

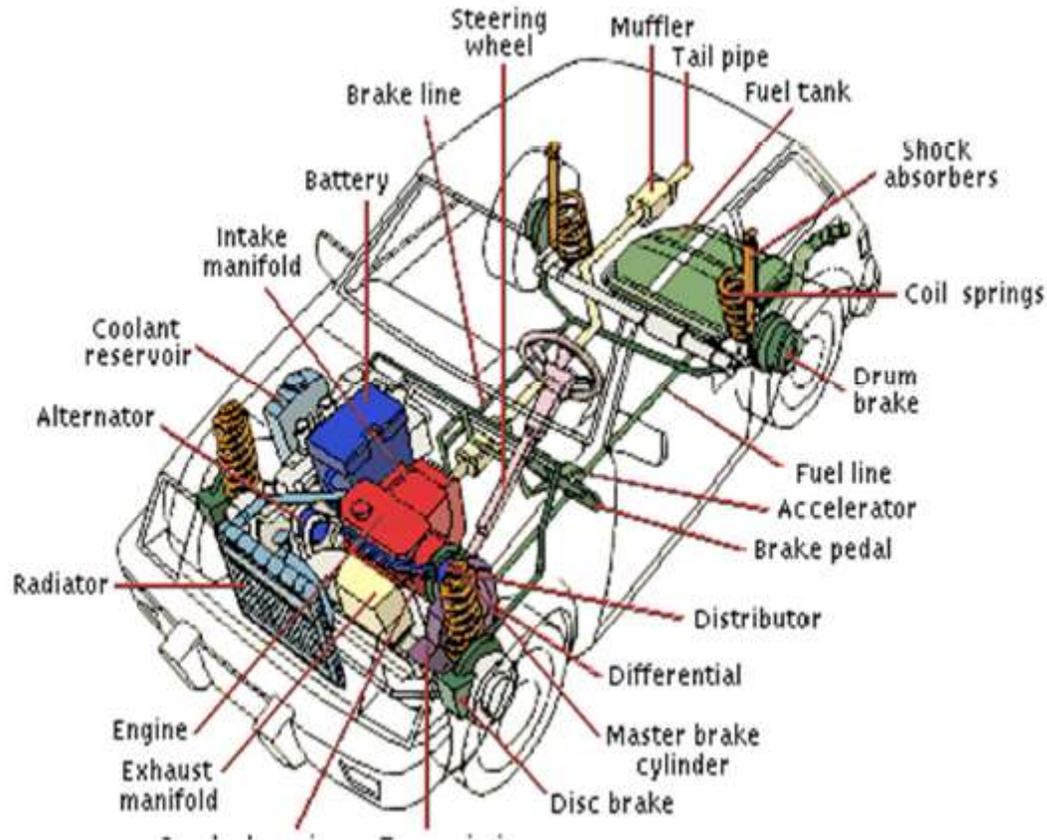
AUTOMOBILE ENGINEERING LABORATORY EXPERIMENT.

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3RD JUNE, 2014.

LECTURE NOTE: GEC. 226.





PICTORIAL VIEWS OF AN AUTOMOBILE.

OBJECTIVE: Study and Demonstration of Layout of an Automobile.

EQUIPMENT: A working or non working model of Layout of an Automobile.

THEORY:

Components of an Automobile

BASIC STRUCTURE:

This is the unit on which are to be built the remainder of the units to turn it into a power operated vehicle. It consist of frame, suspension system, axles, wheels and tyres

Frame – There are two distinct forms of construction

1. The conventional pressed steel frame to which all the mechanical units are attached and on which the body is superimposed.
2. The integral or frameless construction, in which the body structure is so designed as to combine the functions of body and frame, the units normally attached to the frame being attached directly to the body. Frameless construction is possible only in case of a closed car, since the roof, screen pillars, door pillars and rear panel are essential load taking parts of structure.
3. This means that the frame is the base of the vehicle. Engine, clutch, gear box, rear axial etc are mounted on the frame.

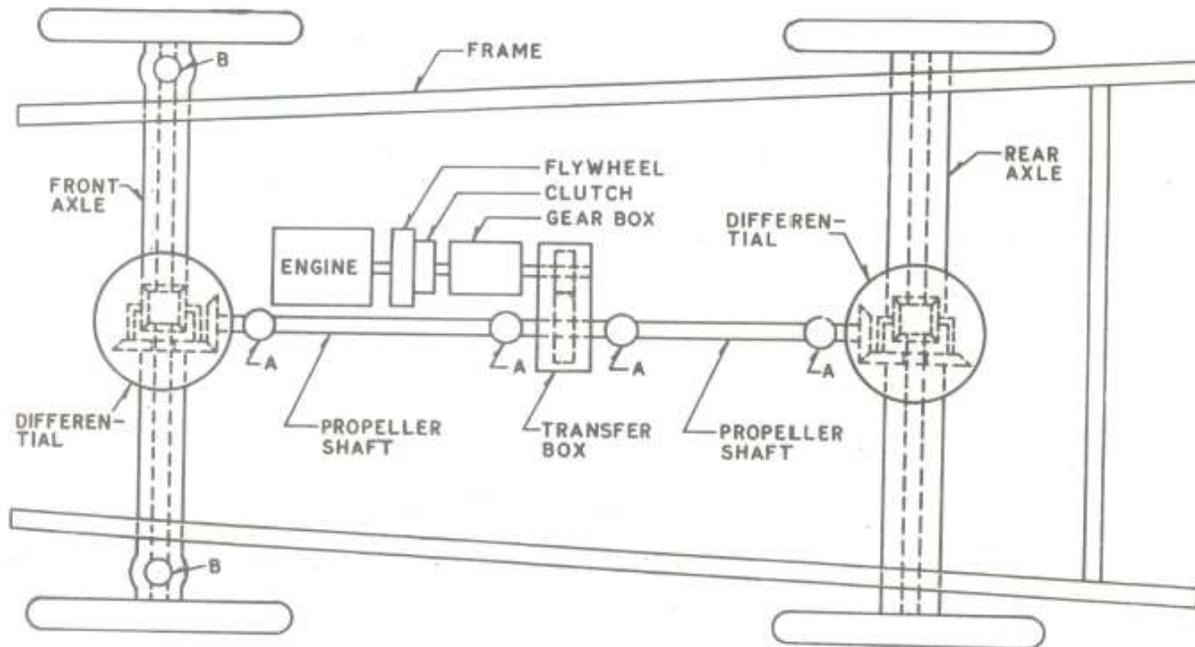
Suspension System.

Functions of suspension systems are:

1. To prevent the road shocks from being transmitted to the vehicle components
2. To safeguard the occupants from road shocks
3. To preserve the stability of the vehicle in pitching or rolling, while in motion

There are two types of suspension systems

1. The conventional system, in which the springs are attached to a rigid beam axle
2. The independent system, in which there is no rigid axle beam and each wheel, is free to move vertically without any reaction on the other wheel.



AUTOMOBILE LAYOUT.

Axles:

The weight carrying portions of the axles, whether it may be front or rear, may be considered as a beam supported at the ends, loaded at two intermediate points and subjected to following loads

1. The vertical load at the spring centres due to which the weight of the vehicle.
2. A fore and aft load at the wheel centre due to driving or braking effort
3. Torque reactions due to the drive or brakes.
4. A side thrust at the radius of the tyre due to centrifugal force when rounding a curve.

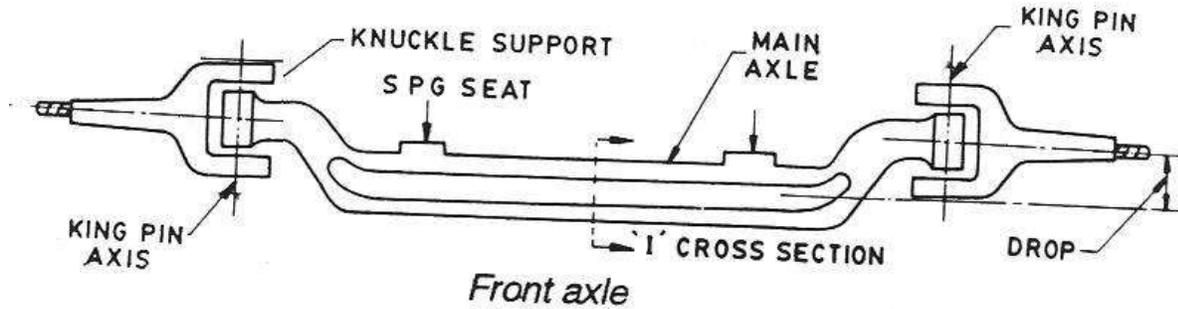
Front axle:

The front axle is used to carry the weight of the front part of the vehicle as well as to facilitate steering and absorb shocks due to road surface variation. It must be rigid and robust in construction. It is usually steel drop forging having 0.4% carbon steel or 1 to 3% Nickel steel.

Functions:

1. It carries the hubs and the wheels.

2. It carries the weight of the front part of the vehicle.
3. It works as cushion through the spring which facilitates a comfortable ride.
4. It controls the ride through shocks absorber fitted on H. It carries the brake system.
5. It carries stub axle, king pin, Steering arm by which the vehicle steers.
6. In case of four wheel drive it also transmits power to road wheels.
7. It includes steering mechanism, braking mechanism and suspension etc.



FRONT AXLE

Rear axle:

The power from differential is transmitted to rear wheel by rear axle. Depending upon the methods of supporting the rear axle and mounting the rear wheels, the rear axles are classified into three types which are:

- 1) Semi floating type
- 2) Three-quarter floating type
- 3) Full floating type

Functions of Rear Axle:

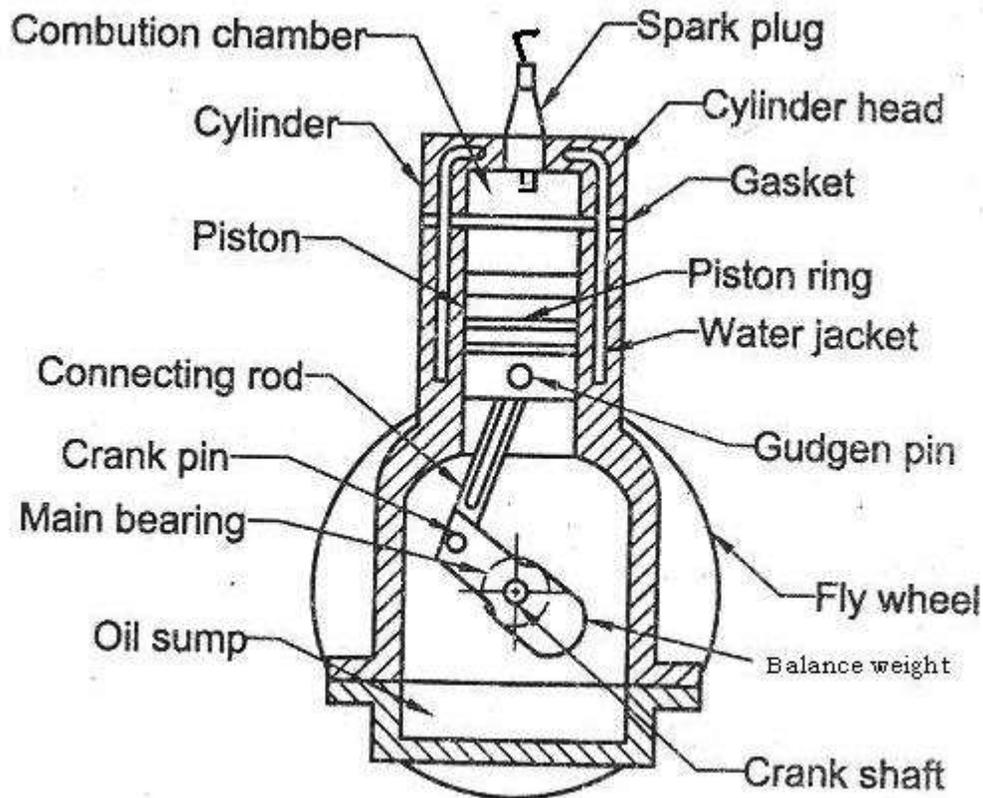
As the rear axle is suspended from the body of the vehicle by leaf springs attached to the axle housing. The rear axle performs several functions which are as under;-

1. Changing the direction of driveshaft rotation by 90 degrees to rotate the axle shafts.
2. Providing a final speed reduction between the drive shaft and the axle shafts through the final – drive gears or differential gears.
3. Providing differential action, so that one wheel can turn at a different speed as compared to the both wheel, when required,
4. Providing axle shafts or half shafts to drive the rear wheels.
5. Acting as a thrust and torque reaction member during acceleration and breaking.

Wheels – Wire spoked wheels have been used mainly on sports cars, primarily on account of their light weight and quickness in changing the wheel. However the pressed steel wheel has displaced these (all) ordinary purposes. Such a wheel consists of a central flanged disc pressed in to a rolled section rim retained in position by welding. Light alloy wheels are currently used in case of luxury and sport cars.

Power plant

The power plant provides the motive power for all the various functions which the vehicle or any part of it, may be called upon to perform. The power plant generally consists of an internal combustion engine which may be either of spark-ignition, or of compression ignition type.



INTERNAL COMBUSTION ENGINE

The function of the heat engine is to convert the heat energy contained in the fuel into mechanical work. Engines in which the combustion of fuel takes place inside the engine cylinder are known as internal combustion engines. **Ex:** - Petrol, Diesel and Gas engines.

Engines, in which the combustion of fuel takes place outside the engine cylinder, are known as external combustion engines. **Ex:** - Steam engines.

3) TRANSMISSION SYSTEM:

Functions of transmission system are

- 1) To disconnect the engine from the road wheels when desired
- 2) To connect the engine to driving wheels without shock
- 3) To vary the leverage between the engine and the driving wheels
- 4) To reduce the speed permanently in a fixed ratio
- 5) To turn drive through a right angle
- 6) To make a provision such that the driving wheels may rotate at different speeds while taking turns.

Clutch

Its purpose is to enable the driver to disconnect the drive from the road wheels instantaneously and to engage drive from the engine to the road wheels gradually while moving the vehicle from rest.

Gear Box (Transmission):

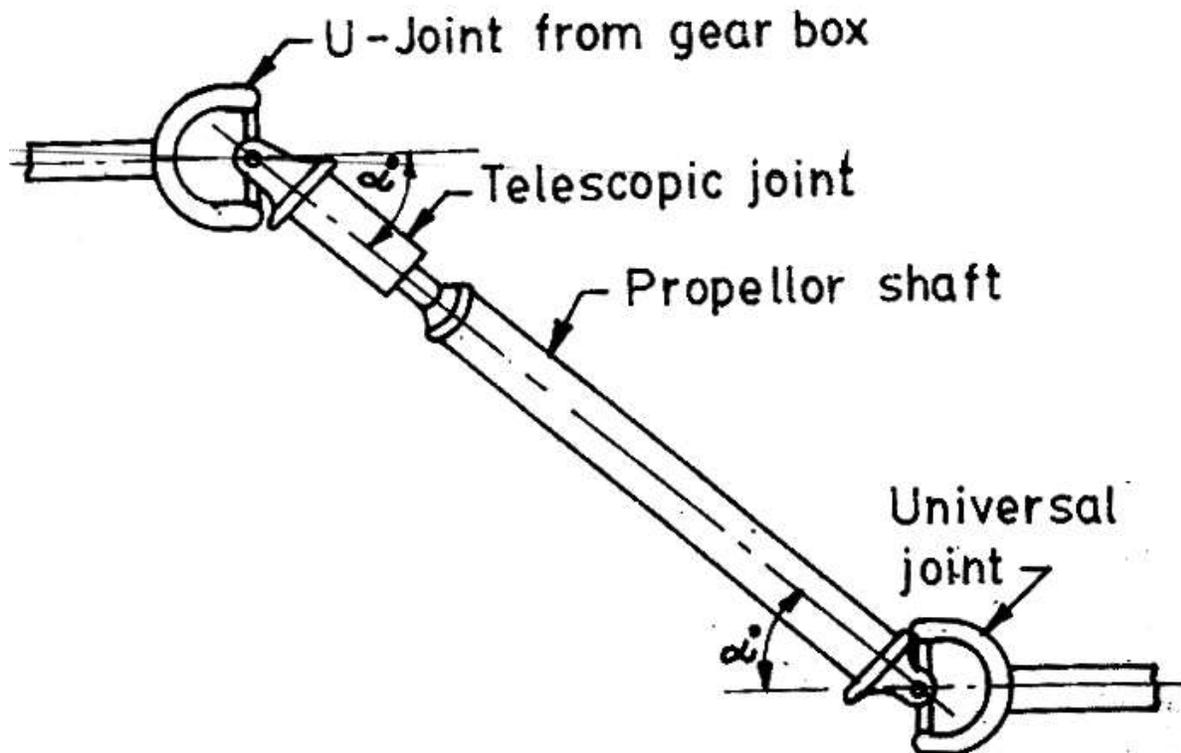
The gear box or transmission provides the necessary leverage variation between the engine and road wheels.

Bevel pinion and crown wheel:

They turn the drive through 90 and also provide a permanent reduction in speed .The permanent reduction is necessitated because of the fact that speed of engine has to be maintained at optimum level at all times, yet a minimum value of torque has to be made available at the road wheels.

Universal joint.

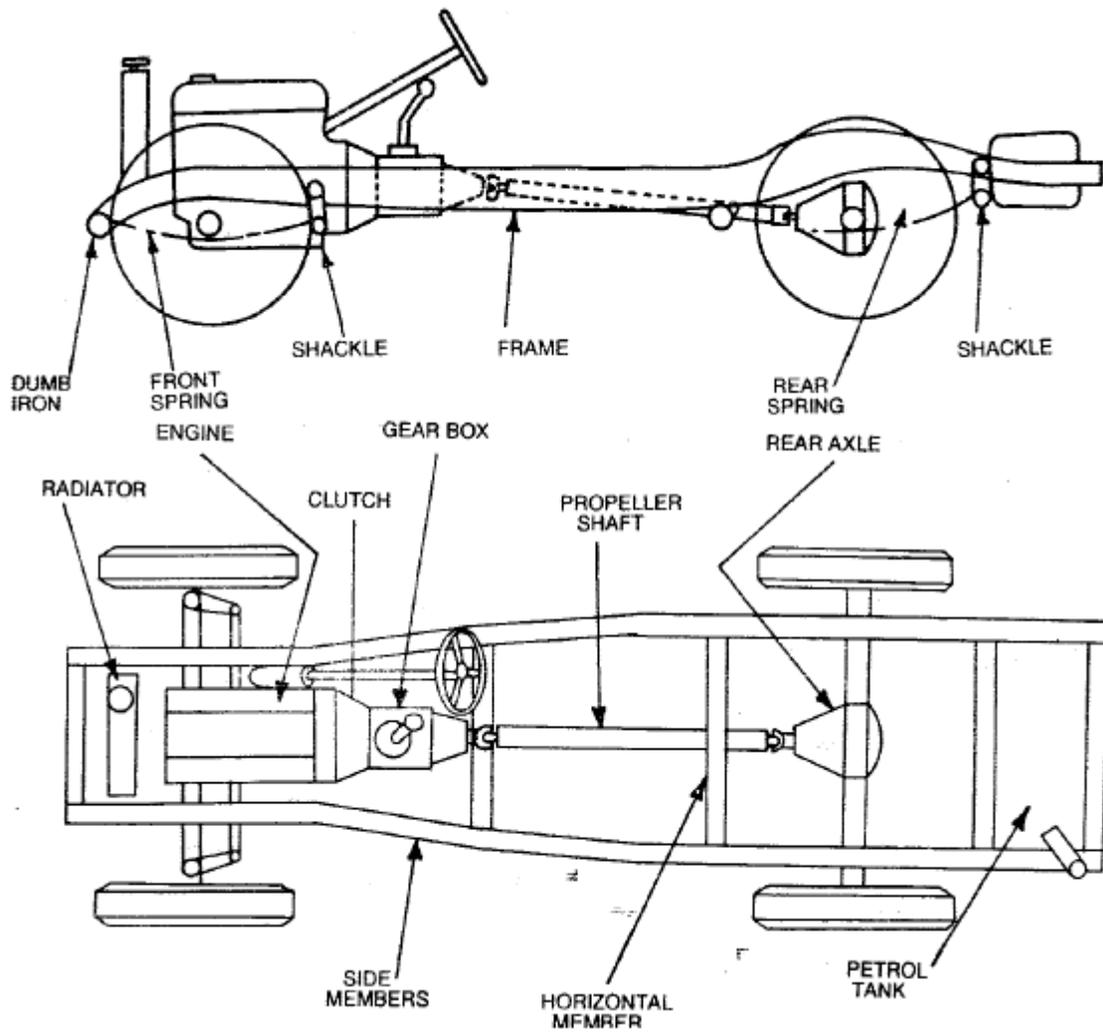
They provide for the relative movement between the engine and the driving wheels due to flexing of road springs.



PROPELLER SHAFT

Differential

While taking turns, the driving wheels must run at different speeds. This is done with the help of differential. Instead of using the long propeller shafts and transmitting the power from engine to the rear axle , a number of alternative methods have been used.



LAYOUT OF CHASSIS AND ITS MAIN COMPONENTS

Ref:

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DATE:

IDENTIFICATION AND APPLICATION OF HAND TOOLS

Aim:

To identify the various hand tools and to study the applications of each tool.

Introduction:

A good work shop must have equipment to undertake all types of fault finding and servicing jobs. The following is a list of hand tools and equipment's, which are a must in the work shop.

1. Screw driver:

These are used to tighten or loose the screw in the machine element. The main parts of screwdrivers are,

1. Handle which is a smooth and shaped properly for good grip. It is usually made of wood or moulded plastics.
2. Blade made of hardened and tempered carbon steel or alloy steel for strength. Blades are usually rounded, though occasionally square or rectangular sections are also used. The length sizes various from 40 mm to 250 mm or even more. The ends of the blades are formed in to flared tips for turning screw by fitting in to their head slots.
3. Screwdrivers are specified according to the length of the blade and width of the tip. Normally blade length of 45mm and 300mm and tips 3mm to 10mm wide are available.

2. Spanners:

These are also called wrenches. These are used for tightening or loosening the nuts. These are made of high tensile or alloy steel and are drop forged & heat-treated. Their size is determined by the nuts or bolts it fits. In the unified system used commonly, the spanners are marked with sign A/F followed by a number representing decimal equivalent of the nominal size across the flats of the hexagonal nuts or bolts. The following types of spanner are commonly used.

3. Ring Spanners:

The ring spanners also called box spanners. The end openings completely enclosed by the nuts and the bolt heads, for which they cannot slip and cause damage. Further the end holes in some ring spanners are twelve sided, because of which they can be used in restricted spaces.

4. Open-Ended Spanners:

These are the most commonly used type of the spanners in the garage, although they may not be the best means of tightening or loosening the nuts. Therefore these are employed where ring spanners or socket wrenches cannot work.

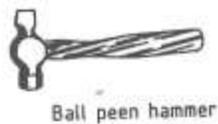
It is observed that spanner opening is kept at an angle with the body axis. This is done to facilitate the turning of the nut in restricted space.

5. Combination Spanners:

These are on one end and have hole on the other end. Thus they are combination of open-ended and the ring spanners. Initially for loosening jammed nuts more torque is required and we use ring end, which will not slip. However after the nut is already loose, it is more convenient to further continue with the open end.

6. Socket Spanner:

These types of spanners are useful in restricted spaces where common types of spanners cannot be used. Both 6&12-point socket should be included in the well-equipped tool kit. This consists of different sizes, which can be used with various types of handles. A part from handles, both electric and air operated impact wrenches are used to drive socket for speeding up the work.



Ball peen hammer



Plier



Slide cutting plier



Diagonal Cutting Plier



Long Nose Plier



Chisel



Steel rule



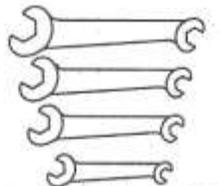
Inside Caliper



Outside Caliper



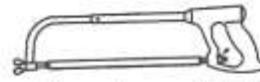
Screw driver



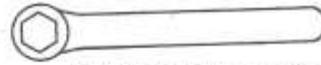
Double ended spanner



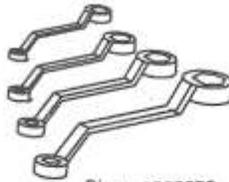
Pressure grip



Hacksaw Frame with Blade



Single ended box spanner



Ring spanner



Feeler gauge



Plug wrench



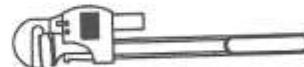
Vernier Caliper



External micrometer



Adjustable wrench



Pipe wrench



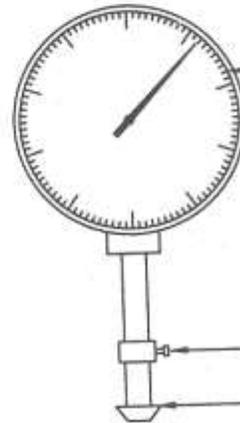
Dot Punch



Thin blade screw driver



Square blade screw driver



Compression gauge

Knob

Rubber seal

Compression Tester

7. Torque Wrench:

Important nuts and bolts in automobile work have to be tightened with the specified amount of torque because excessive torque may result in their breakage while with lesser torque they will come out loose during use. This is made possible by a torque wrench. It is a specialized form of a socket spanner.

8. Wheel Nut Spanner:

A number of different types of spanners are used for tightening or loosening wheel nuts.

9. Allen Wrenches:

Allen keys are used on Allen screws, which have hexagonal shaped grooves in their heads.

10. Pliers:

Different types of pliers have been shown in figure. A plier a device mainly used gripping only and should never be used as substitute for spanners that will damage the nut by rounding off its corner.

11. Hammers:

A hammer is a tool used for striking operations such as denting, bending, punching, straightening, riveting, etc. the head and the handle form the two parts of hammers. The head is made of drop forged carbon steel and has a hole for fitting the handle there in. A medium weight ball peen hammer is the one commonly used in automobile work.

12. Chisels:

A common application is the tearing open of corroded nuts and bolts with a flat chisels. The main parts of a chisels are the head the body and the cutting edge or point. These are made of high carbon steel or chrome vanadium steel. Chisels should be kept sharp. These should be sharpened approximately 60 degree included angle.

13. Files:

Files are used for smoothing rough surface and for removing small amount of metal. The cut in file may be classified either as single cut or double cut, depending up on whether they have cuts in one direction or in both directions. Files may be also be classified according to the shape of cross section.

14. Hacksaws:

Hacksaws are meant for cutting metals by sawing. A hacksaw consists of an adjustable frame with a handle and replaceable hacksaw blade. The construction of the hacksaw is such that different blade length can be accommodated within limits. The hacksaw blade has a thin harrow strips with teeth on one or both sides and two pin holes at the ends.

15. Drilling Machine:

Drilling machine may be hand operated or electrical ones. The tool used for drilling is called a twist drill. It is main parts are shank, body and the point; shank is fitted in to the drill chuck of the machine, while the point is the conical end, which does the cutting. The cutting edges of the point are called tips.

16. Twist Drill:

The position of the drill between the shank and the point is termed body, which consist mainly of the spiral grooves called flutes. These form the cutting edges and provided passage for the chips to come out and the coolant to flow down to the point. A set of twist drills, generally from 0.5mm to 6mm is sufficient for automobile work.