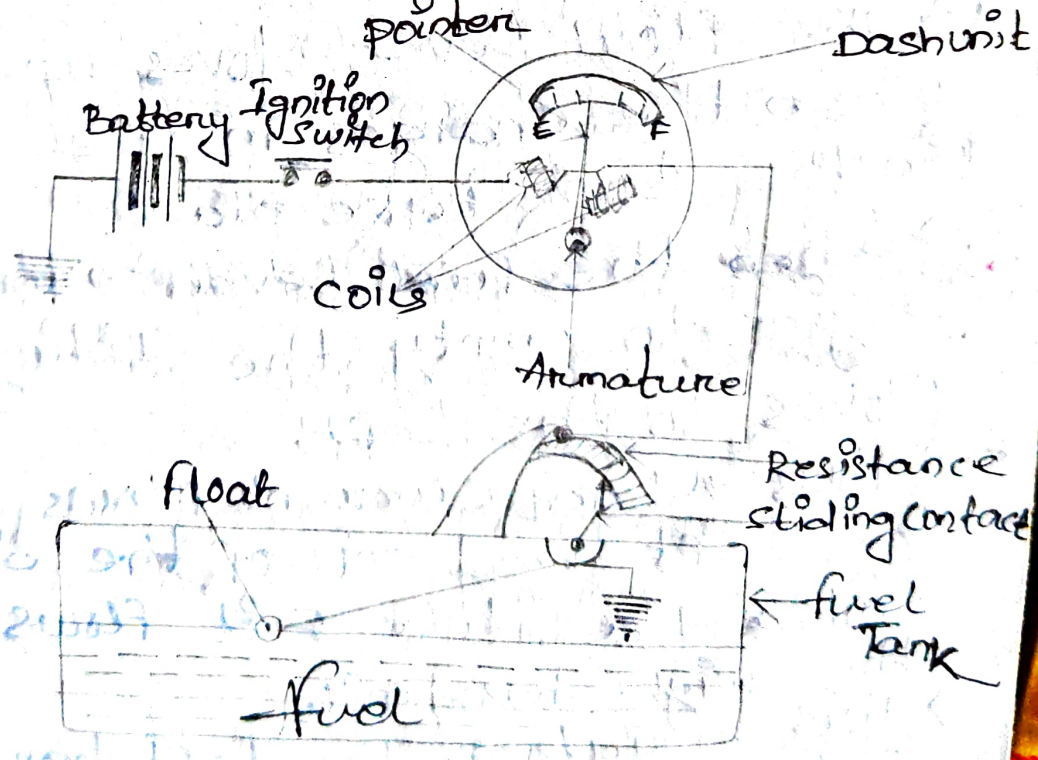
right to indicated a higher oil Pressure.



*Indicating and Warning Devices

FUEL GAUGE

Balancing Type fuel Gauge



1. → It has two unit's, the dash unit and the tank unit.

1. → These are connected series by a suitable wire to the battery through the ignition switch.

2. → When the ignition switch is turned on, the current from the battery flows through both the units.

3. → The tank unit consists of a float mounted at one end of the hinged arm and a sliding contact at the other end. The sliding contact moves along the resistance.

4. → The float lever moves up or down when the changes in fuel level in the tank take place.

5. → When the fuel level in the tank begins to empty the sliding contact moves to the left.

6. → Thus more current flows through the left hand coil of the dash unit, and a little of it flows through the right-hand coil.

→ This results in the left-hand coil being magnetically stronger than the right-hand one.

7. → The armature along with the pointer is moved towards the left side thus indicating a low fuel level in the tank.

8. → on the other hand, when the fuel level in the tank is high, the float moves up thus making the sliding contacts to insert most of the resistance into the circuit.

9. → Now most of the current that flows through the left-hand coil also flows through the right-hand coil.

→ The right hand coil is relatively stronger and this causes the armature and pointer to swing to the right, thereby indicating a high fuel level in the tank.

* Thermostatic Type fuel Gauge

* In this case a thermostatic blade is provide in the dash unit.

→ The tank unit has the resistance and sliding contact.

1. → The float along with the lever moves the sliding contact along the resistance, thus changing the intensity of the current flowing through

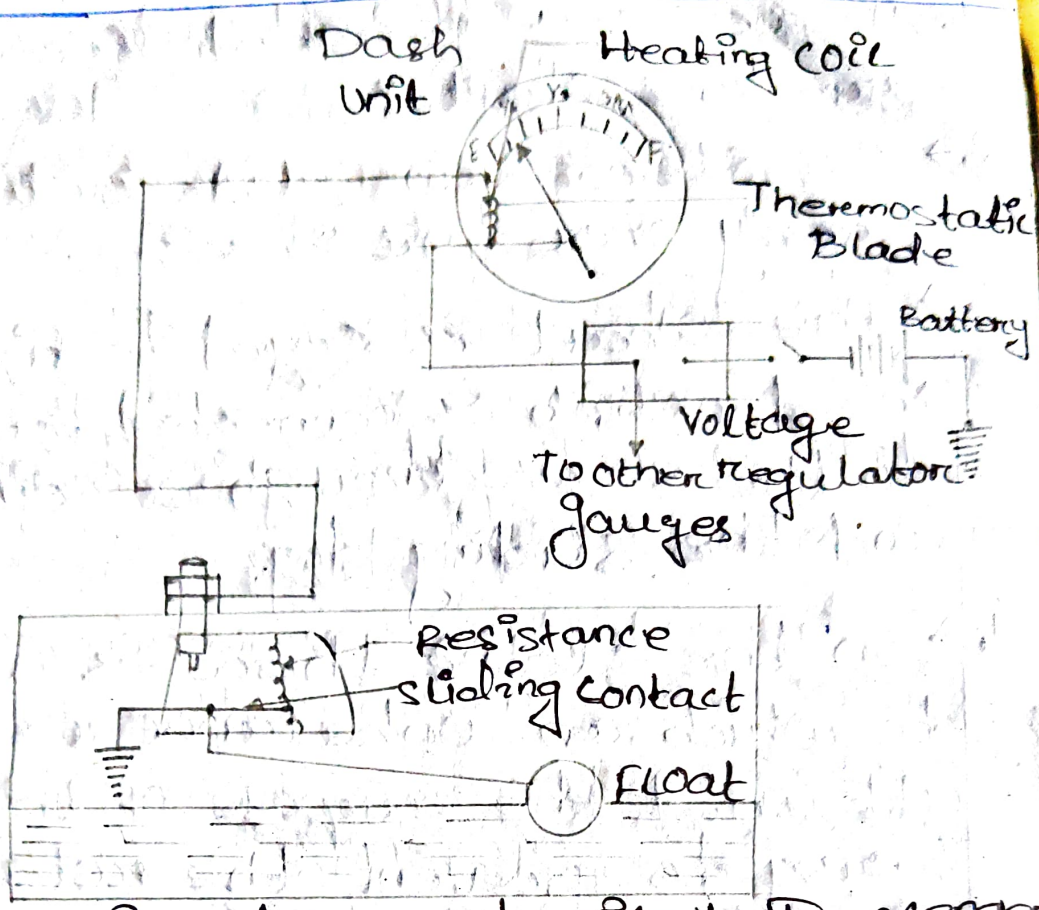
heating of the dash unit.

2. → When the fuel level in the tank is low, most of the resistance is inserted in the circuit, thus allowing heating of the coil.

3. → The thermostatic blade is less warped and hence the pointer swings to a lesser extent, thus showing a low fuel level.

4. → (When the fuel level in the tank is high, the contact moves up) thus taking out resistance from the circuit and causing more heating of the coil due to more current flow in it.

5. → This warps the blade to a greater extent and swings the pointer towards the right side of the scale, indicating a higher fuel level.



Wiring Circuit of a typical Passenger lighting System.

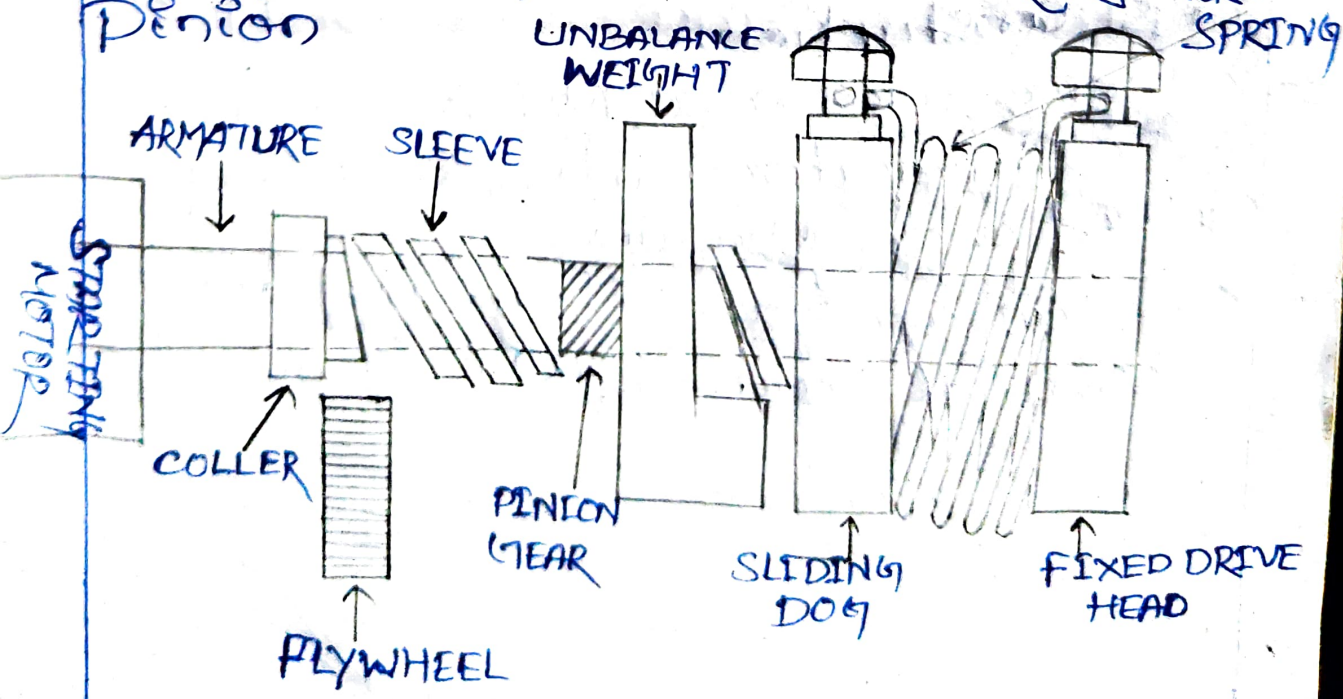
Thursday Standard Bendix Drive/07/12/09/24

1. There is a threaded sleeve on the armature shaft.
2. The sleeve can slide or turn freely over the shaft.
3. The shaft is keyed to fixed drive head which is connected torsionally to the sleeve through a coil spring and the sliding dog.
4. On the sleeve there is a pinion to which an unbalance weight is attached the purpose of the weight being to prevent the rotation of the penion on the sleeve threads
5. When the Motor start, the armature shaft rotates causing the sleeve to rotate and because the pinion can't rotate due to the unbalance weight, it Moves axially towards the Motor till it is engaged with flywheel.
6. Further Movement of the pinion is prevented by the collar attached on the sleeve and because of this pinion has to start rotating.
7. At it is also in Mesh with the engine flywheel the flywheel is rotated and the engine starts.

8. → When the engine start, it is the flywheel that rotates the pinion and because of its bigger size, the flywheel rotates the pinion Much faster than the armature has slowed down due to releasing ~~result that the~~ of the self-starter switch, with the result that the pinion is backed out of Mesh with the flywheel.

9. → An important precaution with this and other types of inertia drives is that the pinion and the sleeve should not be lubricated.

10. → Lubrication causes the dirt to accumulate on the sleeve and pinion teeth which causes sticking of Pinion



Saturday (DC Generator) 28/09/2024

* What is a DC Generator

A DC Generator is an electrical Machine whose Main function is to Convert Mechanical energy into electricity.

2 → when the Conductor slashes Magnetic flux, an emf will be generated based on the electromag-netic Induction Priciple of faraday's laws.

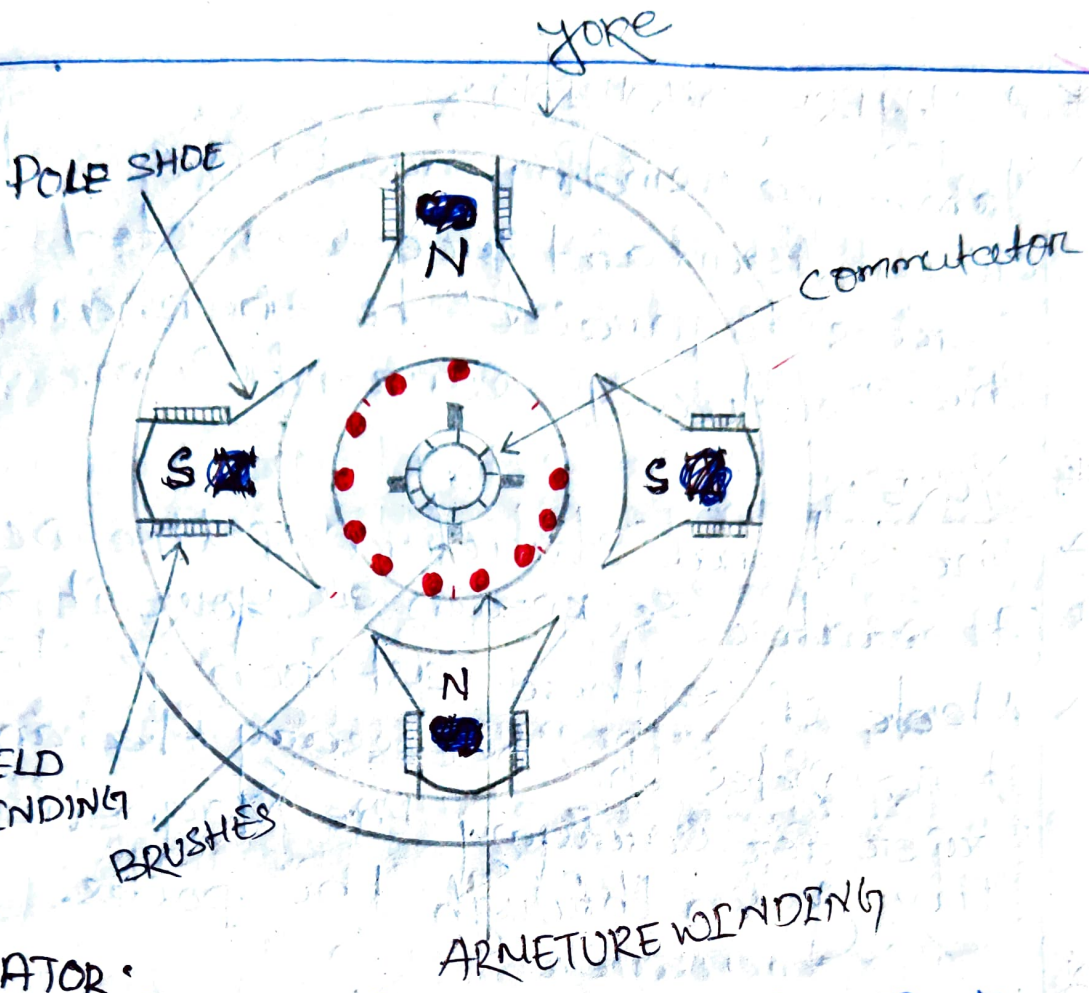
3 → This electromotive force can cause a flow of current when the conductor circuit is closed.

* Parts of a DC Generator

1 → A DC Generator can also be used as a DC Motor without changing it's construction.

2 → there fore a DC Motor otherwise a DC Generator, can be generally called a DC Machine.

3 → Below we have Mentioned the essential part of a DC Generator



* STATOR:-

1) The Main function of the stator is to provide Magnetic field where the coil spins.

2) A Stator includes two magnetic opposite polarities facing each other.

3.) There Magnets are located to fit in the region of the rotor.

* ROTOR:-

A rotor in a DC Machine includes slotted iron laminations with slots that are stacked to shape a cylindrical armature core.

The function of the Lamination is to decrease the loss caused due to eddy current

ARMATURE WINDINGS

→ Armature windings are in a closed circuit form and are connected in series to parallel to enhance the produced current sum.

YOKE:

→ The external structure of the DC generator is known as yoke. It is made of either cast iron or steel. It provides the necessary mechanical power for carrying the magnetic flux given through the poles.

POLES:-

→ The function of a pole is to hold the field windings. These windings are wound on poles and are either connected in series or parallel by the armature windings.

POLE SHOE

→ Pole shoe is mainly utilized for spreading the magnetic flux to prevent the field coil from falling.

COMMUTATOR

→ A commutator works like a rectifier that changes AC voltage to DC voltage within the armature winding. It is designed with a copper segment

and each copper segment is protected from the other with the help of Mica sheets. It is located on the shaft of the Machine.

* BRUSHES

The electrical connections can be ensured between the commutator as well as the exterior load circuit with the help of brushes.

* HOW DOES A DC GENERATOR WORK

According to Faraday's Law

1→ Eletromagnetic induction, we know that when a current-carrying conductor is placed in a varying Magnetic field, an emf is induced in the conductor.

2→ According to flemings right-hand rule, the direction of the induced current changes whenever the direction of Motion of the conductor changes. Let us consider an armature rotating clockwise and a conductor at the left Moving upwards.

3→ When the armature completes a half rotation, the direction of the Motion of the conductor will be reversed downward.

DC Generator - Working principle :

Hence,

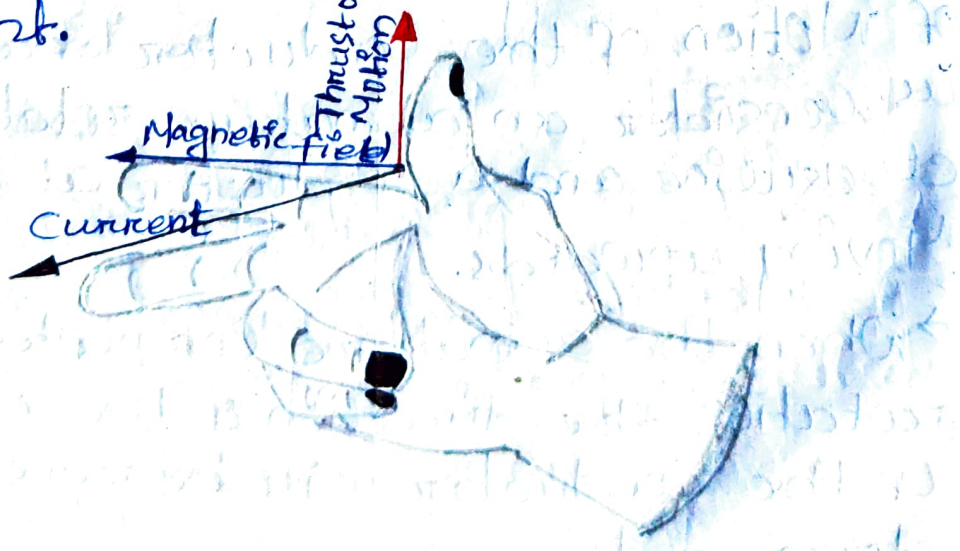
→ The direction of the current in every armature will be alternating. But with a split ring commutator, connections of the armature conductors get reversed when a current reversal

→ Therefore we get a unidirectional current at the terminals.

* FLEMING'S RIGHT HAND RULE

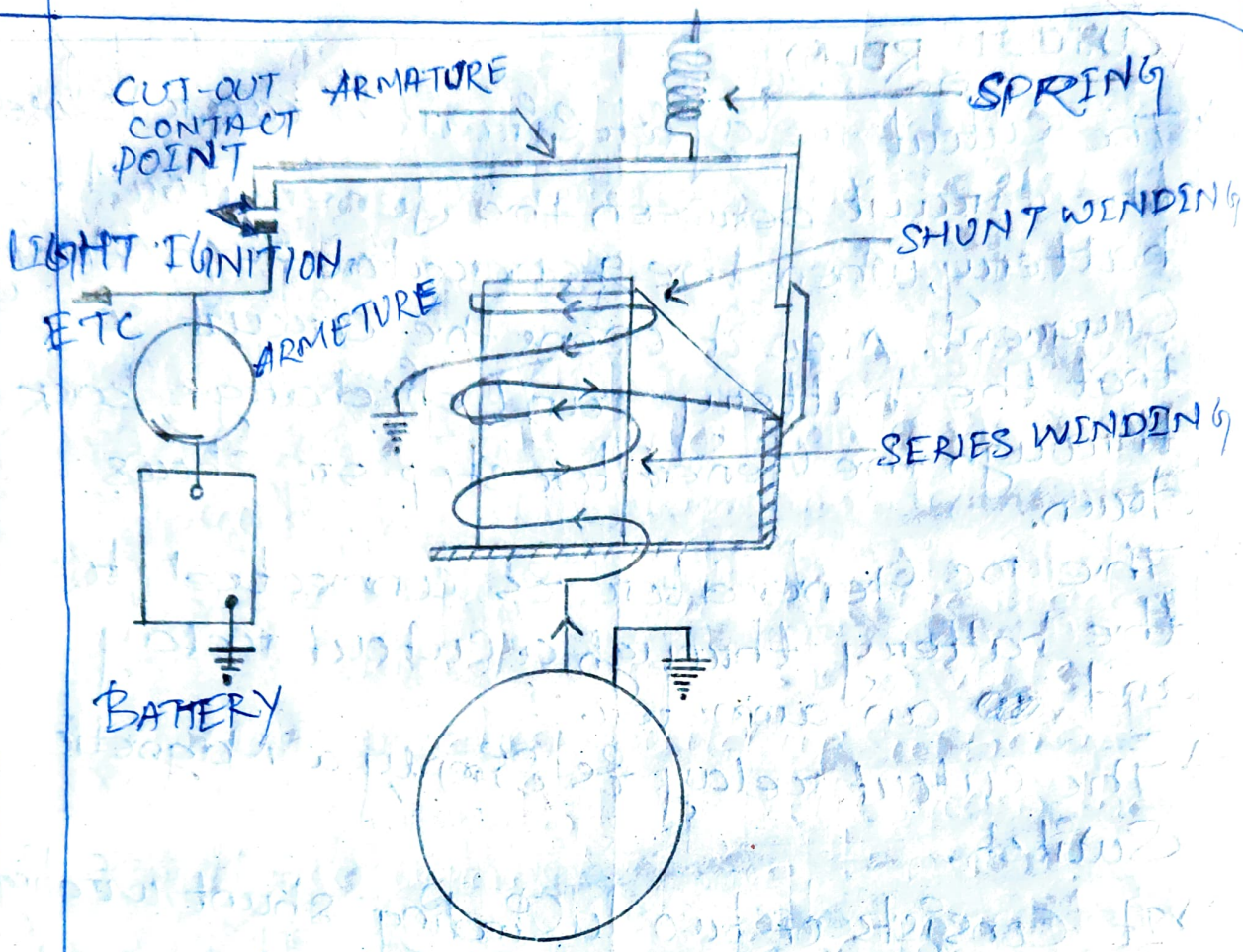
→ Fleming's right hand rule states that if arrange our thumb, forefinger and Middle finger of the righ- hand perpendicular to each other, then

→ the thumb points towards the direction of Motion of the Conductor relative to the Magnetic field, the forefinger points towards the direction of the Magnetic field and the Middle finger points towards the direction of the induced current.



CUTOUT RELAY

1. The cutout relay (or circuit breaker) closes the circuit between the generator the battery, when the generator is producing current. Also it opens the circuit so that the battery can't discharge back through the generator stop or shows down.
2. The DC Generator is connected to the battery through a cutout relay and an ammeter.
3. The cutout relay is simply a Magnetic Switch.
4. It consists of two winding shunt winding and series winding, assembled around a core a flat steel armature mounted on a hinge above the core.
5. The series winding consists of a few turns of fine wire.
6. The armature is connected to the battery through an ammeter by contact points.



* REGULATOR FOR D.C GENERATORS

DC Generators are Made by different Companies. Most famous of them are

1. Delco-Remy regulator
2. Auto-lite regulator
3. Ford regulator

⇒ Delco-Remy regulator, designed by Delco-Remy division of General Motors Corporation. It consists of a cutout relay, a voltage regulator and a Current regulator. It is connected to the Shunt Wound generator

and battery of the car electrical system.

* Voltage regulator :-

1) The Voltage regulator Maintains Practically Constant Voltage in the electrical current.

2) When the battery is low, it is supplied current at a high charging rate by the Generator and when the battery is charged the charge rate becomes slow.

3) The Voltage regulator Consists of two winding on a single core-a shunt winding of many turns of fine wire and a series winding of a few turns of heavy wire.

4) The shunt Voltage winding is connected at one end to the input side of the cut out and grounded to the other end.

5) The series or current winding is Connected at one to the field circuit of the generator and at the other end to the contact point of armature. The armature above the winding is hinged and held in upper position by a spring

6) It closes a set of contact points which complete the generator field circuit through the series winding to ground.

7) When the battery is in a low stage of charge the regulator does not operate.

8) When the generator voltage reaches a predetermined value (8-15.8) volts both the winding build up sufficient Magnetic strength that pulls down the armature against spring tension.

9) Thus, the contact points of the voltage regulator open, collapsing the Magnetic field of the series winding.

10) It also causes the field circuit to ground through the resistance.

11) This increased resistance in the generator field circuit reduces the current through it and hence the Magnetic strength.

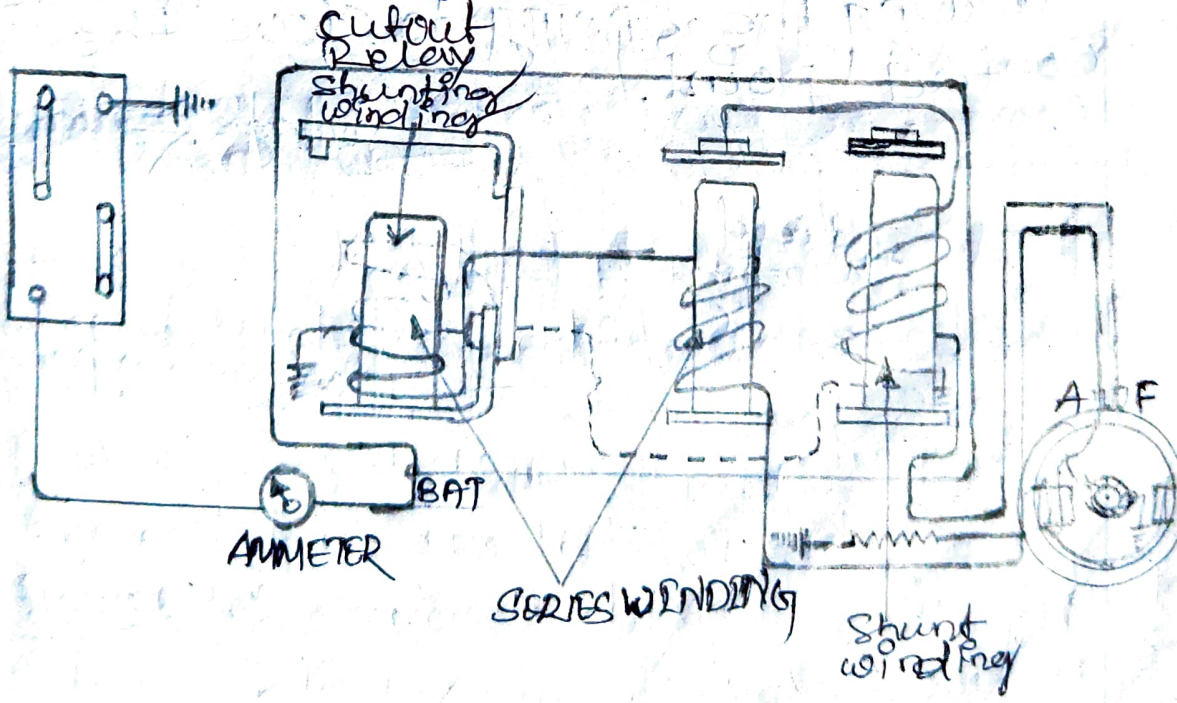
12) This cut down the generator output which reduces the current in the shunt coil.

13) Because the Magnetic field strength is reduced, the armature is again and the output increases.

14) The entire sequence is repeated many times a second causing the resistance to be inserted into and removed from the Generator field Circuit as many as 200 times a second.

15) This hold the Voltage to a constant value.

16) The constant voltage thus maintained becomes less and less able to send current into the battery because the battery voltage increase as it approaches a charged condition. Thus the charging rate is reduced in proportion to the condition of charge of the battery.

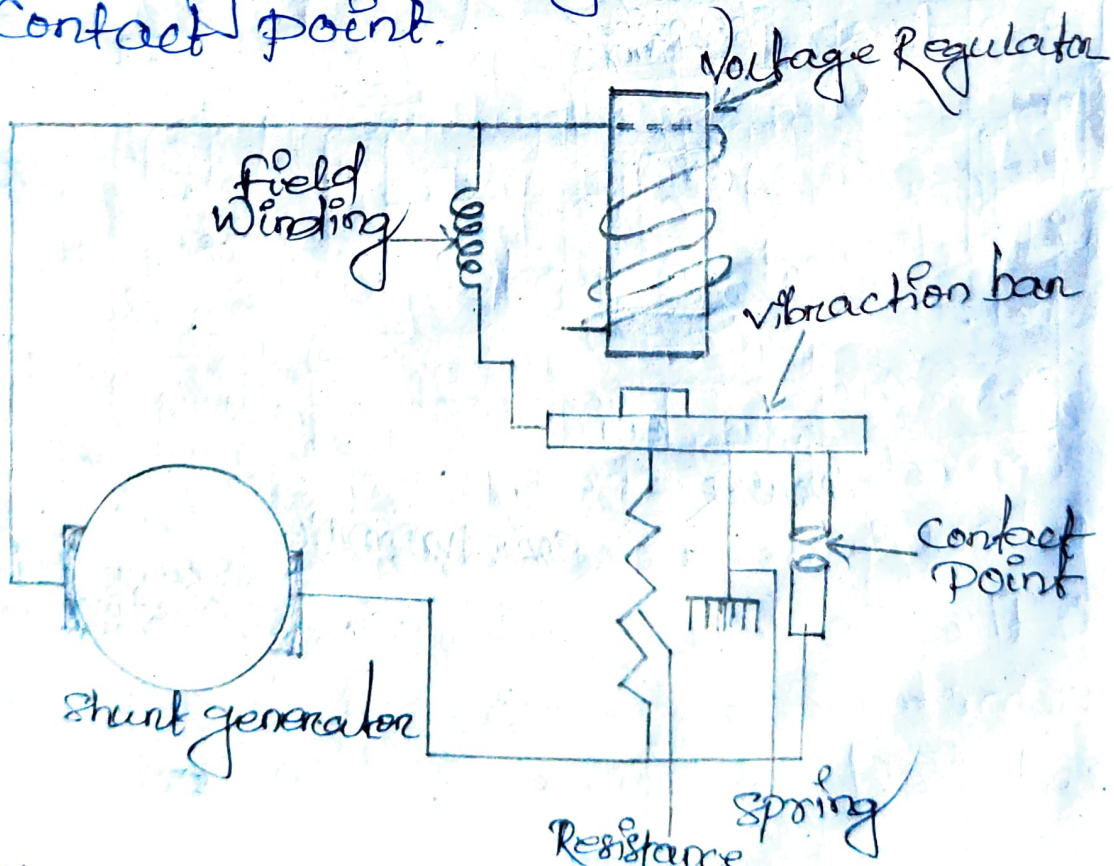


[Constant Voltage System]

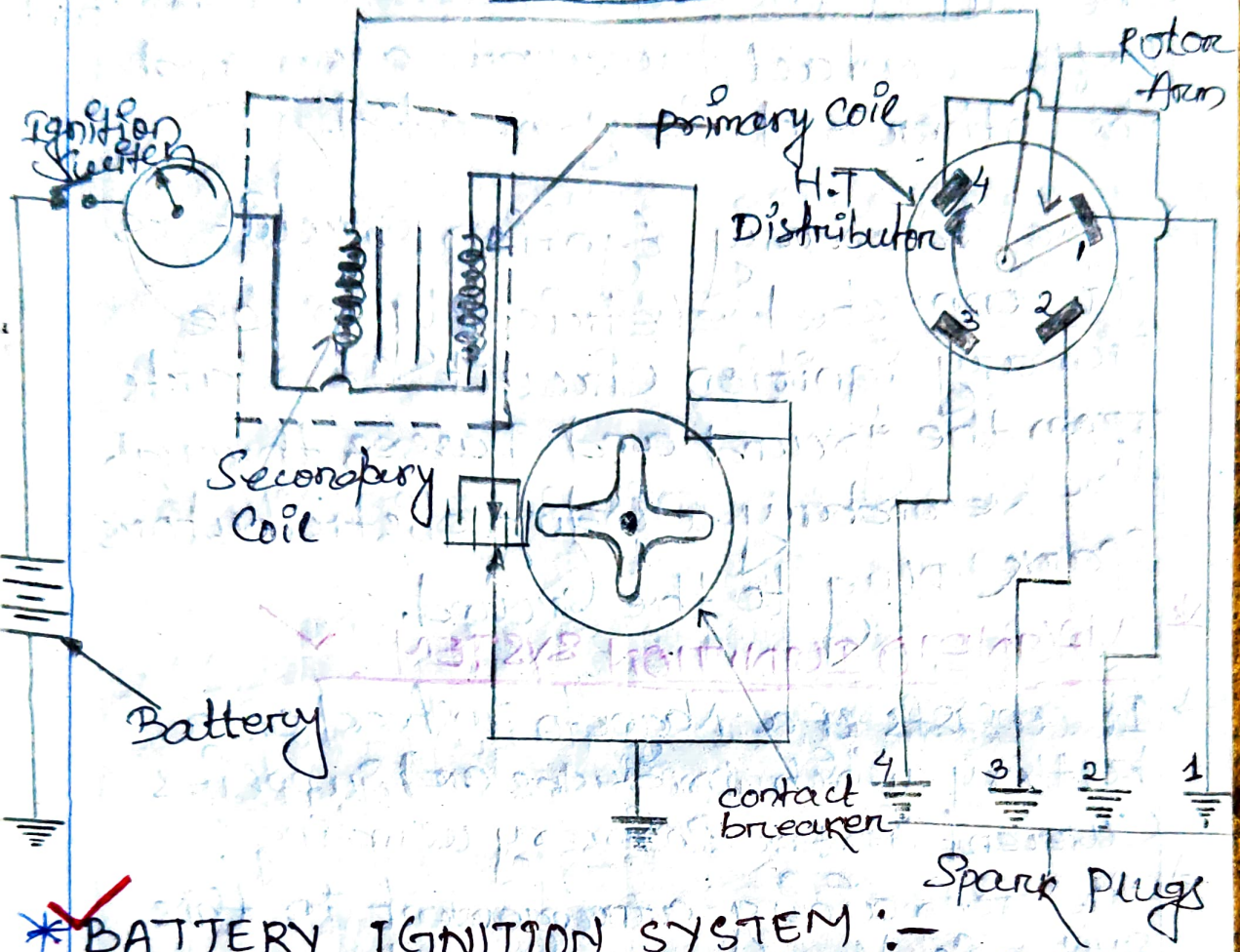
* The Voltage Regulator consists of an electromagnet wound with many turns of fine wire, which is excited by the armature current.

* When the predetermined value of voltage is reached, the vibrating bar attached with a Moveable Constant point is attracted by the Magnet inserting resistance in the generator field Circuit.

* This insertion of resistance in the field circuit increase the total resistance of the field Circuit, Increase the field circuit, thus dropping the armature voltage allowing the spring to close the Contact point.



BATTERY IGNITION SYSTEM FOR FOUR-CYCLINDER ENGINE



* BATTERY IGNITION SYSTEM :-

⇒ The battery ignition system for a four-cylinder engine. It consists of a battery, ammeter, switch ignition coil, condenser, contact breaker distributor and spark plug.

1⇒ The primary ignition circuit starts at the battery and passes through the switch, ammeter primary winding contact breaker points to the ground.

2⇒ A condenser is also connected in parallel to the contact breaker points.

3) one end of the condenser is connected to the contact breaker arm and the other end is grounded.

4) The Secondary Ignition Circuit is not connected electrically to the Primary Ignition Circuit. It starts from the ground and passes through the Secondary Winding distributors Spark Plug to the Ground.

* MAGNETO IGNITION SYSTEM ✓

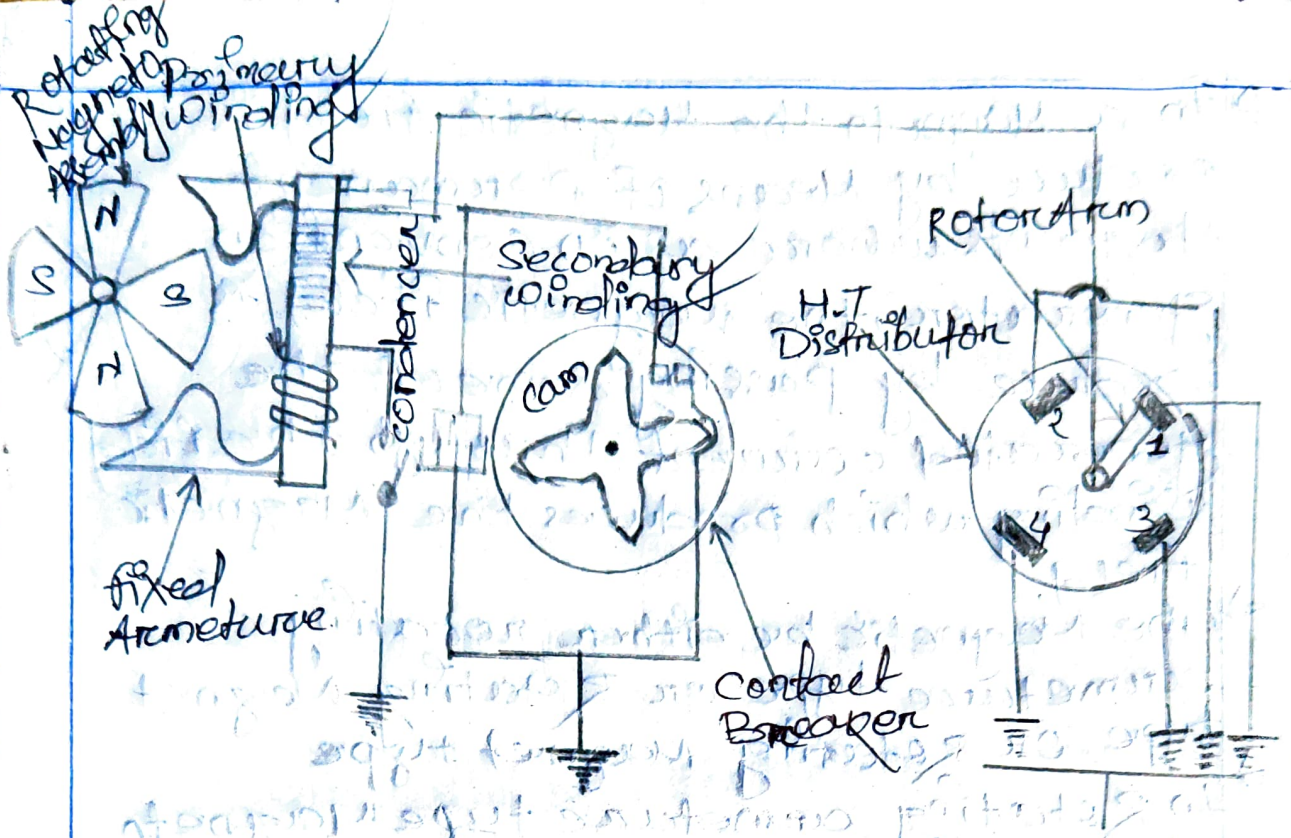
⇒ It consists of a Magneto instead of a battery which produces and supplies Current to the Primary winding.

⇒ The remaining arrangement in this system is the same as that battery Ignition System.

⇒ The Magneto consists of a fixed armature having primary and Secondary winding and a Rotating Magnetic Assembly which driven by the engine.

⇒ When the Magnet Rotates, Current flows in the Primary winding

⇒ The Secondary winding gives Voltage Current to the distributor, which distributes it to the respective Spark Plugs.



Magneto IGNITION SYSTEM

1* The Egnition coil steps up 6 or 12 Volts from the battery to the high tension voltage of about 20,000 to 30,000 volts required to jump the Spark at the Spark plug gap, which Egnite to combustible charge in the cylinder.

2* The rotor of the distributor revolves and distribute the current to the four Segments which in turn, Send it to the Spark Plugs.

3* The Purpose of the condenser is to reduce arcing at the breaker points and thereby prolong their their life.

⇒ In a Magneto the Magnetic field is produce by Means of permanent Magnents where as in convention generator, the Magnetic field is produce by passing some of the generated current through the field winding which produces the Magnetic field.

⇒ The Magnetic be either rotating armeture type or Rotating Magnet type or Rotating Magnet type

⇒ In Rotating armeture type Magneto the armeture carrying the primary and Secondary Winding and the Condenser, Rotates between the poles of a Stationary horse Shoe Magnet.

Battery Ignition / Magneto Ignition System

Transistore Thursday 01/24/2024

Transistorized coil ignition system (TCI)