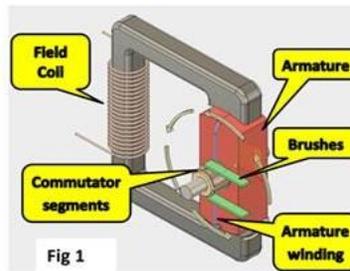


ELECTRICAL SYSTEM, INSTRUMENTS IN THE DASHBOARD & CONROLS

Dynamo:

Dynamos convert external power to electrical power. A simplified representation of a dynamo has the field coil, electric current flows through it, making the outer iron frame into an electromagnet. The iron armature completes the magnetic circuit, just like putting a nail across the end of a horseshoe magnet. The more current flowing in the field coil, the stronger the magnet until a maximum, dependent on the metal inside the coil, is reached. The armature winding is a loop of insulated wire joining the two copper commutator segments together. When the armature spins through the magnetic field, it generates a current in the winding—this current then goes via the commutator segments through the brushes and out of the dynamo.



Starting motor:

A starting motor is a powerful electrical motor that engages the car's flywheel in order to spin the crankshaft. As in all electric motors, the starter is composed of windings of wire that form loops, ending at the commutator segments. The armature coils are mounted on the motor's central shaft and the field coils are formed into four

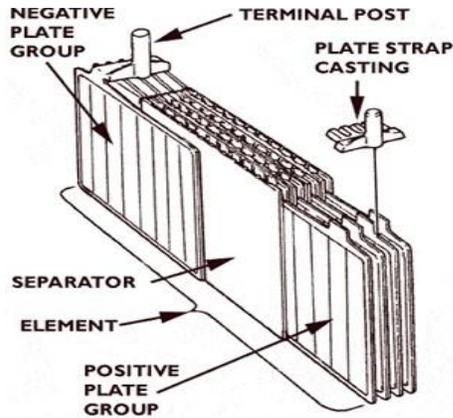
or more shoes, placed inside the steel frame of the starter. Brushes are used to create electrical contact to the commutator segments and when current is fed into two of the four brushes, it flows through all the loops of the armature and shoe windings and out the other two brushes. This creates a magnetic field around each loop. As the armature turns, the loop will move to a position where the current flow reverses. This constant reversal of current flow allow the armature and field coils to repel each other and spin the motor. The greater the current flowing in the coils, the greater the magnetic forces, and the greater the power of the motor.

The copper loops and field windings are heavy enough to carry a large amount of current with minimum resistance. Since they draw heavy amount of current, they must not be operated on a continuous basis for longer than 30 seconds. After cranking for 30 seconds it is wise to wait a couple of minutes to let the starter motor dissipate some of its heat. Starters heat quickly, so prolonged use can cause serious damage. A typical symptom of overheating starter motors is extremely slow, labored engine cranking.

Various wiring designs are used in starter motors and one of the most popular is the four pole, three winding setup. Two of the windings are in series with themselves and the armature. One winding does not pass through the armature, but goes directly to the ground. This Shunt Winding aids with additional starting torque. However, as the starter speed increases, the shunt still draws a heavy current and tends to keep starter speed within acceptable limits.

Battery:

The source of electricity in a tractor is the battery. A battery is an electrochemical device which converts chemical energy into electrical energy. Tractors use “lead-acid” batteries. A lead acid battery uses a series of lead dioxide plates for its positive terminal and porous, soft lead for its negative plates. All the plates are arranged alternately and submerged in a solution of sulfuric acid and water. The positive plate’s lead oxide is a compound of lead and oxygen. Sulfuric acid is a compound of hydrogen and sulfate radical, so the acid’s chemical designation is H_2SO_4 .



Chemically, when a battery is connected to an external load it begins to discharge. As that happens, the lead in the positive plate combines with the sulfate of the acid, forming lead sulfate in the positive plate. Oxygen in the positive plate combines with hydrogen from the acid to form water, which reduces the concentration of the acid in the electrolyte. Also, the pure lead in the negative plate combines with the sulfate, forming lead sulfate and making the positive and negative plates more alike in chemical composition. Electrons are released during this reaction, creating electrical current at a specific voltage.

Lights:

In the lighting system of tractor the lamps (bulbs) are used for warning purpose and lights for lamination purpose. The main lamps include the head lamps, the tail lamp, the number plate lamp, the direction indicator lamps and dashboard lamps. The complete lighting circuit consists of a number of individual circuits for a single lamp or a pair of lamps each with its own switch, live connection and earth connection.

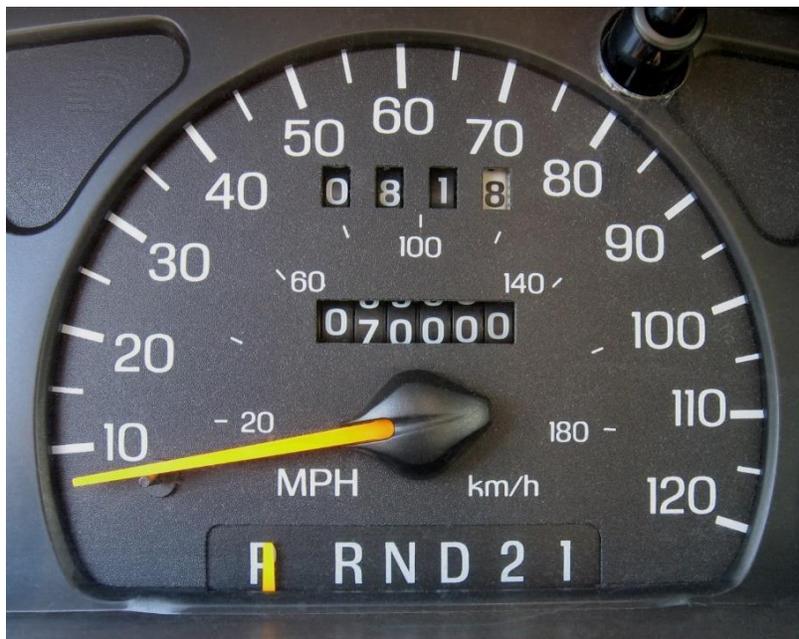
Horn:

The accessories like horn are connected parallel across the battery terminals. It has separate switch. Battery voltage travels through a high current wire through the relay to the horn and also through a smaller wire through the ignition switch to the relay's low current coil. Important thing is that horn circuit is always hot or live when the ignition switch is turned on and all that's needed is a path to ground.

Odometer:

Odometer is an instrument used for measuring the distance travelled by a vehicle. The device may be electronic, mechanical or a combination of the two.

Mechanical odometer: it starts with the transmission. The transmission system contains a small gear that measures the odometer advancing. This gear is connected to the speedometer drive cable. The other end of this cable is connected to the instrument cluster. The internal transmission gear turns when the engine is turned on, and the car starts moving. This internal transmission gear motion is conveyed to another set of gears linked to changeable digits by the connected drive cable. Thus, the counting begins from the right side of the group of members. The process continues till the distance travelled by automobile compels the left side digits to roll over. This counting process repeats until all the adjacent numbers touch their apex values. Then, all the digits are set back to zero, and it starts again.



Electronic odometers: it is also known as digital odometers. They depend on the automobile's electronics for establishing accurate mileage. They employ a special gear for changing the count seen on the dashboard. In addition, a magnetic sensor replaces the drive cable to track the gear turns in the transmission. The wires conduct the obtained signal to the car's onboard computer that interprets and converts the data into mileage count. The advantage of electronic odometers is that they provide better accuracy. In addition, no one can manipulate electronic odometers easily, hence giving an accurate count of the vehicle's mileage.

Odometers come with an additional trip meter called trip odometer. It helps the vehicle owners determine the mileage for any particular distance without interfering with the primary odometer reading.

Ampere meter:

The ammeter is also known as ampere meter and used for measurement of electric current and the unit of the current measured by this meter is ampere so it also called ampere meter.

The ammeter consists of a movable coil connected duly with the input terminals. This coil generates a magnetic field when current passes through it. This magnetic field, in turn, responds with a second field, resulting from a permanent magnet placed at the center.



Spring is set to counteract the torque generated by the interaction of these two magnetic fields. Hence, when the current increases, the spring also stretches according to the magnitude of the input current. A fine needle attached to the coil shows the reading. Wiring should be done in such a way that it ensure that the maximum current flows through the ammeter circuit.

Brake:

Brake is used to stop or slow down the motion of a tractor. It is mounted on the driving axle and operated by two independent pedals. Each pedal can be operated independently to assist the turning of tractor during the field work or locked together by means of a lock.

Differential lock:

Differential lock is a device to join both half axles of the tractor so that even if one wheel is under less resistance, the tractor comes out from the mud as both wheels move with the same speed and apply equal traction.

PTO lever:

The PTO is a switch or lever found on tractor and mowers and stands for Power Take Off that transfer an engine's mechanical power to another piece of equipment. This can be an electrical switch or mechanical engagement that takes engine power to operate the implement.

Hydraulic lever:

Hydraulics allow machines to transmit force from one point to another using an incompressible fluid. Hydraulic lever works on the same principle as the mechanical lever, a simple machine that functions like a seesaw. If one end of the lever is pushed down, the other end moves up. If the lever is well designed, then the machine can lift a very heavy object without much effort. This is especially true when the lever's fulcrum is close to its load.

Draft control lever:

The draft control lever raise or lower the implements as the draft of attached implement increases or decreases. The position of hand control lever, in effect, establishes the draft to be maintained.

The sensing device which actuates the hydraulic system to lower or raise the hitch system is located on either the lower links or upper links, depending upon the size of tractor. The load sensing system senses the load and sends a message to the

pump causing it to provide just enough pressure to overcome the load. Under no load condition, it works under less pressure.

Position control lever:

Position control lever is normally associated with a three point hitch system. It provides control of attached implement and allow the pre-select and to position the implement by the hand control lever. The relative position of the hand lever and hydraulic cylinder are identical. Within the limit of valve controlling the maximum pressure, the hydraulic cylinder will automatically move the implement to its pre- determines position and maintain it there, regardless of any leakage in the system.