

UNIT

1

Introduction

Structure

Introduction

Garage, service station and specialist repair shop

Layout of a typical garage, service station and specialist repair shop

Tools and equipment for a garage, service station and specialist repair & power tools

Learning Objectives

After completing this unit, the student will be able to understand

- To understand the garage ,service station and specialist repair shop setup and environment
- know the requirement of tools &equipment used in garage, service station and specialist repair shop & power tools
- Study the layout of garage, service station and specialist repair shop

1.0 Introduction

The servicing of the automobile has also changed greatly to keep in step with the engineering advances of the industry.

The tools and equipments which the early mechanic used were poor compared to today's standard, and in many cases were made by the mechanic.

Today's automotive mechanic is welltrained and works in a clean, bright, well-ventilated, specially designed automotive service centre.

A thorough knowledge of the parts and understanding of the mechanisms are essential in order that faulty conditions in any part of automotive mechanism may be detected and corrected. As a result, the mechanic must possess the knowledge, skill, and experience in this field to be successful.

1.1 Garage, service station and specialist repair shop

General Garage

For efficient and proper running of motor vehicle, it is necessary that motor vehicle should be properly maintained and repaired. Satisfactory repair works reasonably charges, qualified and experienced technical staff providing prompt attention and good workmanship help a garages to get reputed and popularize in the market.

A garage in general is a place where cars stored and cared for it includes departments like storing, sales room, auto-supply department, oil and accessory sales. It also provide maintenance service in case of tyres, battery, lubrication and running repair. it should be very well equipped for providing petrol, lubrication and washing bay as well as for tyre and battery service. For major works it may not be necessarily having the equipment. Although there would be available equipments air compressor, car lift, jacking facilities and axle stands etc.

Types Of Garages

According to "Auto Mobiles association" system, garages are graded into following four categories.

- (a) One spanner sign or small garages
- (b) Two spanner sign or medium garages
- (c) Three spanner sign or large garages
- (d) Break down truck or big garages

(a) One spanner sign garages

These garages, small in the size have adequate facilities for customers. About 50% of the staff is properly trained and qualified. In such garages mainly deal with replacement and adjustment of most of the major components for a particular range of vehicles.

(b) Medium garages

These have good customer facilities and about two-third of the staff is well trained. All routine services and some of the specialized work carried out here.

(c) Large garages

In these garages, all the staffs well trained and qualified. The inspection, diagnosing, servicing and repair can be carried out without advanced booking in the garages.

(d) Big garages

These garages can carry out most of the first aid type repair until midnight. They provide recovery van services to carry away damaged or broken down vehicles. They provide electrical repairs until at last midnight. In addition to providing good parking area and waiting room facilities.

Service Station

A service station is a place where in addition to care of the motor vehicle like mechanical service and minor repairs, petrol is supplied, cars are lubricated, and cleaned, washed and other types of simpler services that are required daily are performed. In general it includes a number of sections like garage general it includes a number of sections like garage general service, mechanical service, major repair shop, tire shop, paint shop, body shop.

A service station in addition to the equipment available in a garage is usually run in conjunction with a sales agency for a particular type of motor vehicle to provide comprehensive repair service for that particular vehicle.

The equipment available, in a general garage will be added with specialized equipment like lifting tackle, and different types of jigs, fixtures and tools specially designed for checking, adjusting and repair of particular type and make of the vehicle. A service station may consist of a machine shop having a lathe, drilling machine etc.

In case of big service station special types of machines like crank shaft grinding machine, valve reface, surface grinder, reboring and boring machine, and brake drum lathe also will be equipments.

Specialist repair shop

It is an engineering workshop where works not attended in service station will be attended. The specialist repair shops need experts in their particular line. They usually provide good service in attending to repairs at reasonable charges

as well as take off the responsibility from the shoulders of the service station men. Similarly the electrical repair, radiator repairs, painting and welding jobs as well as body work can also be send to specialist repair shop.

Differences Between General Garage, Service Station And Specialist Repair Shop

S.no Garage	Service station	Specialist repair
1. In garage replaces and repairs are carried on by the skilled workers.	In service station fuel filling and water servicing facilities are available. It has a small workshop to provide repair for particular make of vehicle. It may have sales agency for particular type of vehicle.	It is an engineering workshop. Where works not attended in service station will be attended.
2. Petrol pump, washing bay, tyre and battery servicing equipments are available.	All the equipment in the garages plus small work shop tools, viz. lathe, drilling machine, jigs and fixtures are available.	It has crankshaft grinding machine, FIP test bench and painting shop etc.
3. Generally garage is located on main roads.	It is also located on main roads or nearer to the highway.	Located on sides of the highways or main roads.

1.2 Layout of a typical garage, service station and specialist repair shop

The internal layout of a garage should be such as to make it water proof, clean and spacious to provide sufficient space for small work benches, to storage and repair benches. Following consideration should be made in the layout of garage and service stations:

- (i) To provide light to the work benches, opening the windows should be provided at the proper place.
- (ii) To keep the floor easily cleanable, it should be a smooth concrete floor with a surface cleaning compound.

- (iii) The doors are provided as many members as required for easy flow of men and materials.
- (iv) The electrical control should be accessible to the operators.
- (v) To form a neat storage for hanging tools, hooks or screw eyes should be provided on the peg boards.
- (vi) To provide a deposit of waste material.

(a) Layout of typical garage and service station

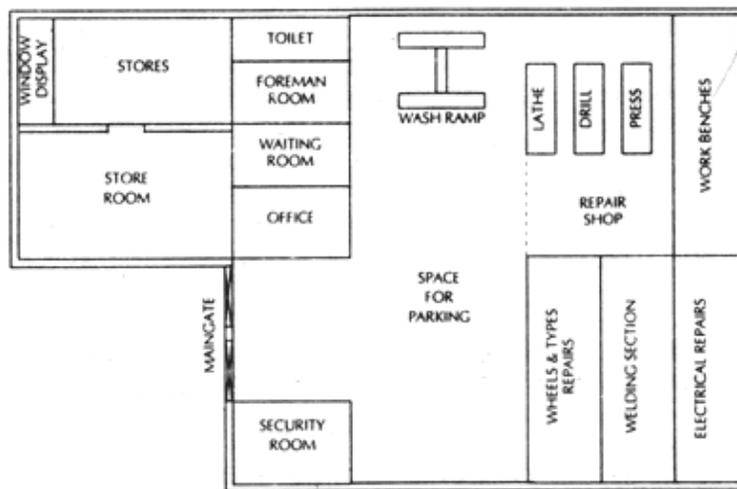


Fig 1.1 Layout of Typical Garage

(b) Layout of modern service station : They layout of service station is shown

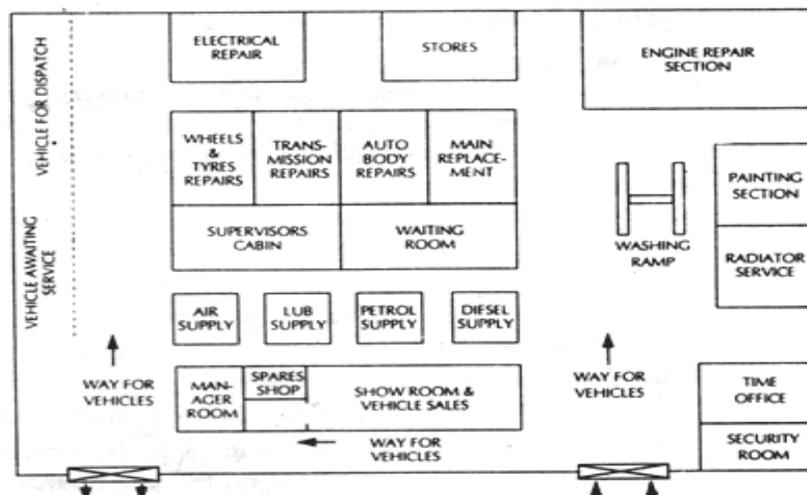


Fig 1.2 Layout of modern service station

1.3 Tools And Equipment For A Garage, Service Station And Specialist Repairshop & Powertools

Many of the tools and items of equipment are necessary to enable the motor vehicle workshop to cope with the wide variety of servicing and repair work. The following is a list of tools and equipment in the auto shop.

Hand tools : Many kind types and sizes of tools are used in automobile work.

1. D.E. spanner set : These are the most commonly used type of spanner in garage. The opening should be the right size to fit the nut or bolt. If the spanner opening is too large, it could round off the corners of the hex. These make the use of the proper spanner more difficult. These spanners are available in different sizes ranging from 6 to 32mm.

2. Ring spanner : In ring spanners the end openings completely enclose the nut or the bolt head, so that they do not slip and cause damage. Further, the end holes in the ring spanners are twelve sided, because of which they can be used in restricted spaces, since the nut or the bolt head can be worked upon even when the swing of the spanner is restricted to 15.

3. Tubular spanner : These are also used for the same purpose as ring spanner. It will be like a long tube having hexagonal ends at each end of different size. They may vary in size from 8mm to 32mm. It can be used where double end and ring spanner cannot be used.

4. Socket spanners : These types of spanners are useful in restricted spaces where common types of spanners cannot be used. They consist of sockets of different sizes which can be used with various types of handles. The handles have projection at one end around which the sockets fit. One type of handle has a universal joint at the projection end which makes it possible to work with the handle at an inclination with the socket. A ratchet handle is also available which obviates necessity of lifting of the socket from the nut or the bolt head.

5. Adjustable wrenches : This wrench has jaws that can be adjusted to fit nuts and bolt heads of various sizes. These types of wrenches have advantage that these can be suitable for a large number of nut and bolt head sizes.

6. Torque wrenches : Important nuts and bolts in automobile work have to be tightened with a specified amount of torque, because excessive torque may result in their breakage while less torque they will remain loose. This is made possible by a torque wrench. It is a specialised form of socket spanners.

7. Screw driver : The screw driver is used to drive, or turn screws. The most common type has a single flat blade for driving screws with slotted heads. There are also the Phillips head and reed, and prince screw drivers.

8. Hammers : A medium weight ball pen hammer is the one commonly used in automobile work. It should be gripped on the end of the handle. When you swing the hammer, the face should strike the object squarely, and not an angle.

9. Pliers : pliers are a special type of adjustable wrench. The two legs move on a pivot so that items of various sizes can be gripped. There are two types gripping pliers and cutting plier.

10. Pullers : Pullers come in a variety of types and sizes and are used to remove wheels, gears and bearing from shafts from housings. Each pulling operation differs from the other, and care must be exercised to prevent damage to the parts during pulling.

11. Spark plug spanner : For removing or tightening spark plugs.

12. Feeler gauge : For measurements such as valve clearance, spark plug gap, contact breaker gap etc., we use feeler gauges which are simply blades of different thickness.

13. Valve spring compressor : Valve spring compressors or lifters are used to compress the valve spring to facilitate the removal of the valve retain lock or keeper from the valve stem.

14. Piston ring compressor : Piston ring compressors are places around the piston covering the rings. As the compressor is tightened, it compresses the piston rings into their grooves on the piston. Then the piston and rod assembly is installed into the cylinder.

15. Piston ring expander : It is generally use to expand and remove the piston rings from their grooves without breaking.



D.E. Spanner



Fig. 1.3 Adjustable Spanner



Ring Spanner



Fig. 1.4 Screw Driver



Fig. 1.5 Ball Pen Hammer



Fig. 1.6 Cutting Plier



Fig. 1.7 Socket Spanners



Fig. 1.8 Torque Wrench



Fig. 1.9 Valvespring compressor



Fig. 1.10 Piston Ring Compressor

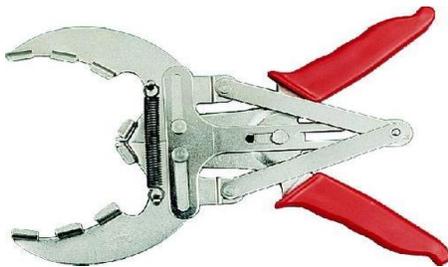


Fig. 1.11 Piston Ring Expander



Fig. 1.12 Puller



Fig 1.13 Feller Gauge

Service station equipments

A large number of different types of equipments are required in a garage or service station for carrying out different types of repair works. Different types of equipments are required to cope up with the wide variety of work to be done can be classified as under.

Special equipments for service station

1. Compressed air plant
2. Car washing machine
3. Lifting tackles
 - (a) Hydraulic jack
 - (b) Car lift
 - (c) Axle stands
 - (d) Jib crane
 - (e) Achain hoist
4. Chassis dynamometer
5. Wheel balancer
6. Tire remover
7. Brake drum lathe
8. Brake shoe lining riveting machine
9. Spark plug tester
10. High pressure grease gun

11. Wheel alignment gauges
12. Degreasing plant

Special equipments for engine repair:

1. Crankshaft grinding machine
2. Cylinder head surface grinding machine
3. Line boring machine
4. Connecting rod big end bearing boring machine
5. Camshaft grinding machine
6. Valve refacer machine
7. Hydraulic press
8. Cylinder boring machine
9. Cylinder honing machine
10. Connecting rod rebabbiting jig

Special equipments for compression engines

1. Bench nozzle testing and cleaning equipment
2. Fuel injectortester
3. Fuel pump tester
4. Nozzle and needle grinding and lapping machines.

Power tools : Power tools are increasingly used in modern automated auto workshops. They are operated by pneumatic, electric, hydraulic powers. Their use envisage quicker, effortless and efficient service.

Pneumatic Nut and Bolt Tightener : It tightens and loosens the nuts and bolts in no time. This is a portable machine whose working end can be changed to suit different sizes of bolts and nuts.

Valve Refacer : It is used to recondition the weared and worn valve faces. On employing an attachment, it can be used to grind valve stem, tappet and the rocker arm.

Portable Drilling Machine : This is an electrically powered machine which is used to make holes whenever required. It can be taken conveniently to any area of repair since it is handy, compact and portable.

Drill Stand : It is used to mount the drill machine. The job to be drilled can be placed and clamped on its base. The height of the drill machine can be adjusted suitably to accommodate jobs of different heights. For this purpose the grooves are cut on its vertical stand. The height adjustment is done by means of a lever and mechanical linkage.

Polisher and Sander : This is an electrically powered machine used to rub the burrs from the surfaces of components, and then polish it to super finishing accuracy. The standing is accomplished by means of emery paper or emery cloth of coarse grade while the fine grade is used for polishing.

Portable Grinder : This is used to grind the rough surfaces, unwanted projections, pro-truding corners etc. being sturdy and handy, it can be taken to any remote, restricted and less accessible areas for repairing.

Summary

1. A garage in general is a place where cars are stored and cared for. In garage repairs and repairs are carried on by the skilled workers.
2. Service station has a small workshop to provide repair for particular make of the vehicle.
3. Specialist workshop is an engineering workshop where works not attended in service station will be attended. Eg., body work, FIP testing etc.
4. Important factors to be considered while location service station- easily approachable, idle sight, availability of the vehicles in the surroundings, availability of qualified and experience labour force (mechanics), provision of proper drainage, sanitation system.
5. Torque wrench is a important tool for tightening nuts and bolts with a specified amount of torque, because excessive torque may result in their breakage while less torque they will remain loose.
6. Valve spring compressor or lifters are used to compress the valve spring to facilitate the removal of valve retainer lock or keeper from the valve stem.
7. Feeler gauge is used for measurement such as valve clearance, spark plug gap, contact breaker gap, etc.
8. Piston ring expander is a general tool. It is used to expand and remove the piston rings from their grooves without breaking.

Short Answer Type Questions

1. What is garage, service station and specialist repairshop .
2. What are the tools used in garage, service station and specialist repairshop.

Long Answer Type Questions

1. Explain the tools and equipment used in garage, service station and specialist repairshop.
2. Write about powertools.
3. Draw a neat sketch and indicate the garage, service station and specialist repairshop.

OJT Activity

1. Visit different garages, service stations and specialist repair shops , to understand the workshop environment and identify tools equipment used in the shop.
2. Prepare the layout of garage, service station and specialist repair shop.

Major Equipment For Service Station

Structure

Introduction

Car Washing Machine

Vehicle hoist

Air Compressor

Lubrication Equipments

Learning Objectives

After the completion of this unit, student will be able to

- Know about the different service station equipment construction and working
- Know the lubrication equipment and explain about lubricating equipment

2.0 Introduction

A good automobile shop must have an equipment such as car washing machine, air compressor, vehicle hoist and grease gun to undertake servicing jobs of vehicles.

2.1 Car Washing Machine

Regular chassis washing of both cars and commercial vehicles to remove grease, oil, mud and other corrosive deposits is most essential. This type of cleaning is a time representative of preventive maintenance. This is easily done by a spray of water with a solvent, at high pressure (above 25 kg/cm²).

Car washer consists of a pump which is driven by a electric motor. The pump sucks water from a well or from water tank filled beneath it and delivers to the nozzle through a pipe of hoses with high pressure. There are two types of car washers as follows.

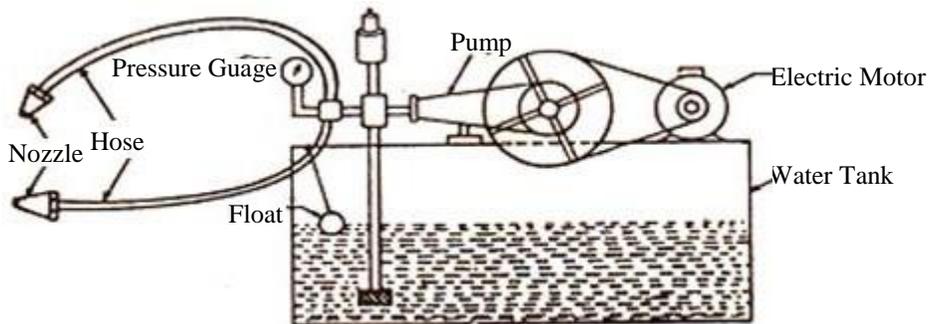


Fig 2.1 Car Washing Motor

That provided with single hose which can be used to wash only one vehicle at a time

1. That provided with twin hoses which can be used to wash two vehicles at a time. The nozzles are adjustable, so that the delivery of water can be regulated at variable force from fine spray to solid jet.

Automatic Washing-

The automatic car wash machine has a three horse power pumping station which pumps up to 100 liters of water per minute through 15 numbers of nozzles, 12 of which spray as a pre-wash arch which washes tires, wheels and rocker panels and rest three nozzles sprays on back top brush. The machine dispenses a specially formulated foaming, high pressure chemical during a pre-wash pass which is applied along with high pressure wash.

The high pressure spray automatically adjusts to the vehicle's dimensions by the use of PLC based control panel and lastly, high pressure air blowers maintain the best air-steam helps to dry the complete vehicle surfaces.

The features and benefits of

1. Washes all shapes, sizes and configurations of vehicles.
2. All brushes are made of extremely durable at soft bristles that are carefully hand-woven.
3. There is an intensified rear wash programme to effectively double wash the backs of vehicles.

2.2 Vehicle hoist

In a big workshop, a hydraulic hoist becomes necessary to facilitate the service work. Different types of hoists are used in automobile workshop. They are.

- (i) Drive on lift or single post hoist
- (ii) Two post hoist
- (iii) Four post hoist
- (iv) Six post hoist.
- (v) Generally single post hoist as shown in fig 2.2 used in workshop.

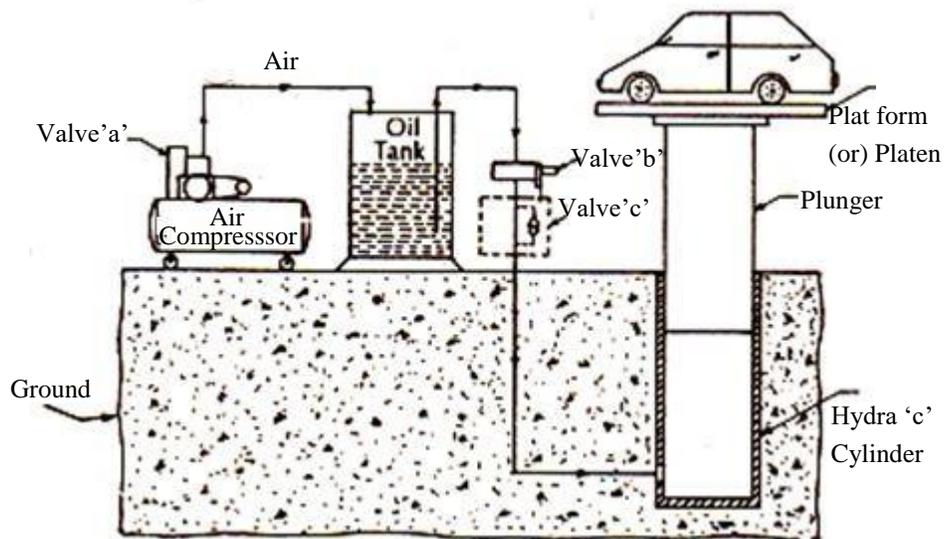


Fig 2.2 Vehical Hoist

The lift or hoist consists of a platform which is fixed on the top of the ram working in a hydraulic cylinder. Normally the platform will be at ground level and will be raised with the help hydraulic pressure applied on the ram.

When valve 'A' is actuated, high pressure air from the compressor acts on an oil surface in the reservoir. Oil rushes through piping into hydraulic cylinder via another pilot valve 'B'.

Pressured oil entering the bottom cylinder, lifts the plunger up. An automobile stationed on platform attached to the plunger is thus lifted up giving access for washing and servicing.

To lower the vehicle, valve is brought to the original position. Due to self weight of vehicle, platform etc., and plunger descends gradually pushing back oil into the reservoir through the restriction valve 'C'. The speed at which the vehicle or platform is to be lowered can be adjusted by the restriction of the unidirectional flow regulator 'C'.

2.3 Air Compressor

Air compressors are used to compress the air which can be used for a number of purposes like washing of vehicle, cleaning of engine, spraying of lubricating oil, spraying of paint, tyre inflation, greasing a vehicle, for lifting hoist, for pneumatic grinder, for spark plug cleaning etc.

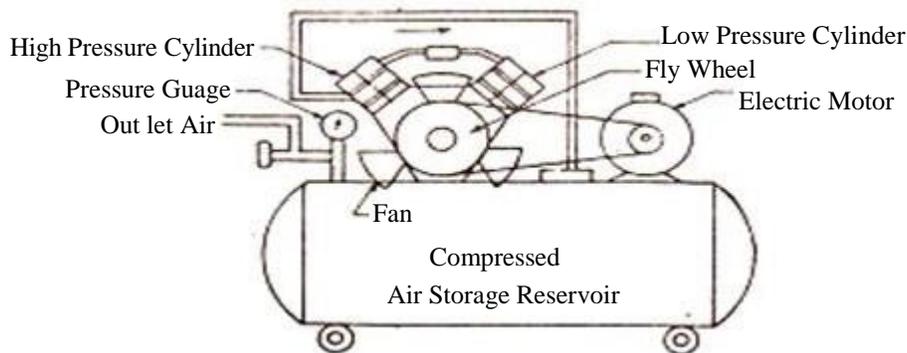


Fig 2.3 Air Compressor

An air compressor is shown in fig 2.3. It can be compared with the working of petrol engine or any other engine. The air compressor is coupled to electric motor.

An automatic pressure controller is provided between motor and main current line, to break the circuit when the pressure inside the air tank reaches a maximum value.

Compressor piston draws air into the cylinder during suction stroke through the inlet valve. As piston moves upward during its next stroke, the inlet

valve closes and the air gets compressed and delivered to the air tank through outlet valve. One pressure gauge is fitted on air tank for observing the filling position.

2.4 Lubrication Equipments

Lubrication is the most important factors in the maintenance of the car. If this is neglected in any way the mechanism wears more rapidly and troubles are apt to occur. On the other hand liberal lubrication means long life and efficient running, with general freedom from trouble.

To lubricate certain components beneath the chassis with the help of lubrication equipments, grease guns and high pressure lubrication equipments are used.

Grease guns

Grease guns are used to lubricate the chassis components with grease. Several types of hand operated grease guns are available. They are.

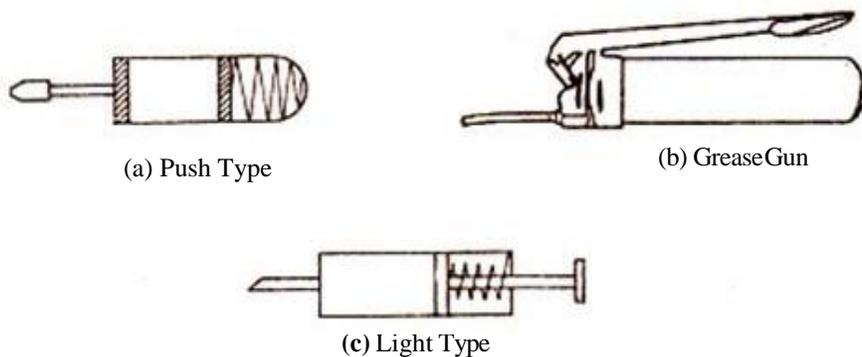


Fig 2.4 Grease Gun

- (a) Push type
- (b) Grease gun
- (c) Light type, and
- (d) Bucket type

Hand and compressed air- operated

Depending upon the type of lubricant and pressure used the first three types of hand operated grease guns.

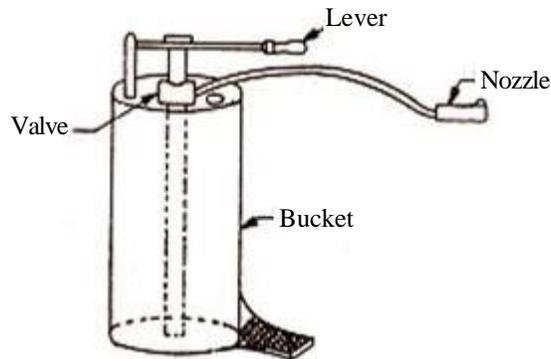


Fig 2.5 Hand Operated Bucket Type Lubricator

Push type grease guns consist of a cylindrical barrel one end of which is fitted with a nozzle cup, a piston moves inside the barrel. The piston rod assembly cap is screwed tightly to barrel. To and fro movement of piston rod develops pressure inside the barrel. When lever is depressed grease comes out of the nozzle under high pressure.

Bucket type grease gun valve will be operated by a lever which sucks grease from the central tube and delivers through outer tube and hand nozzle. It is shown in fig 2.4

High Pressure Lubrication Equipment

High pressure lubrication equipment is shown in fig 2.4. it is similar to hand operated grease gun but operated under air pressure.

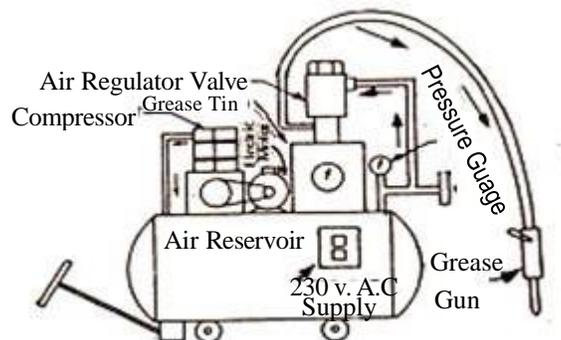


Fig 2.6 High Pressure Lubricator

A separate container for grease filling is arranged on compressor tank and valve is fitted on it. Grease gun pipe and air compressor pipe are connected to valve. It is necessary that lubricant should be forced into the bearing until the old lubricant is forced out new lubricant appears.

Summary

1. Car washing equipment is used to regular chassis washing of both cars and commercial vehicles to remove grease, oil, mud and other deposits.
2. Compressed air is supplied by the air compressor. This air is used for lifting the vehicle, spraying of lubricating oil, spraying of paint, for pneumatic grinder, for spark plug cleaning etc.
3. Types of vehicles hoists :
 - (a) Drive on lift or single post
 - (b) Two post hoist
 - (c) Four post hoist
 - (d) Six post hoist
4. Cleaning the vehicle, greasing of all points, changing of mobile oil of engine, adjustments of brakes etc, of the vehicle by mounting it on a lift or hoist.
5. To lubricate certain components beneath the chassis with the help of lubrication equipments grease guns and high pressure lubrication are used.

Short Answer Type Questions

1. What is the purpose of car washing machine, vehicle hoist, air compressor.
2. What are the types of lubrication equipments.

Long Answer Type Questions

1. Explain the construction and working of car-washing machine or automatic washing machine.
2. Write about vehicle hoist, air compressor, high pressure lubrication, hand operated lubrication.

