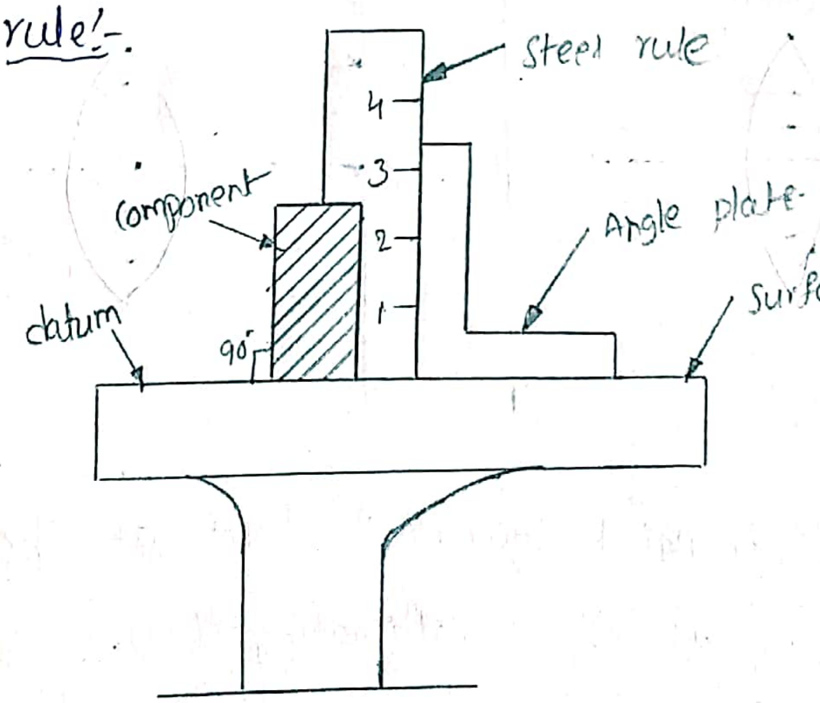
UNIT - 2.

LINEAR MEASUREMENTS.

The aim of this inspection of a component is to see whether it lies within the prescribed limits or not. and as to whether it meets workmanship demanded by service specification. The critical examination of any components can be made by means of measuring instruments capable of dimensional control.

Measuring instruments are designed either for linear measurement (or) line measurement (or) end measurement. The measuring instruments classified depending upon accuracy that can be attained.

Steel rule:-



Engineer's steel rule

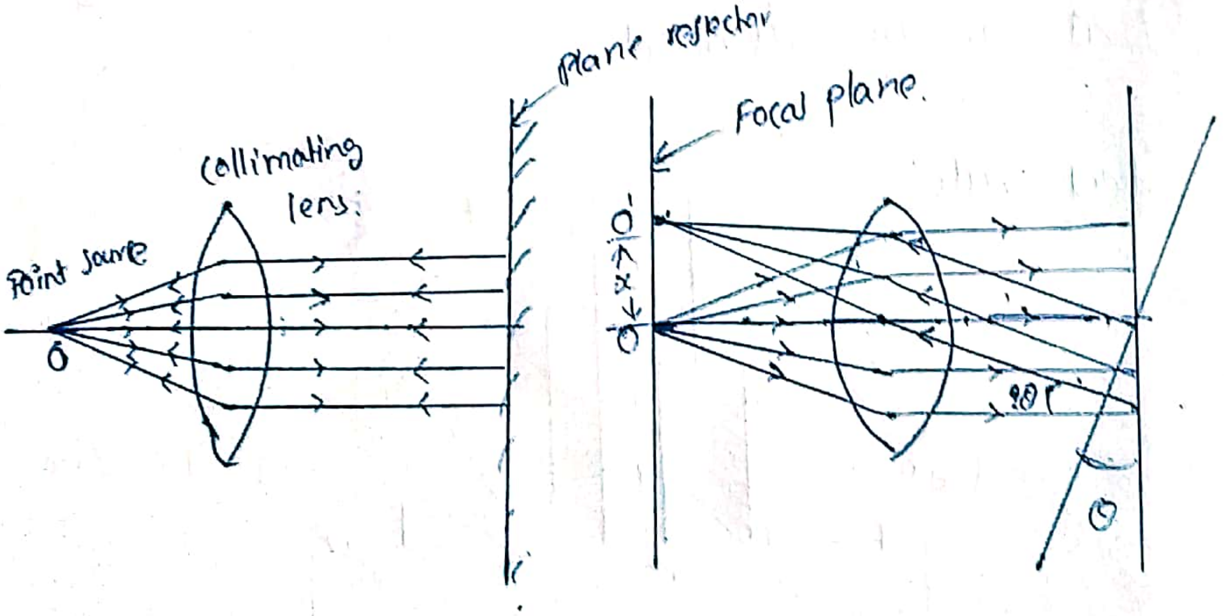
It is the line measuring device. It is simplest and most common measuring instru-ment used in inspection. It works on the basic measuring technique of comparing (comparing) an unknown length to the one previously calibrated.

UNIT - III

OPTICAL MEASURING INSTRUMENTS.

Auto Collimator :-

This is an optical instrument used for the measurement of small angular differences. For small angular measurements autocollimator provides a very sensitive and accurate approach. Autocollimator is essentially an infinite telescope and a collimator combined in one instrument.



Let O is point source of light at the principle focus of a collimating lens.

The ray of light from "O" incident (falls on) on the lens without travel as a parallel beam of light. If this beam strikes a plane reflector which is normal to the optical axis it will be reflected back along it's own path. and focus at the same point O.

If the plane reflector be now tilted through a small angle θ, then the parallel beam will be reflected through twice this angle. and will be brought to focus at O' in the same plane at a distance "x" from "O". Obiviously

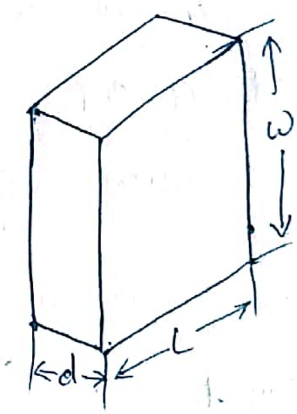
$OO' = x = 2\theta . f$

where, f is the focal length of the lens.

UNIT - 2

Slip Gauges:-

Slip gauges (or) guage blocks are universly accepted end standards of length in industry. These were introduced by Johanson a swedish engi-neer. These are also called as Johanson slip gauges.



Dernisions of a slip gauge.

Slip gauges are rectangular blocks of hygrade steel with exceptionally low tolarence.

Gauge blocks are suitabley hardned. throughout to ensure maximum resistance to wear. They are then stabilized by heating and cooling success-ively in stages so that hardening stresses are removed.

After beings hardened they are carefully finished by highgrade lapping to a high degree of finish, flatness and accuracy. For sucessfull use of slip gauges their working faces are made truly flat and parallel. Slip gauges are also made from tungsten carbide which is extremly hard and wear resistance.

The cross-section's of these gauges are 9mm x 30mm to 9mm x 35mm. Any two slip gauges when perfectly cleaned may be wrung together. The dimensions are perminantly marked on one of the measuring faces of gauge blocks.

Uses.

(i) Direct prisize measurement. where the accuracy of a workpiece demands it.

(ii) For checking accuracy of vernier callipers, micro-meters and such other measuring instruments.

(iii) Setting up a comparator to a specific dimension.

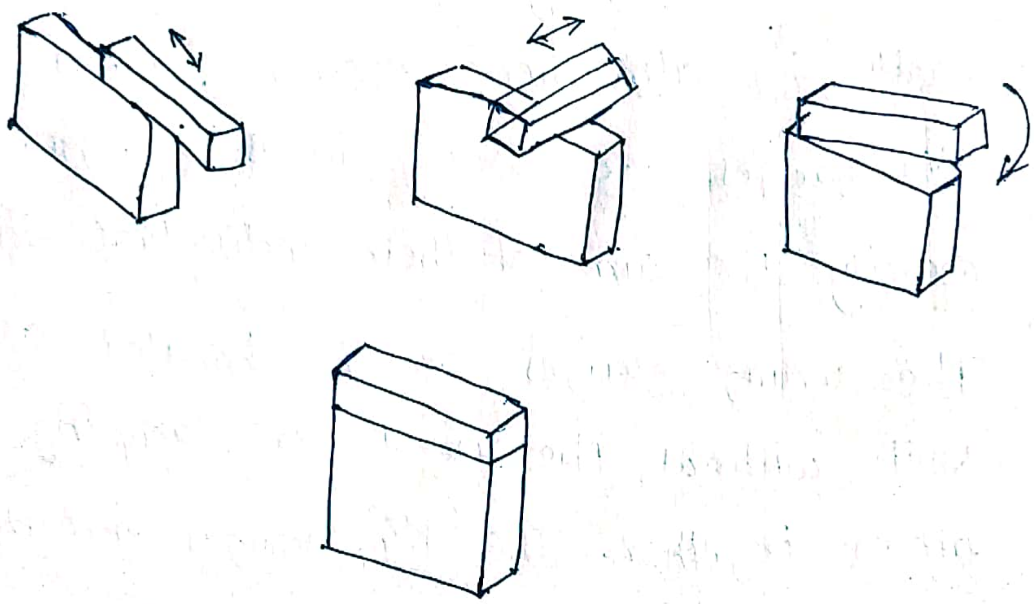
(iv) For measuring angle of workpiece and also for angle setting in connection with a sine bar.

(v) The distances of plugs on a fixture are offened best measured with the slip gauges.

(vi) To check gap between parallel locations, such as in gap gauges (or) between two mating parts.

Wringing of slip gauges:-

The success of precision measurement by slip gauges depends on the phenomenon of wringing. The slip gauges are wrung together by hand through a combined sliding and twisting motion. The gap between two wrung slips is only of the order of 0.00635 microns which is neglizable.



Wringing of slip gauges

Procedure for wringing of slip gauges:-

(i) Before using the slip gauges are cleaned by using a lint free cloth, chamious leather (or) a cleaning tisue.

(ii) One slip gauge is ~~[illegible]~~ then oscullated slightly over the other gauge with a light pressure

(iii) One gauge is then placed at 90° to other by using light pressure and is then rotated untill the blocks are brought in one line

In this way air is expelled out from between the slip gauges faces causing the gauge blocks to athern. The adhesion is caused partly by molecular attraction and partly by atmospheric pressure, when two slip gauges are wrung in this manner is exactly the sum of their individual dimensions. The wrung gauges can be handled as a unit without the need for clamping all the pieces together. The slip gauges are made from high grade steel with co-efficient of thermal expansion $(11.5 \pm 1.5)\, 10^{-6}$ per °c.

Scanned by CamScanner

Care of slip gauges:-

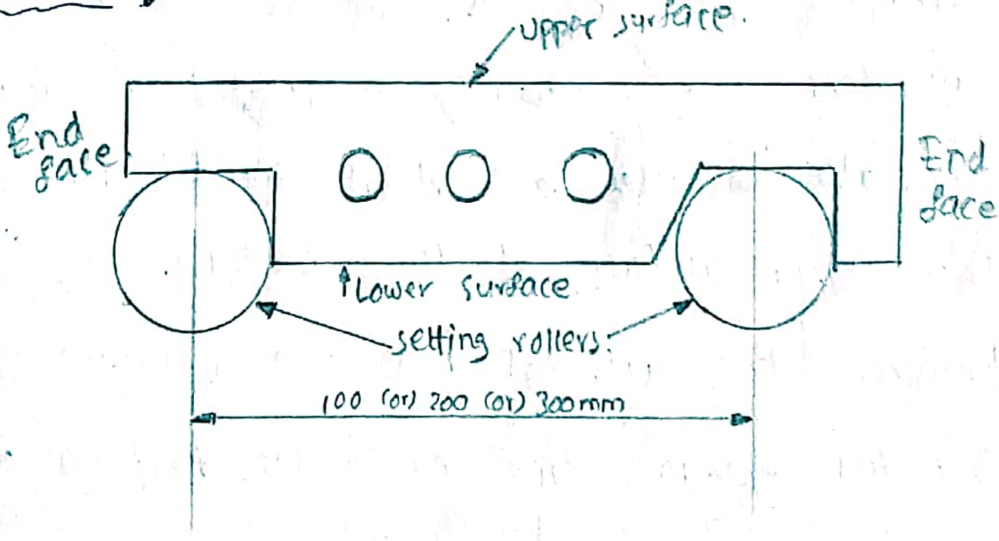
(i) Protect all the surfaces against climatic conditions by applying suitable anti-corrosive such as petrolium jelly.

(ii) keep the slip gauges in a suitable case in which there is a seperate compartment for each gauge and keep the case closed when not in use.

(iii) Protect the gauges and their case from dust and dirt.

(iv) The slip gauges should not be magnatise other-wise they will attract metallic dust.

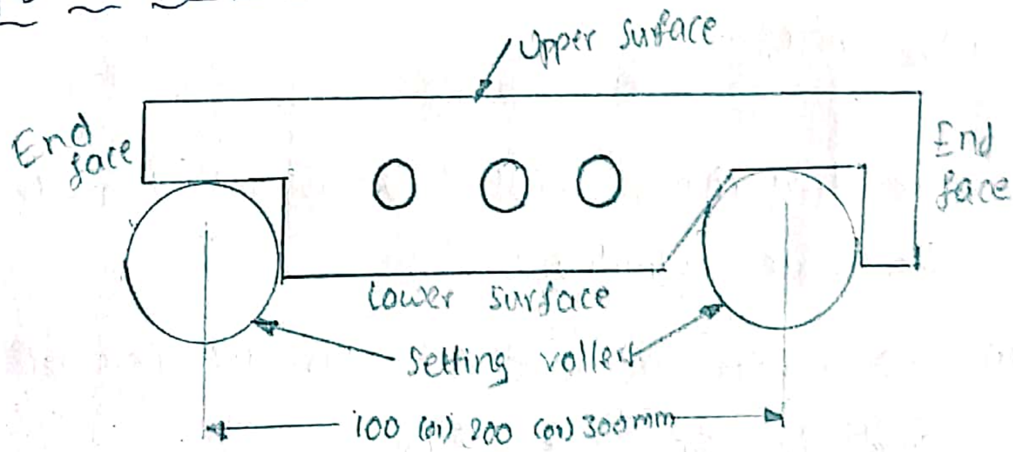
Sine Bar:-

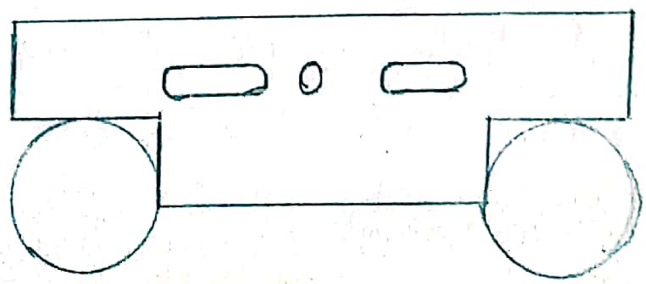


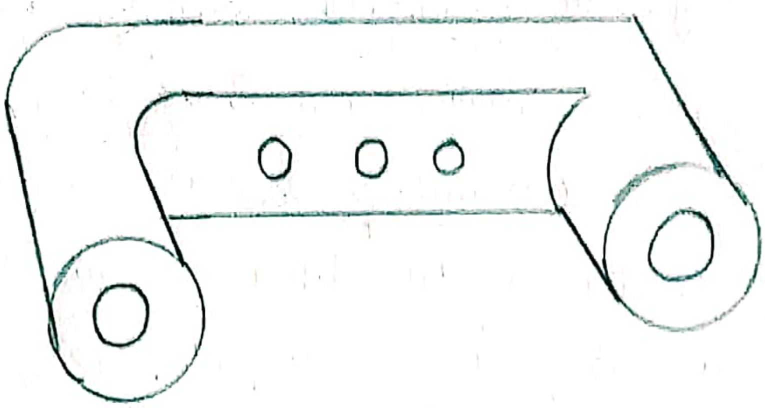
The sine bar in itself is not a complete measuring instrument. Another datum such as surface plate is needed, as well as another auxillary equipment notablely slip gauges and indicating device to make measurements. Sine bar used in conjunction with slip gauges constitute a very good device for the precise measurement of angle. Sine bars are used either to measure angles very accurately (or) for locating any work to a given angle within very close limits. Sine bars are made from high carbon, high chromium corossion resistant steel, hardened, ground and stabilized. Two cylinders of equal diameter are attatched at the ends. The axis of these two cylinders are mutually paralleled to each other and also parallel to and at equal distance from the upper surface of the sinebar. The distance between the axis of the two cylinders is exactly 5 inches (or) 10 inches in britis system and 100mm, 200mm and 300mm in metric system. The above requirements are met and maintained by taking due care in the manufacture of all parts. The various parts are hardened and stabilized before grinding and lapping. All the working surfaces and cylindrical surfaces of the rollers are finished to surface finish of 0.2 µm value. Depending upon the accuracy of the centre distance sine bars are graded as A-grade (or) B-grade. B-grade of sine bars are guarented accurate upto 0.02 mm/m. of length and A-grade sine bars are more accurate and guarented upto 0.01 mm/m length.

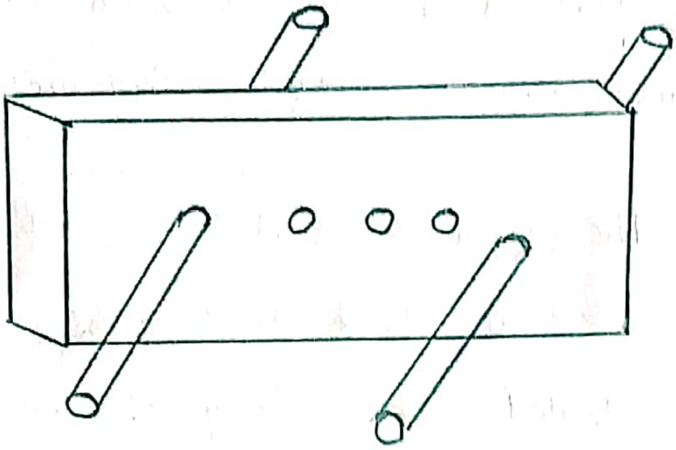
There are several forms of sine bars but figure shown above is commonly used. Some holes are drilled in the body of the sine bars, to reduce the weight and to facillitate

Types of sine bars:-









The accuracy of the sine bar depends upon its constructional features and on maintai-ning these.

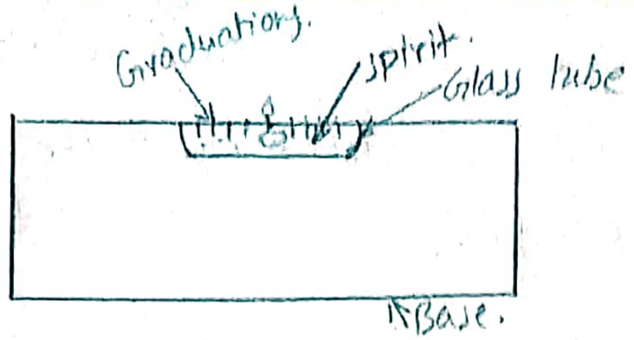
(i) The two rollers must have equal diameters. and be true cylinders.

(ii) The rollers must be set parallel to each other. and to the upper face.

(iii) The precised centre distance between the rollers must be known.

(iv) The upper face must have a high degree of flatness.

Spirit Levels:-



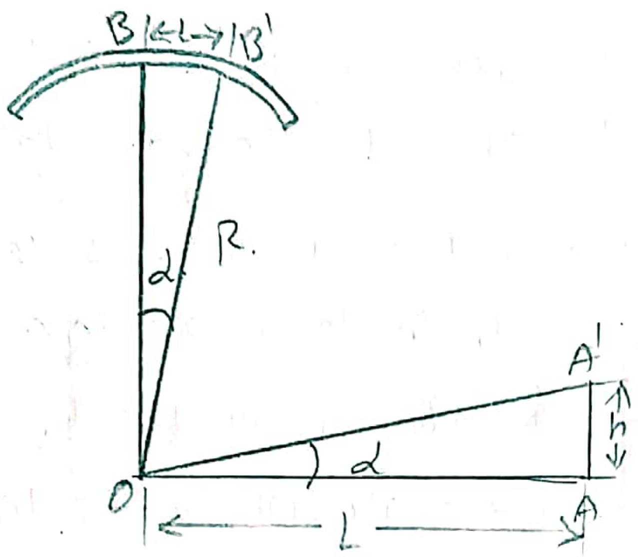
Spirit levels are used for ~~small angle~~ measuring of small angles (or) inclinations and also enable the position of the surface to be determined with respect to the horizontal.

A spirit level consists of a sealed glass tube ground on its inside surface to a convex form, with large radius of curvature R. ~~This~~ A scale is engraved on the glass ~~tab~~ at the top of the tube. The tube is nearly filled with ether such that only a small volume remains at the top part of the tube. which contains ether vapours in the form of the bubbles.

The machinist level consists of a body with a flat base surface ~~and~~ and the glass tube mounted in the upper part of the body.

The side edges of the frame level are made strictly square with the base. Glass tube filled with ether is mounted on the base. For checking the vertical surfaces the side edges of the frame level is placed into exact contact with the surface. and the reading of the bubble noted down.

Principle of spirit level:-



A glass tube is set in the base and adjusted in such away that when the base is horizontal, the bubble rests at the centre of the scale which is engraved on the glass. when the base of the level is moved out how the horizontal the bubble trys to remain at the highest point of the tube and thus moves along the scale. The relations between the movement of bubble and other conditions ~~are~~ involved are as follows:-

→ B is the top of the tube radius and the position of the bubble when the base is at OA.

→ If the base is tilted through an angle 'α' and the base occupies position OA'. The bubble will move a distance L to B'. where angle BOB' = α.

If R is the radius of the tube
L is the length of the base
h is the difference in height between ends.

Then, for small value of 'h'

$$h = L\alpha.$$

Sine bars.

Nomenclature of sine bar.

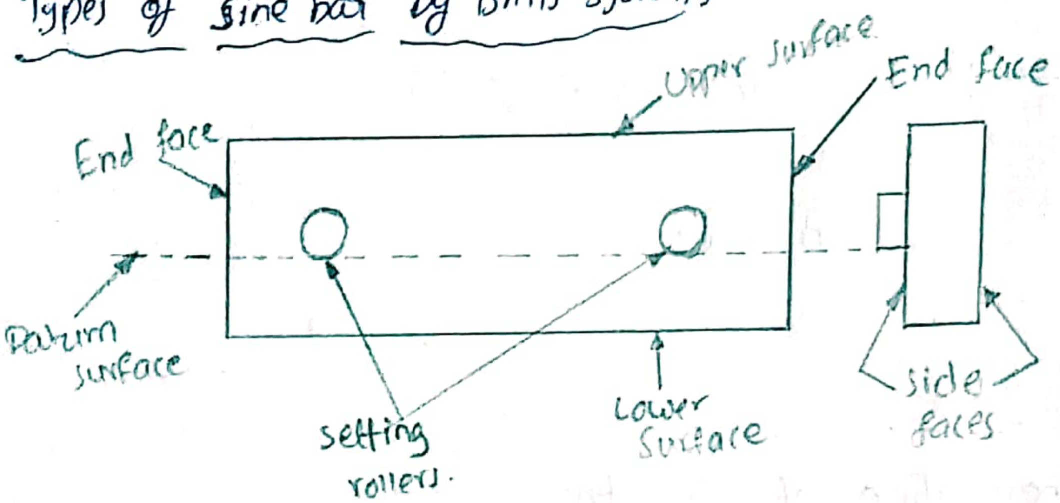
Figure-A:- This type of sine bar can be easily set on steep angles without use of slip gauges. The accuracy of setting decreases with steep angles.

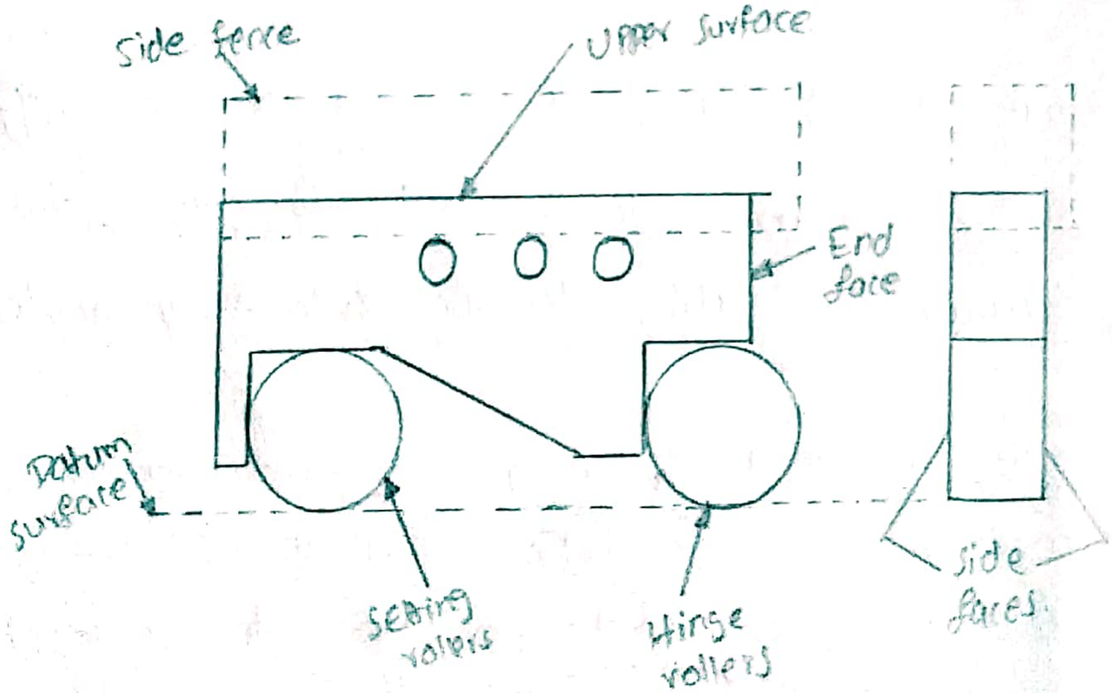
Figure-B:- The figure-B is the most commonly used form in which the rollers are so arranged that their outer surfaces on one side are level with the plain top surface of the sine bar.

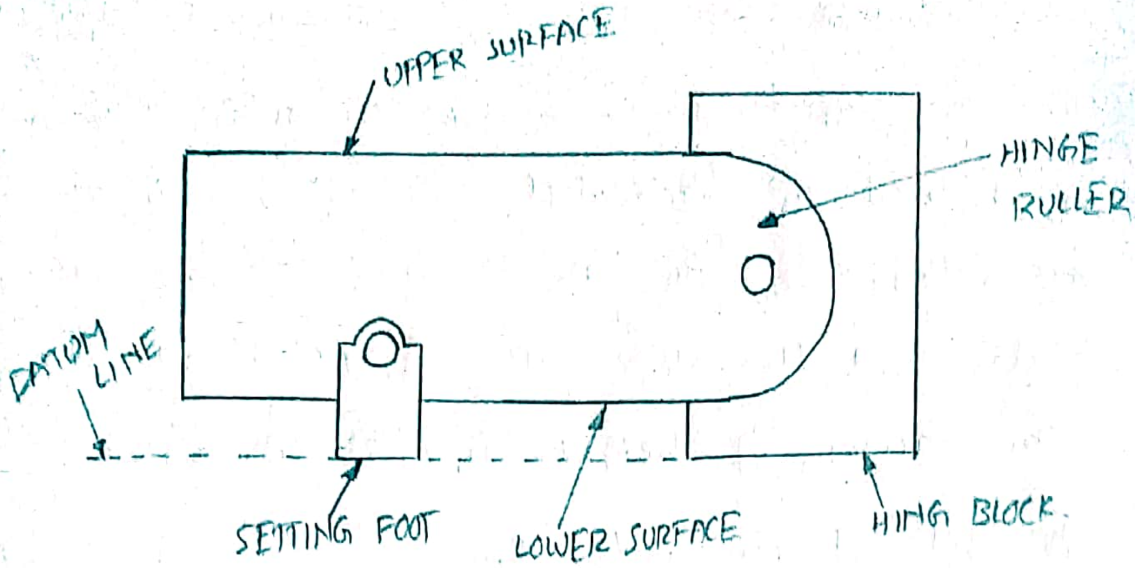
Figure-C:- The form of sine bar shown in figure-c has hollow rollers whose outside diameter is equal to width of sine bar. and is used where the width of sine bar enters into calculation of work height.

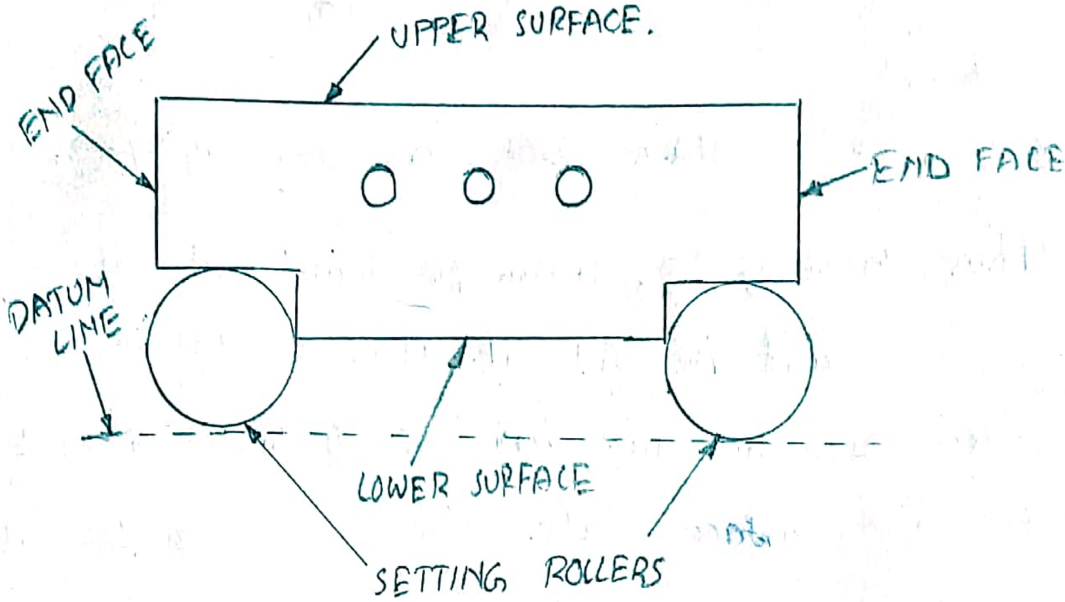
Figure -d:- This form of sine bar is used where ordinary type can not be used on top surface. due to interuption.

Types of sine bar by Britis system:



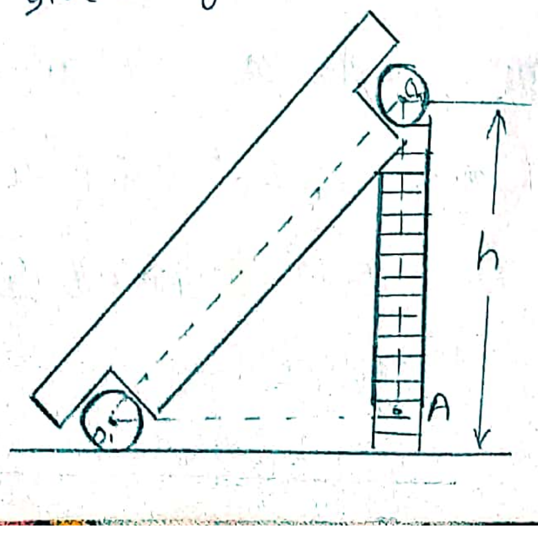






Uses of Sinebar:-

(i) Measuring known angles (or) locating any work to a given angle.



The surface plate is assumed to be having perfectly flat surface so that its surface could be treated as horizontal. One of the cylinders (or) rollers of sine bar is placed on the surface plate and the other roller is placed on the slip gauges of height "h." Let the sine bar be set at an angle "θ."

$$\sin\theta = \frac{O_2A}{O_1O_2} = \frac{h}{l}$$

where,

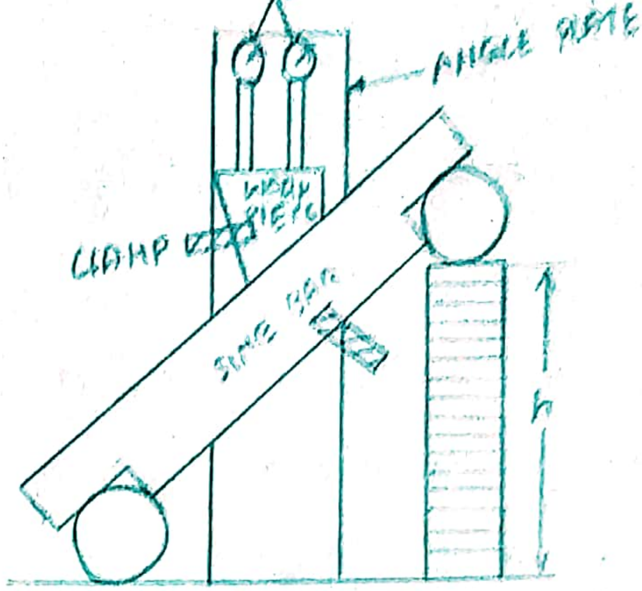
l = Distance between centre of the rollers.

Thus knowing "θ", h can be found out and any work could be set at this angle as the top face of the sine bar is inclined at angle "θ" to the surface plate. The use of angle plates and clamps could also be made incase of heavy components.

(ii) Checking of unknown angles.

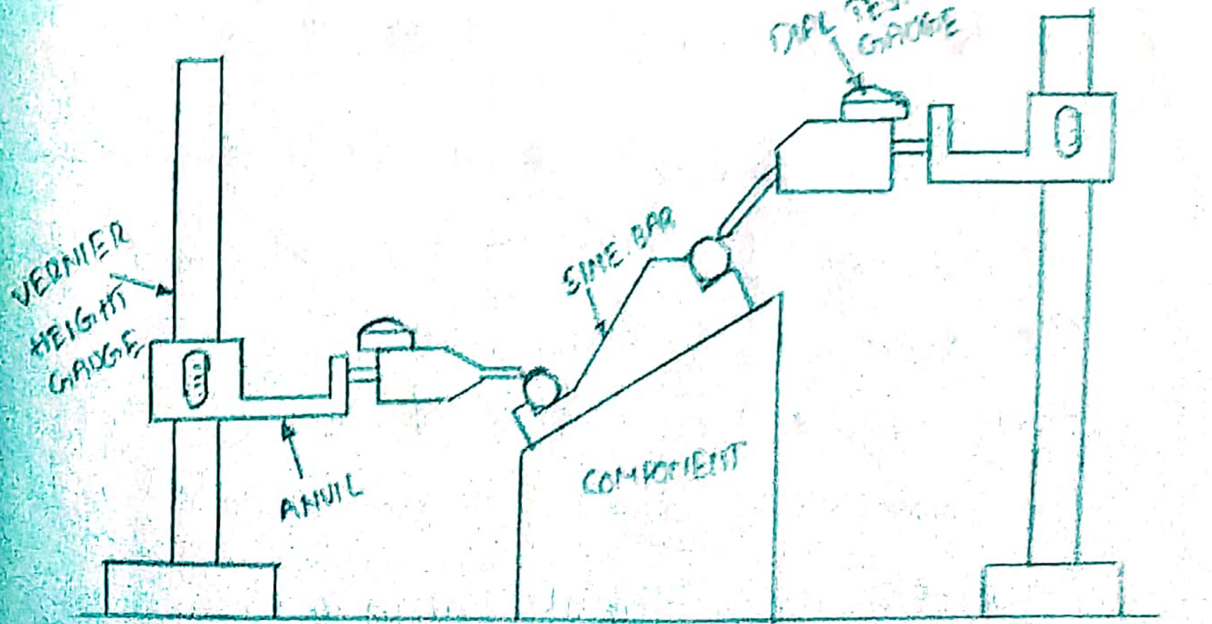
Many atimes angle of component to be checked is unknown. In such cases it is necessary to first find the angle approximately with the help of bevel protactor.

Let the angle be "θ". Then the sine bar is set to an angle θ and clamped to an angle plate.



Checking unknown angle using sine bar

The work is placed on the sine bar and clamped to angle plate and a dial indicator is set at one end and a dial indicator is set at one end of the work and moved other end and deviation is noted. Again slip gauges are so adjusted according to this deviation that dail indicator reads zero across the work surface.



Checking unknown angle of heavy component using sinebar

~~The~~ deviation noted down by the dial indicator is δh over a length l' of work. Then height of slip gauges by which it should be adjusted $= \delta h \times \frac{l}{l'}$

(iii) checking unknown angle of heavy components

In such cases where components are heavy and can not be mounted on the sine bar, then sine bar is mounted on the component as shown in figure. The height over the rollers can then be measured by a vernier height gauge, using a dial test gauge mounted on the anvil of vernier height gauge as the fiducial indicator to ensure constant measuring pressure. The anvil on height guage is adjusted with ~~the~~ probe of dial test gauge showing same test reading for the top most position of the roller.

The use of height gauge for obtaining two readings for either of the rollers of sine bar. The difference of two readings of height gauge divided by centre distance of sine bar gives the sine of the angle of the component to be measured. where greater accuracy is required, the position of dial test gauge probe can be set by adjusting pile of slip gauges. till dial indi-cator indicates same reading over roller of sine bar and the slip gauges.

Limitations :-

(i) The sine bar is physically clumsy to hold in position.

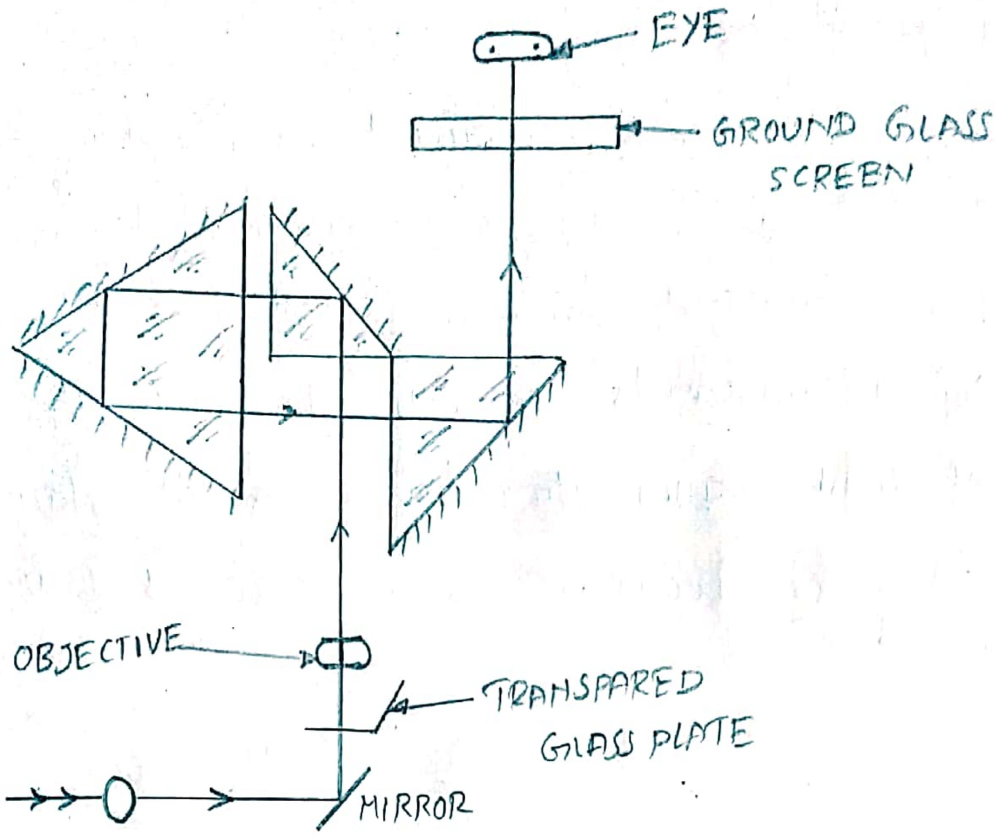
(ii) The body of sine bar obstructs the gauge block stack even if releaved.

(iii) Slight errors of sine bar cause large angular errors.

(iv) Temperature variation becomes more critical.

(v) A difference in deformation occurs at the point of roller contact to the support surface and to the gauge blocks because at higher angles. The weight load is shifted more towards the fulcrum roller.

(vi) The size of gauges, instruments are parts that a sine bar can inspect is limited. Since it is not designed to support large (or) heavy objects.



INTERNAL ARRANGEMENT OF TOOLS MAKERS MICROSCOPE

This is a versatile instrument based on optical means. It consists of a heavy hollow base accomidating the illumunating unit under-neath. Work table is mounted on the base of the instrument on cross-slides and is equiped with accurate micrometer screws to move it in two mutually perpendicular directions in the horizontal ~~plate~~ plane i.e., in longitudinal and lateral direction.

The optical head is mounted on a vertical column and can be moved up (or) down and focused over the work. To clamp the optical head at any desired position, clamping screw is provided.

Workpiece is mounted on a glass plate placed on the table. A light source provides horizontal beam of light which is reflected from a mirror by 90° upwards towards the table. The beam of light passes through transparent glass plate on which workpiece is to be checked are placed.

Interferance of light:-

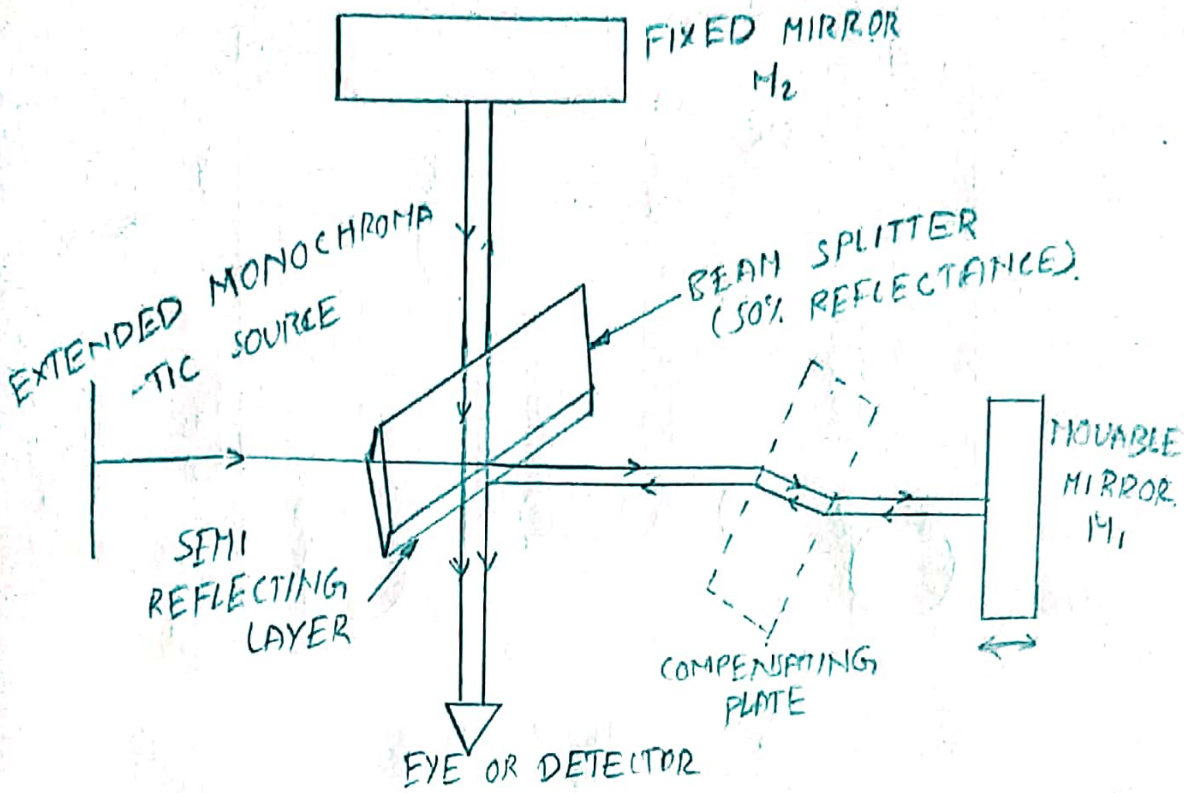
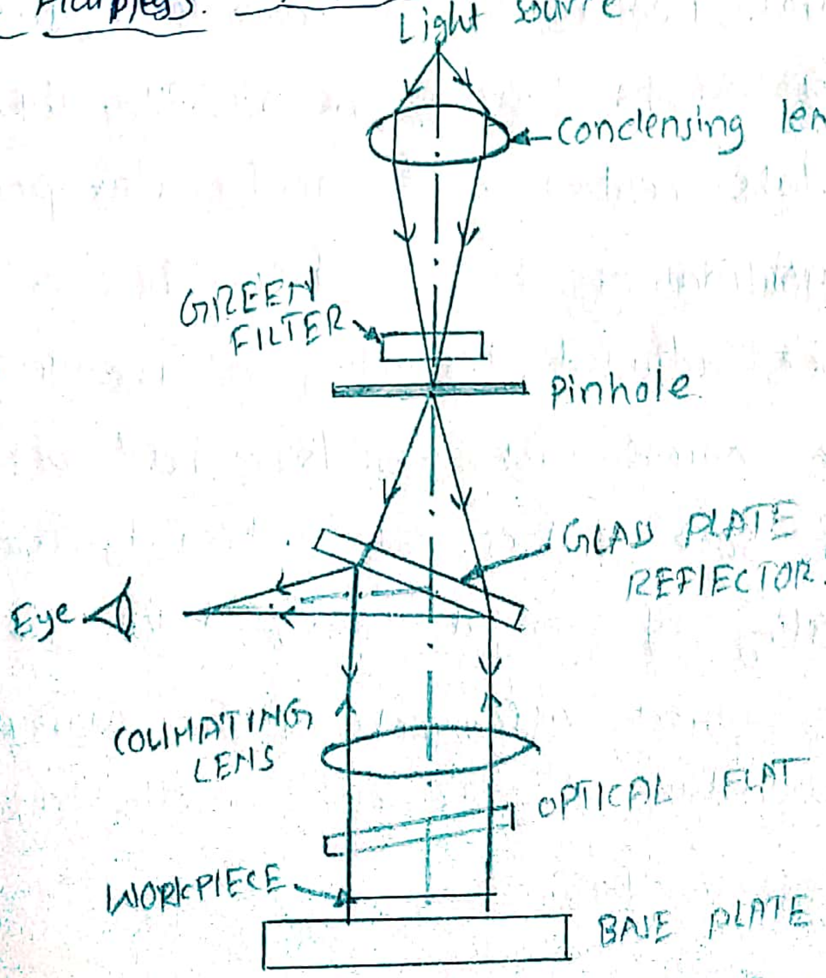


Fig:- MICHELSON INTERFEROMETER

NPL Flatplate interferometer:-



Sine centre:-

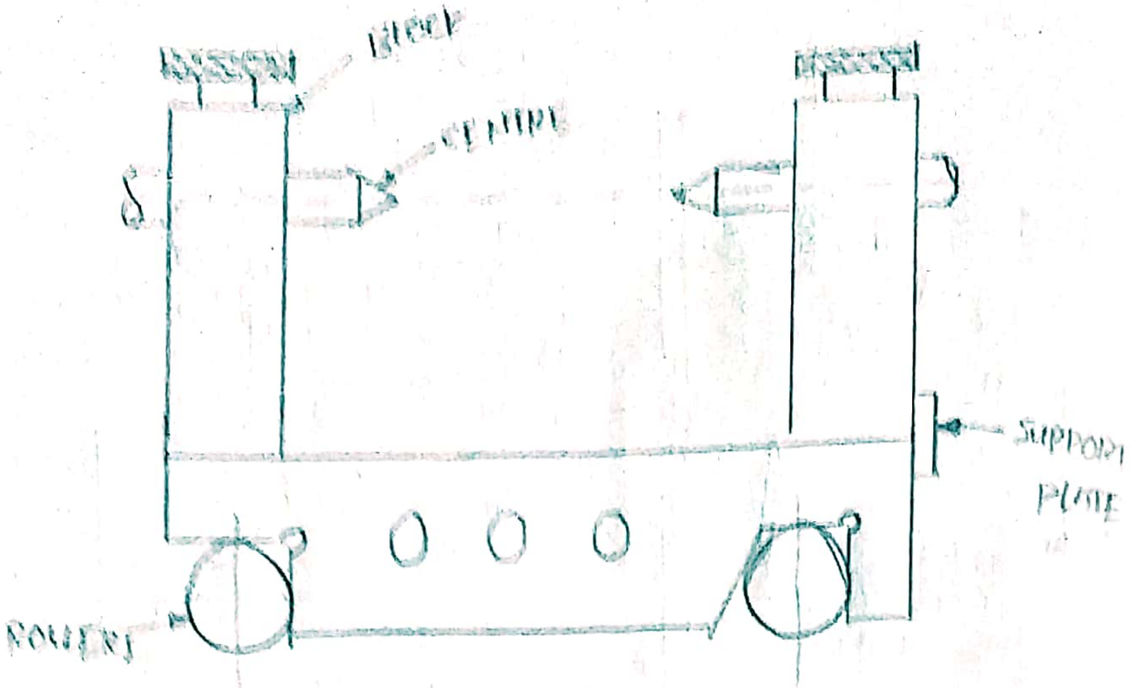


FIG: SINE CENTRE

Due to difficulty of mounting conical work easily on a conventional sine bar sine centres are used. Two blocks as shown in figure are mounted on the top of the sinebar. These blocks accomidate centres and can be clamped at any position on the sine bar. The centre can also be adjusted depending on the length of the conical workpiece, to be held between centres. Sine centres are extreamly useful for testing of conical work, since the centres ensure correct alignment of the workpiece. The procedure for its setting is the same as that of sine bar.

Sine table :-

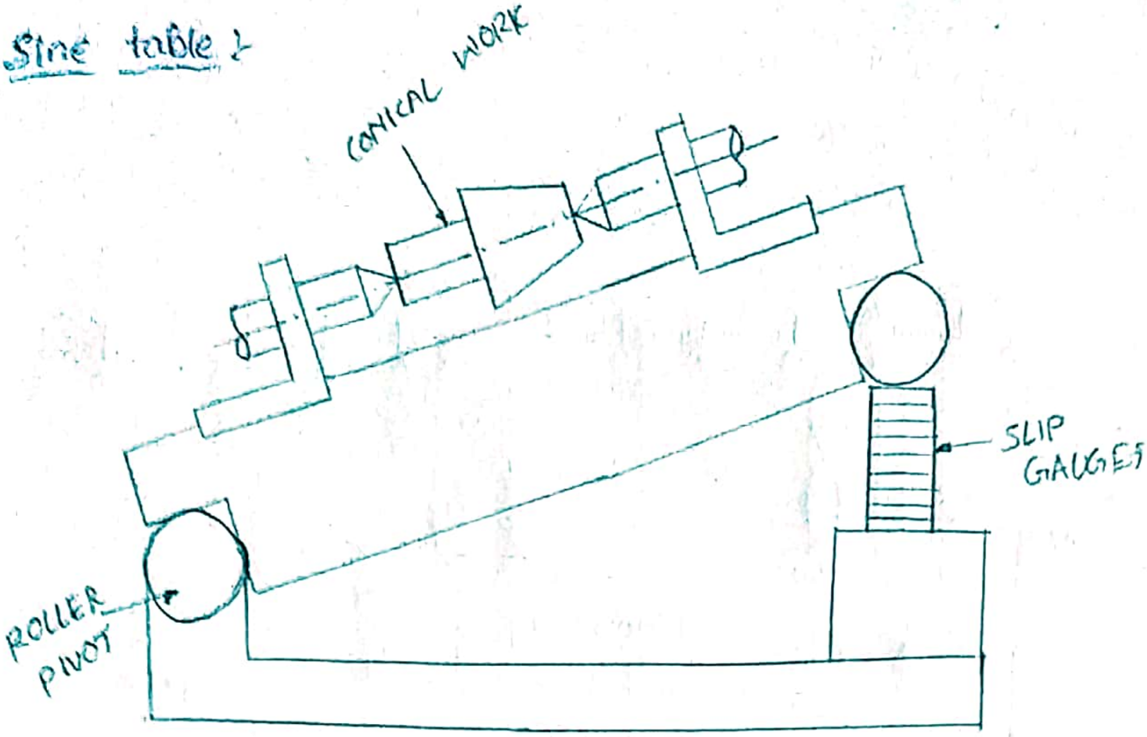
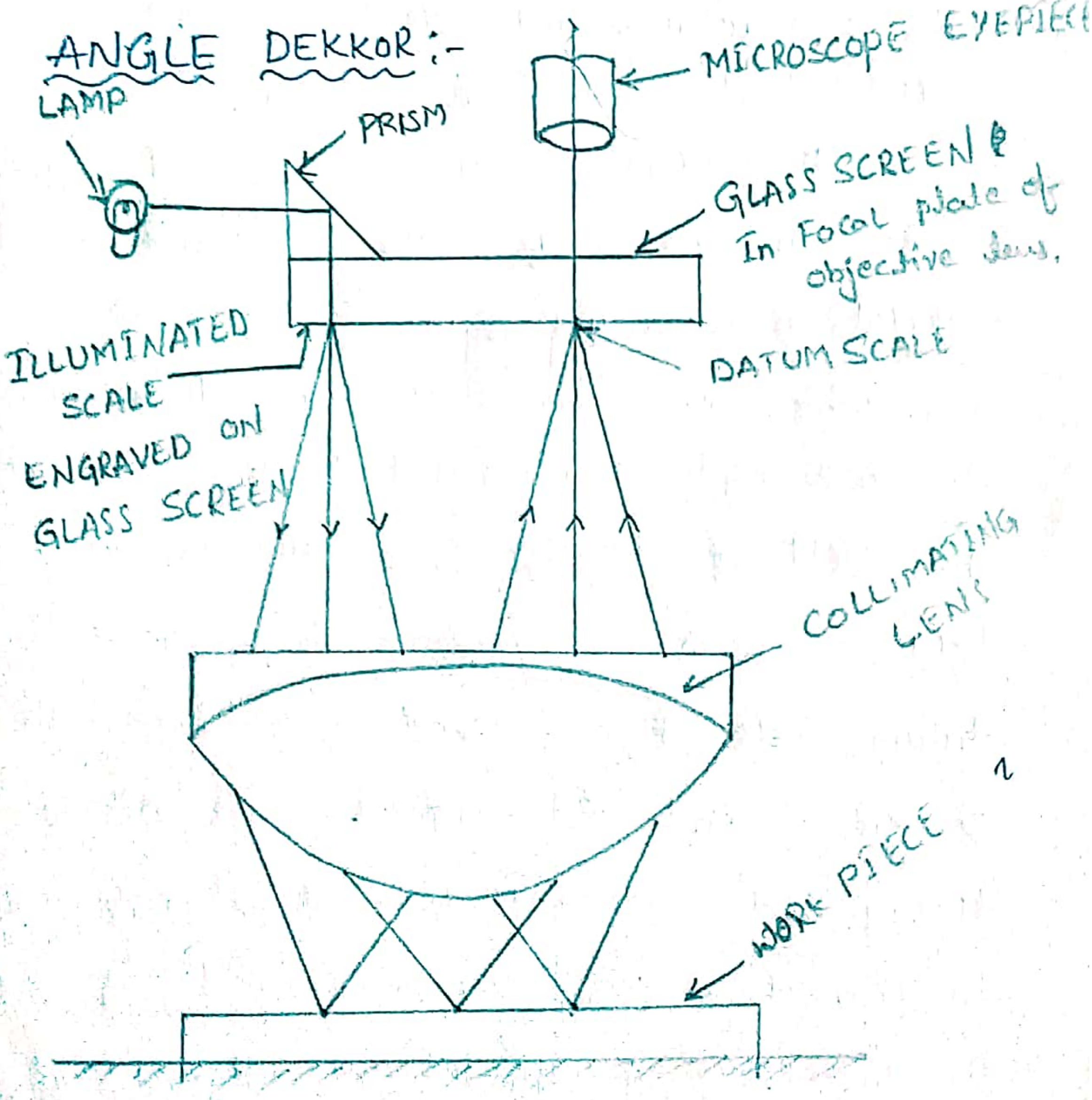
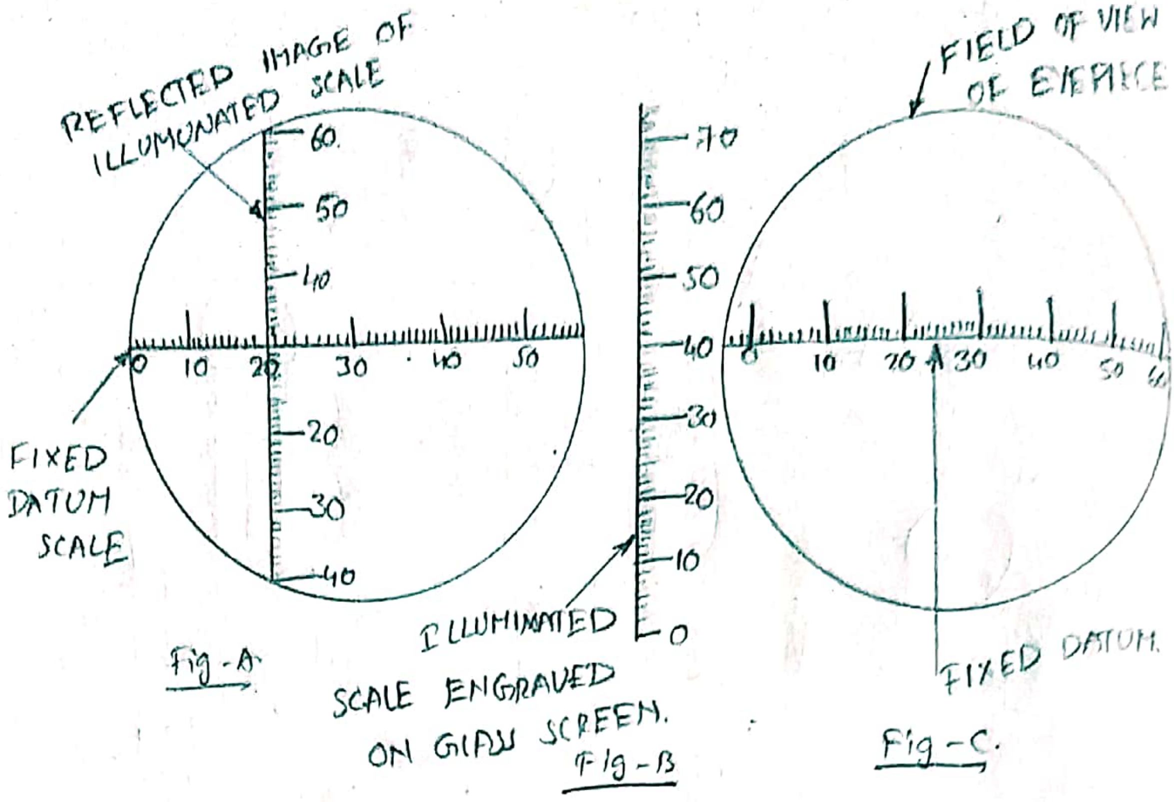


FIG :- SINE TABLE

ANGLE DEKKOR :-





This is also a type of autocolimeter. It contains a small illuminated scale in the focal plane of the objective lens (collimating lens). The scale in normal position is outside the view of microscope eyepiece as shown in fig-B. The illuminated Scale is projected as a parallel beam by the collimating lens. which are the striking a reflector below the instrument is refocused by the lens in the field of view of the eyepiece. In the field of view of microscope there is another datum scale fig-C. fixed across the centre of screen and the reflected image of the illuminated scale is recieved at right angle to this fixed scale as shown in fig-A. and the two scales in this position intersect each other. Thus the reading of the illuminated scale measures angular deviations. from one axis at 90° to the optical axis and the reading on the fixed datum scale measures the deviation about an axis mutually perpendicular to the other two.

Uses of Angle dekkor:-

(i) ~~Ex combined~~ Measuring the angle of a component.

(ii) To obtain precise angle setting for machining operation.

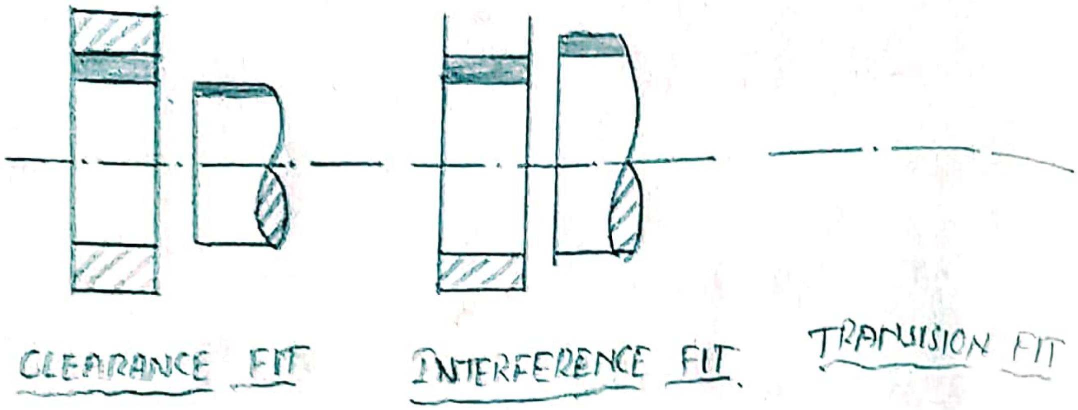
(iii) Checking a sloping angle of V-block.

(iv) To measure the angle of cone (or) taper gauge

Fits:-

when two parts are assembled (or) dissambled the relation resulting from the difference between their sizes before assembly is called fit. Depending upon the actual limits of hole (or) shaft, the fit may be a clearance fit (or) transision fit (or) interferance fit.

(i) Clearance fit:- In this type of fit the largest permitted shaft diameter is smaller than the diameter of smallest hole. so that the shaft can rotate (or) slide through with different degrees of freedom. according to the purpose of matting members.



(ii) Interference fit :- In this type of fit the minimum diameter of shaft is larger than the maximum allowable diameter of the hole. In this case the shaft and the hole members are intended to be attatched perminantely and used as a solid component but according to the application of this combination this type of fit can be varied. Thus if during use one of two member is subjected to wear It should be possible to drive (or) force the two members apart for replacement purpose. Example bearing bushes which are in an interference fit in their housing. A small end in the connecting rod of an engine.

UNIT - 6.

Alignment test (or) Acceptance tests for machine Tools

The quality and accuracy of the finished work depends on the accuracy of the machine tools used in their production. The machine tools must be able to produce workpieces of a given accuracy, within prescribed limits. consistantly.

It is for this reason the machine tools are tested at various stages, during assembly, after assembly, ~~execution~~ erection, repairs (or) overhauls as per accuracy test chart inorder to determine whether it ~~meats~~ meets the requirement ~~[illegible]~~ of specifications (or) not.

The ~~[illegible]~~ alignment test is carried out to check the grade of manufacturing accuracy, of a machine tool. It consists of checking the relationship between various machine elements such as bed, table, Spindle, etc, when a machine tool is idle and unloaded.

(i) Alignment test (or) Geometrical test.

(ii) Performance test (or) practical test.

(i) Alignment (or) Geomentrical tests:-

It is carried out to check the grade of manufacturing, accuracy of the machine tool. It consists of checking the relationship between various machine elements. such as Bed, table, spindle, etc when the machine tool is idle and unloaded.

(ii) Performance (or) Practical test:-

Performance test consists of checking the accuracy of finished component and is known as practical test. The performance test therefore consists of preparing the actual test jobs on that machine and checking the accuracy of the jobs produced. The performance test is carried out to know whether the machine tool is capable of producing the parts within the specified limits (or) not.

Leveling of the machine:-

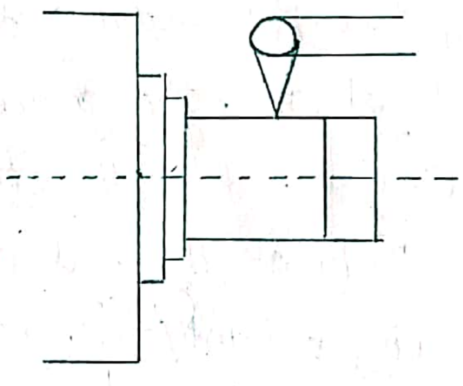
Before the various tests on any machine tool are carried out it is very necessary that it should be installed in trully horizontal and vertical planes. In horizontal plane both longitudinal and transverse directions are equally important. If say any long lathe bed is not installed trully horizontal the bed will undergo deflection, there by producing a simple bend and undesirable stresses will be introduced. If the bed is not installed trully horizontal in transverse direction, twist will be produced. Thus the movement of the saddle can not be in a straight line and true geomentric cylinder can not be generated.

For proper installation and maintanance of its accuracy a special concrete foundation of considerable depth must be prepared. ~~This~~ ~~also~~ Also this must be insulated from the surrounding floor by introducing some form of damping.

The level of the machine bed in longitudinal and transverse direction is generally tested by ~~spirit~~ a sensitive spirit level. The saddle is kept approximately the centre of the bed support feet. The spirit level is then placed at a-a. The ensured level in the longitudinal direction. It is then ~~transfer~~ traversed along the length of the bed and readings at various places are noted docon. For test in transversed direction the level placed on the bridge piece to span to front and rear guide ways and then readings are noted. It is preferable to take two readings in longitudinal and transverse directions simmultaneowsly, so that the effect of adjustment in one direction may also be observed in other. The readings in transverse direction reveal any twist (or) wind in the bed. It may be noted that the true guideways may be perfectly levelled in longitudinal direction, but might not be parallel to eachother. This is revealed by the test in transverse direction.

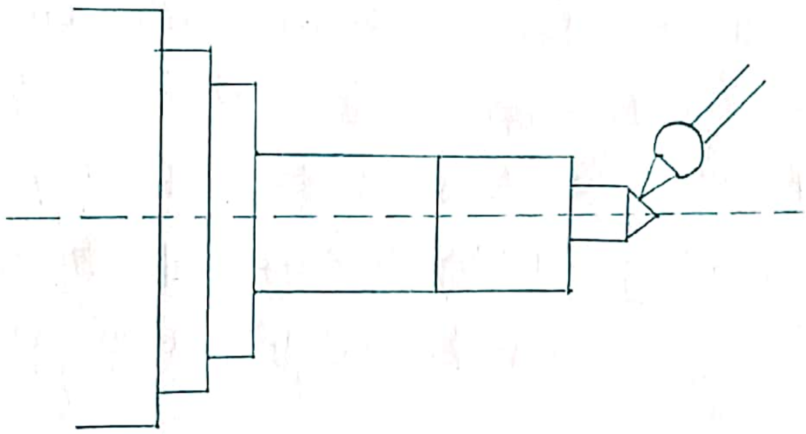
The straight-ness of the bed in longitudinal direction for the long beds can also be determined by other methods using strain edge and autocollimeter. But the test in transverse direction can be carried only by spirit level.

True Running of locating cylinder of main spindle:-



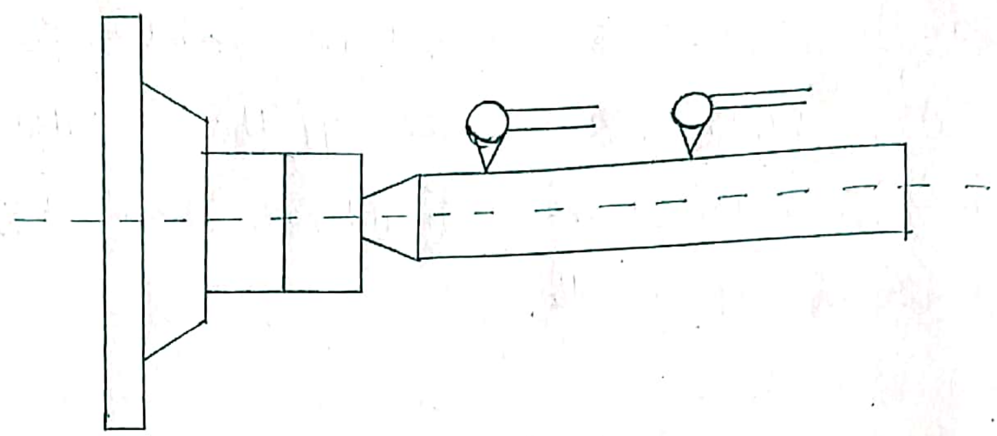
True running of locating cylinder is provided to locate the chuck (or) faceplate. However locating surface cannot be threaded one as threads get worn-out soon and thus introducing play in faceplate (or) chuck. Thus locate the surface is cylinderical and this must run trully, for only then faceplate can run trully. The dial indicator is fixed to the carriage (or) any other fixed member. and the feeler of the indicator touches the locating surface. The surface is then rotated on it's axis and indicator should not shown any movement of needle.

True running of headstock centre :-



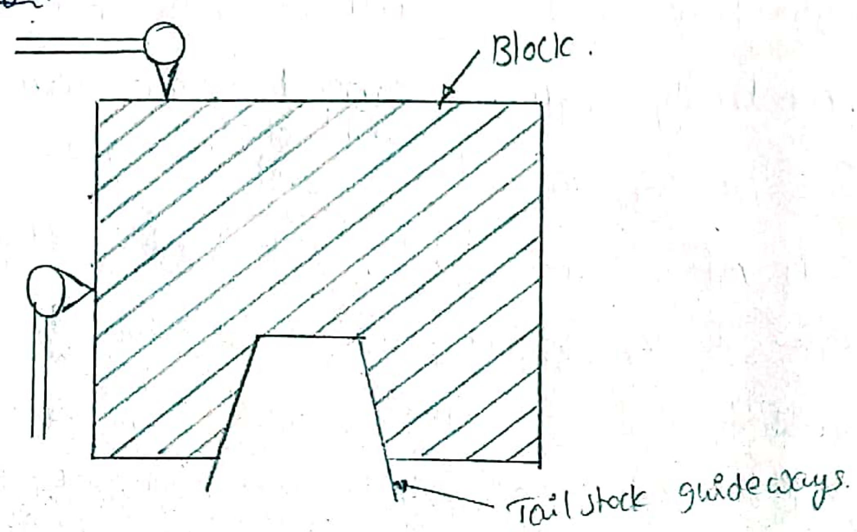
Head stock centre is lived centre and the workpiece has to rotate with this centre. If it is not true with the axis of movement of the spindle, eccentricity will be caused. while turning a work As the job axis to ~~brought~~ could not co-incide with the axis of main spindle. For testing this error the feeler of the dial indicator is pressed perpendicular to the taper surface of the centre and the spindle is rotated. The deviation indicated by the dial gauge gives the trueness of the centre.

True running of taper socket in main spindle:-



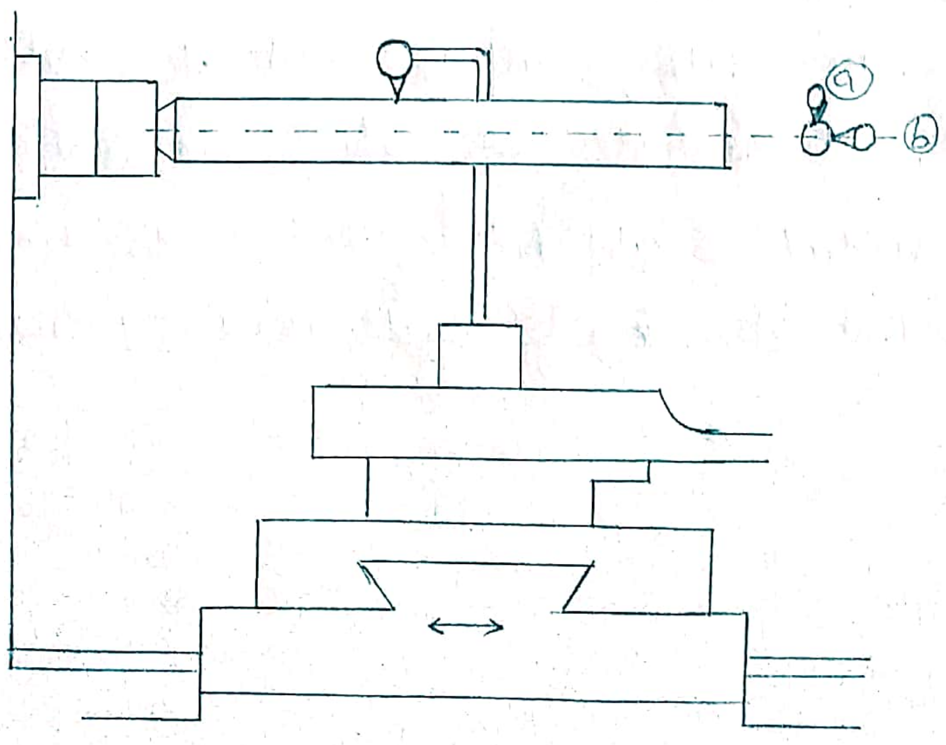
If the axis of tapered hole of the socket is not concentric with the main spindle axis, eccentric and tappered jobs will be produced. To test it a mandrel is fitted to the tappered hole and reading set to extremes of the mandrel are taken by means of dial Indicators as shown in figure.

Parallelism of tailshock guideways with the movement of carriage:-

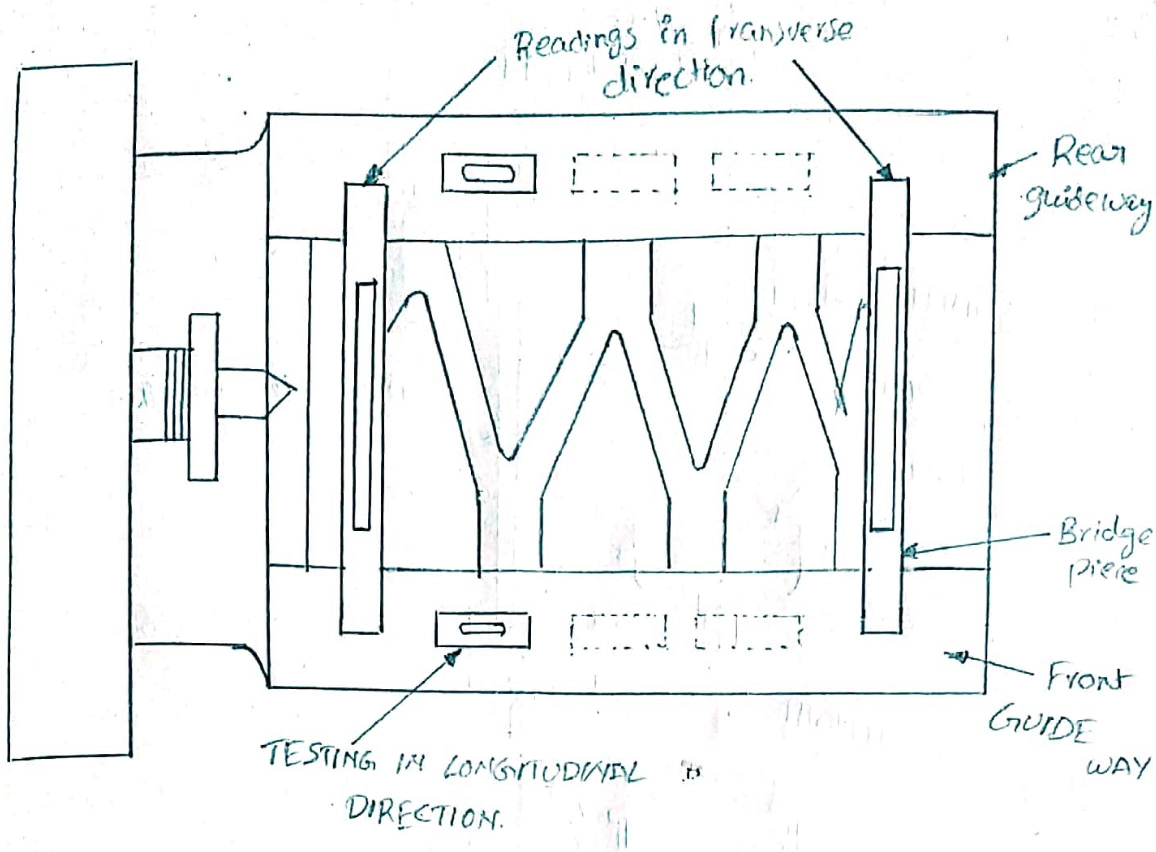


Sometimes the job is held between headstock and tailstock centre for turning. In that case the job axis must co-incide with the tailstock centre. If the tailstock guideways are not parallel with the carriage movement there will be some offset of the tailstock centre and this results in taper turning. To check the parallelism of the tailstock guideways in both planes i.e., horizontal and vertical a block is placed on the guideways and feeler of the dial indicator is touched on the horizontal and vertical surfaces of the block. The dial indicator is held in the carrage and the carriage will move. Any error is indicated by the pointer of dial indicator.

Parallelism of main spindle to saddle movement:-



If the axis of the spindle is not parallel to the horizontal direction a tappered surface is produced. Any deviation from parallelism of spindle axis from bed in vertical axis will produce a hyperboloid surface. For this test a mandrel is fitted in the tappered socket of the spindle. Mandrel has a concentric tappered shank which is close fit to the spindle nose taper. The feeler of the dial indicator is pressed on the mandrel and the carrage is moved. The indication in horizontal plane is given by dial indicator-(B) and in vertical place while dial indicator-A. In vertical plane the mandrel should be ~~raise~~ ~~raising~~ raising towards the free end inorder to contract the weight of mandrel and dog. But for counter acting cutting forces it should be lowered towards free end. In horizontal plane mandrel should be inclined in direction opposite to the direction of tool ~~pressure~~ pressure.



LEVELING OF THE MACHINE

Alignment test on radial drilling machine:-

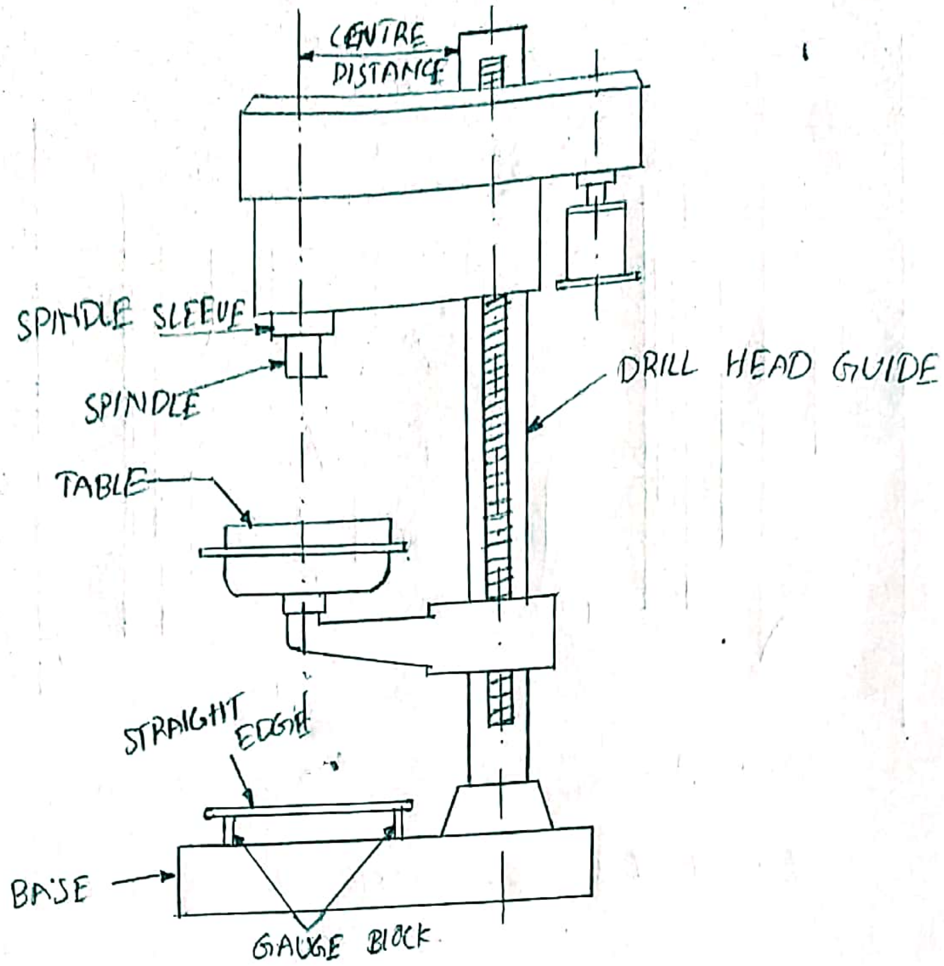
(i) Flatness of clamping surface of base:-

The test is performed by placing a straight edge on two gauge blocks on the baseplate in various positions and the error is noted down by inserting the feeler gauges. This error should not exceed 0.1/1000 mm clamping surface and the surface should be concave only.

(ii) Flatness of clamping surface of table:- same as first test.

(iii)

Scanned by CamScanner



FLATNESS OF CLAMPING SURFACE OF BASE.

(iii) perpendicularity of drill head guide to base plate:-

Squareness (or) perpendicularity of the drill head guide to the base plate is tested.

(a) In a vertical plane passing through the axis of both spindle and column

(b) In a plane at 90° to the plane at (a).

The test is performed by placing the frame level on guide column and base plate and the error is noted by noting the difference between the readings of ~~column and base plate~~ two levels. This error should not exceed 0.25/1000 mm guide column for ⓐ and the guide column should be inclined at the upper end towards the front only and 0.15/1000mm for ⓑ.

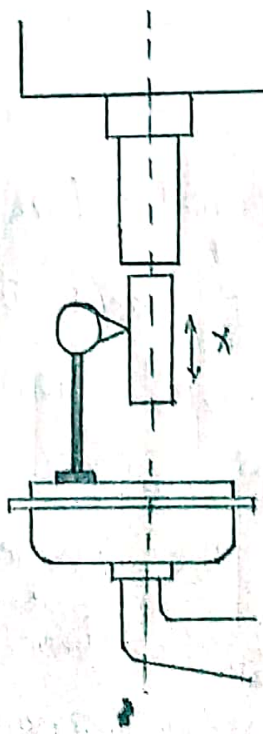
(iv) Perpendicularity of drill head guide to the table.

(v) Perpendicularity of spindle sleeve with base plate.

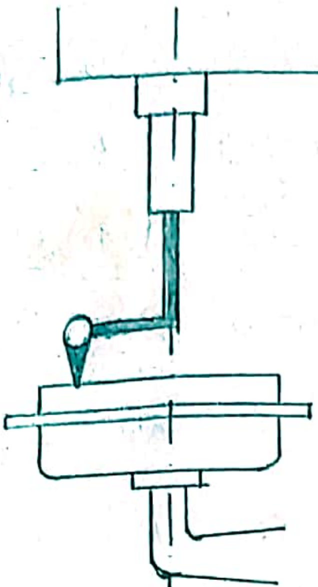
This test is performed in both the planes specified in test-3. and in simillar manner to the difference that the frame levels are to be placed on spindle sleeve. The error i.e., the difference between the readings of the two levels should not exceed 0.25/1000mm for plane-ⓐ and the sleeve should be inclined towards the column only and 0.15/1000 mm for plane-ⓑ.

(vi) True running of spindle taper :- For this test, the test mandrel is placed in the tapered hole of spindle and a dial indicator is fixed on the table and its feeler made to scan the mandrel. The spindle is rotated slowly and readings of indicator noted down. The error should not exceed 0.03/100 mm for machines with taper upto morse No.2 and 0.04/300mm for machines with taper larger than Morse No.2.

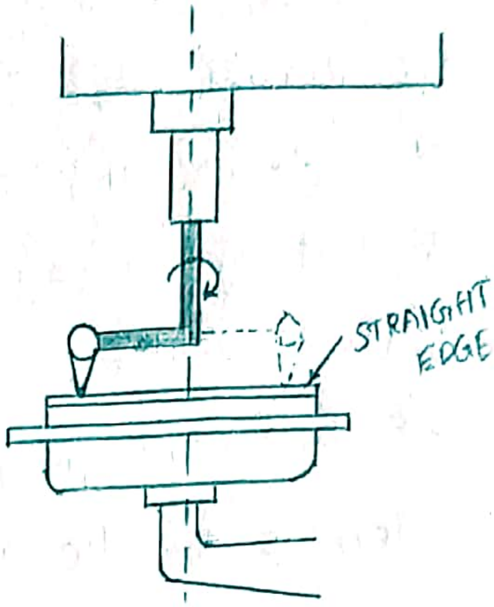
(vii) Parallelism of the spindle axis with its vertical movement :- This test is performed into two planes (A) and (B) at right angles to each other. The test mandrel is fitted in the tapered hole of the spindle and the dial Indicator is fixed on the table with its feeler touching the mandrel. The spindle is adjusted in the middle position of its travel. The readings of the dial Indicator are noted when the spindle is moved in upper and lower directions of the middle position with slow vertical feed mechanism.



Parallelism of the spindle axis with its vertical movement



Squareness of clamping surface of table to its axis.



Squareness of spindle axis with table.

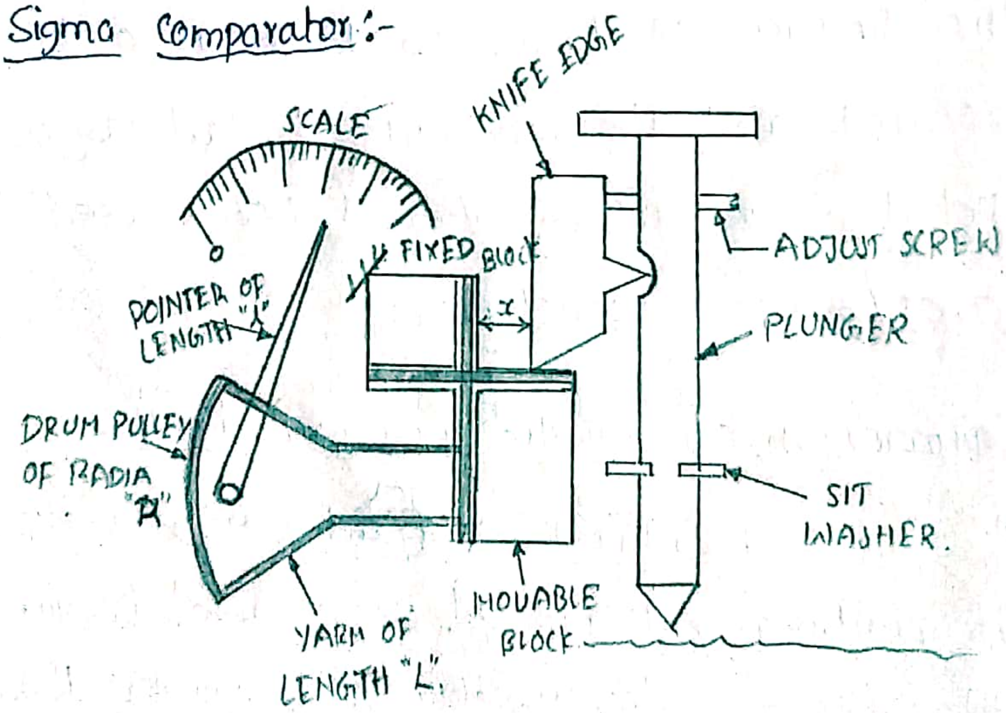
(viii) Squareness of clamping surface of table to its axis:- For performing this test, the dial indicator is mounted in the tapered hole of the spindle and its feeler is made to touch the surface of table. The table is slowly rotated and the readings of dail gauge noted down, which should not exceed 0.05/300 mm diameter.

(ix) Squareness of spindle axis with table:-

For this test a straight edge is placed in positions AA' and BB'. work table is arrang-ed in the middle position of its vertical travel. The dial indicator is mounted in the spindle tapered hole and its feeler made to touch the straight edge first say at A and reading noted down. The spindle is rotated by 180° so that the feeler touches at point A' and again reading is noted down. The difference of two readings gives the error in squareness of spindle axis with table. Similar readings are noted down by placing the straight edge in position BB'.

The permissible errors are 0.08/300 mm with lower end of spindle inclining towards column only for set up AA' and 0.05/300 mm for set up BB'.

Sigma Comparator:-



CONSTRUCTION OF SIGMA COMPARATOR

Magnification, $M = \frac{L \times l}{x \cdot R}$

Advantages :-

(i) It is usually robust, compact and easy to handle.

(ii) There is no external supply such as electricity, air required.

(iii) It has very simple mechanism and is cheaper when compared to other types.

(iv) It is suitable for ordinary workshop and also easily portable.

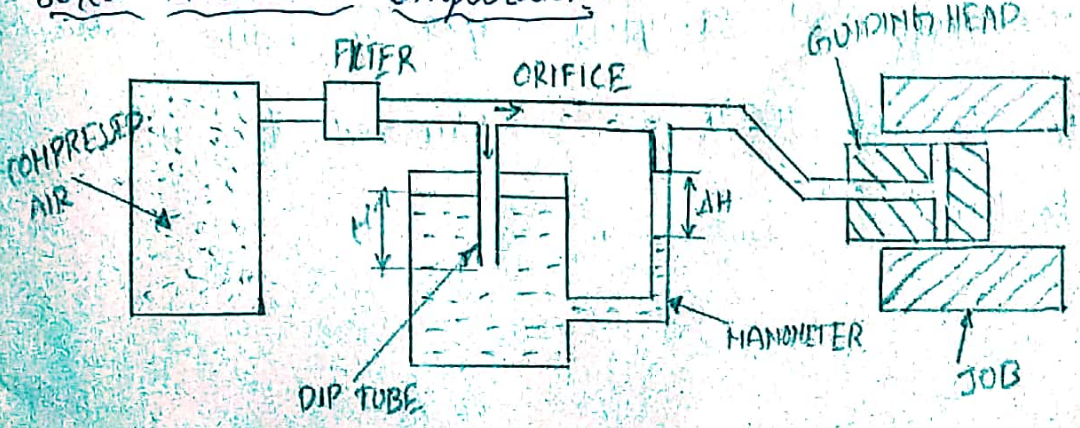
Disadvantages :-

(i) Accuracy of the comparator mainly depends on the accuracy of the rack and pinion arrange -ment. Any slackness will reduce accuracy.

(ii) It has more moving parts and hence friction is more and accuracy is less.

(iii) The range of the instrument is limited since pointer is moving over a fixed scale.

Solex Pneumatic Comparator :-

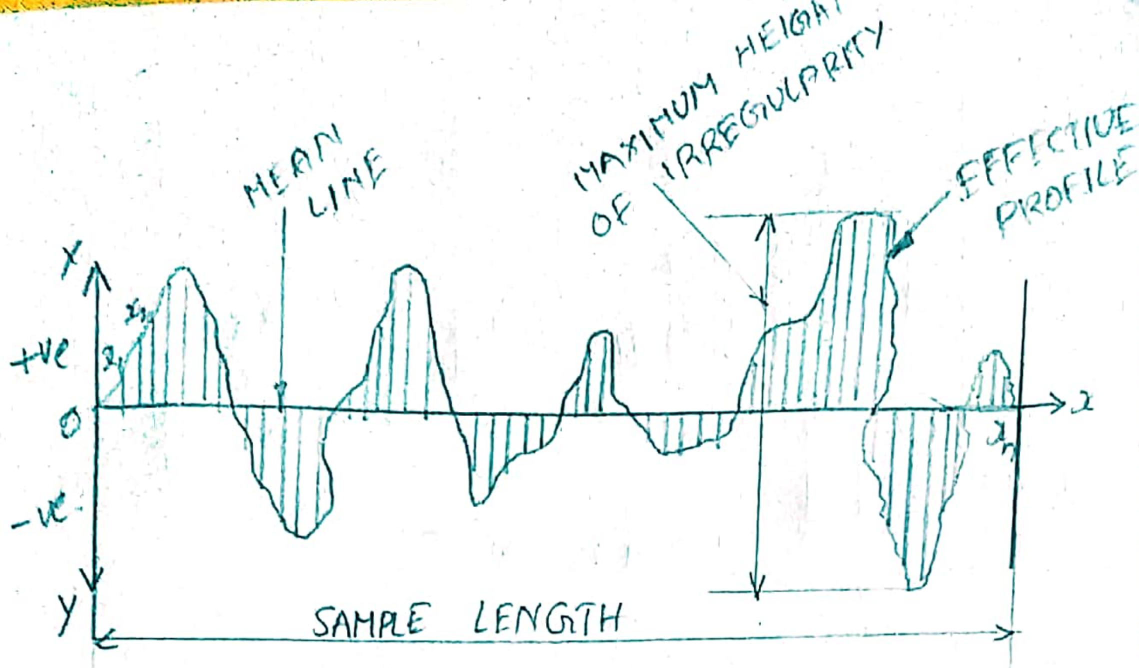


Comparator:- Comparators works on relative mea-surements. It gives only dimensional difference in relation to a basic dimension. So a comparator compares the unknown dimensions of a plot with some standard (or) master setting which represents the basic size and dimensional varia-tions from the master setting are amplified and measured.

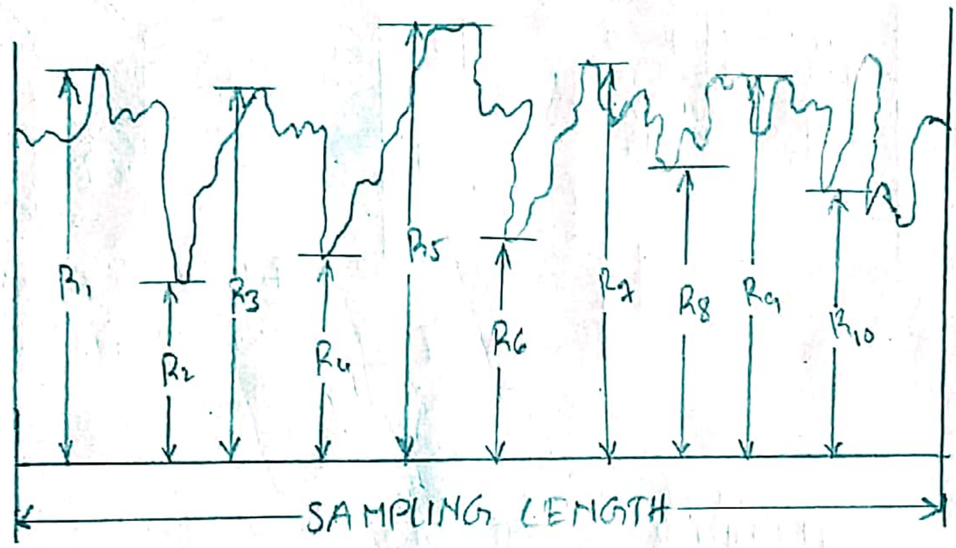
Surface Texture:-

With the more precise demands of modern engineering products, the control of surface texture together with dimensional accuracy has become more important. It has been investigated that the surface texture greatly influences the functioning of the machine parts.

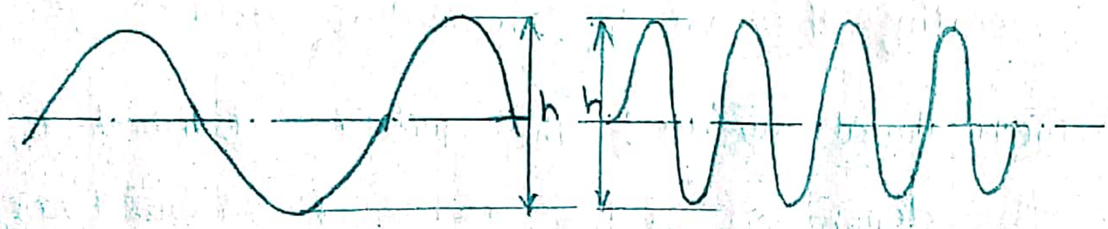
The properties such as appearance, corro-sion resistance, wear resistance, fatigue resistance, lubrication, initial tolerance, ability to hold pressure, load carrying capacity, noise reduction in case of gears are influenced by surface texture.



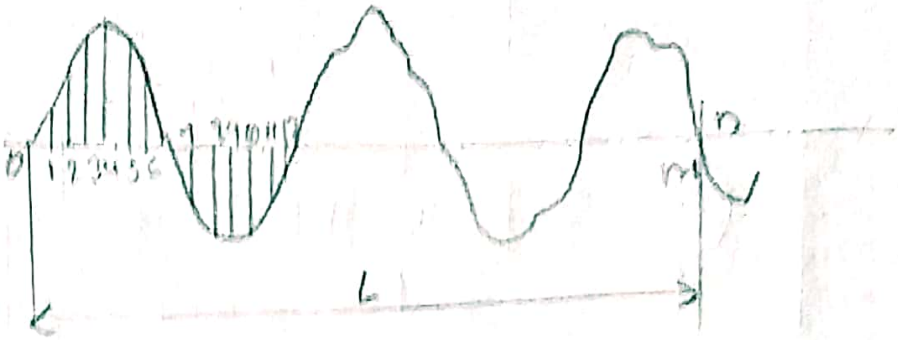
MAXIMUM HEIGHT OF IRREGULARITY



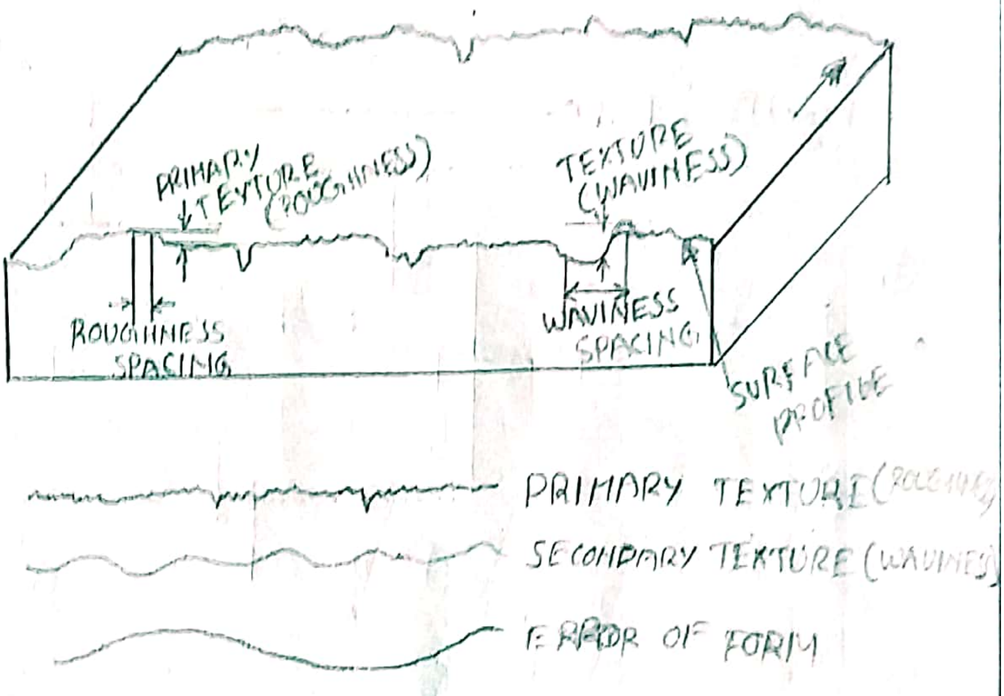
TEN POINT HEIGHT OF IRREGULARITIES.



PEAK TO VALLEY HEIGHT



R.M.S. VALUE



TERMINOLOGY FOR SURFACE ROUGHNESS

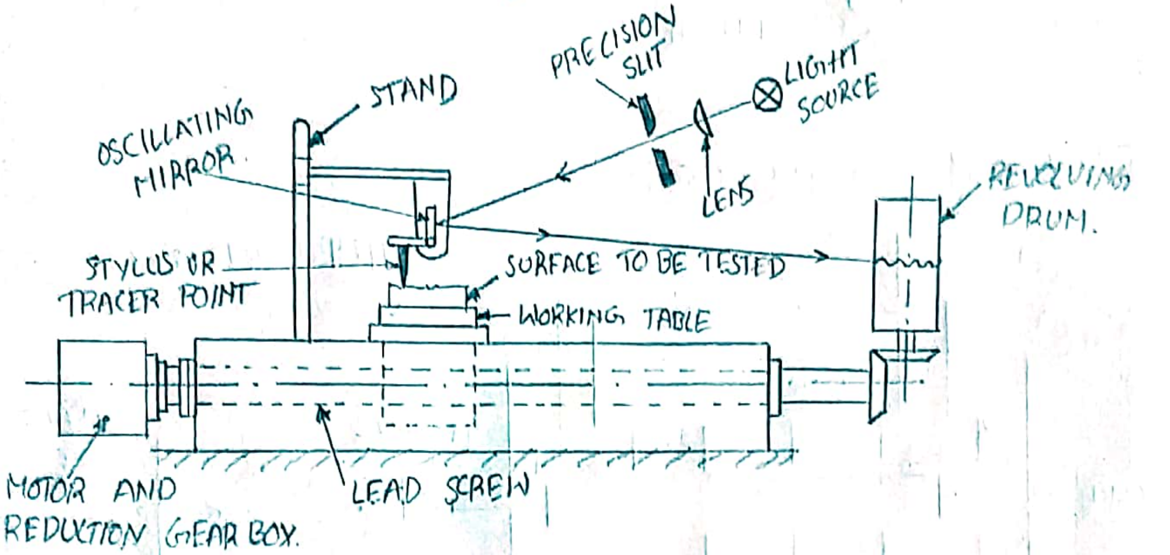
Terminology as per Indian standards:-

Real surface:- The surface limiting the body and seperating it from the surrounding surfaces.

Geomentrical surface:- The surface prescribed by the design (or) by the process of manufacture neglecting the errors of form and surface roughness.

Effective surface:- The close representation of real surface obtained by instrumental means.

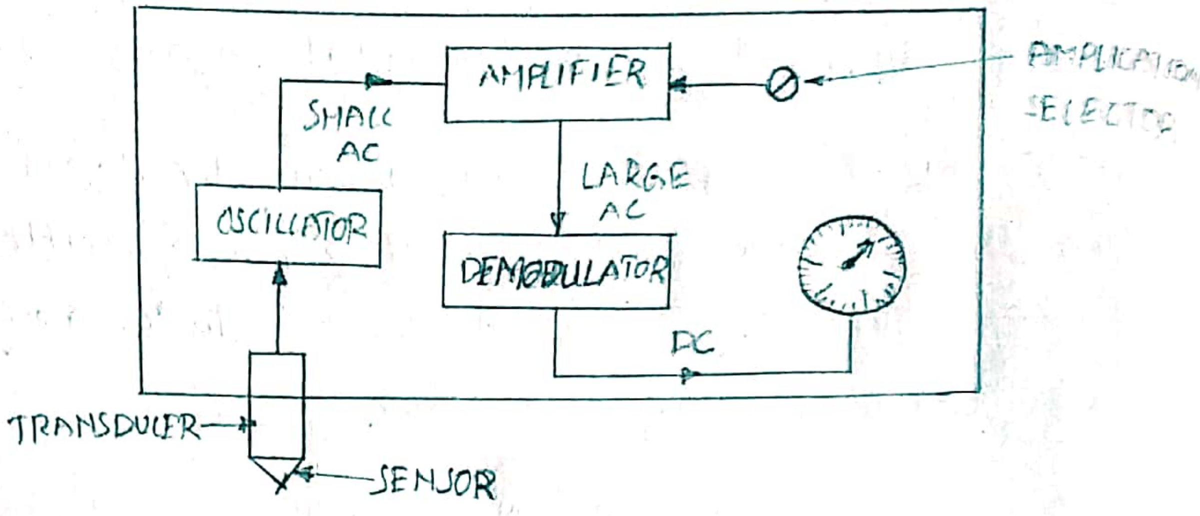
Surface texture:- Repeative (or) random deviations from the nominal surface which form the pattern of the surface. Surface texture includes rough-ness, waviness, lay and flaws.



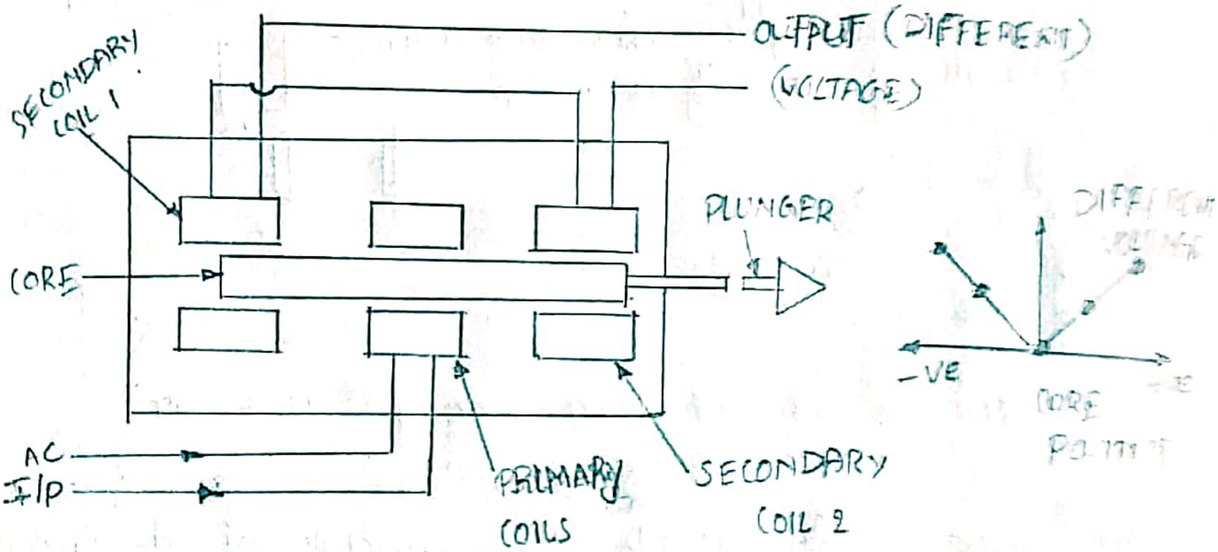
PRINCIPLE OF THE TRACER - TYPE PROFILOGRAM.

Tracer type profilogram:- The principle of the tracer-type profilogram is shown in figure. The surface to be tested is placed on a working table. The table can move to and fro because there is a

Electronic comparator:-



Electrical comparator:-



CONSTRUCTION OF LVDT

UNIT - 4.

Errors in threads :-

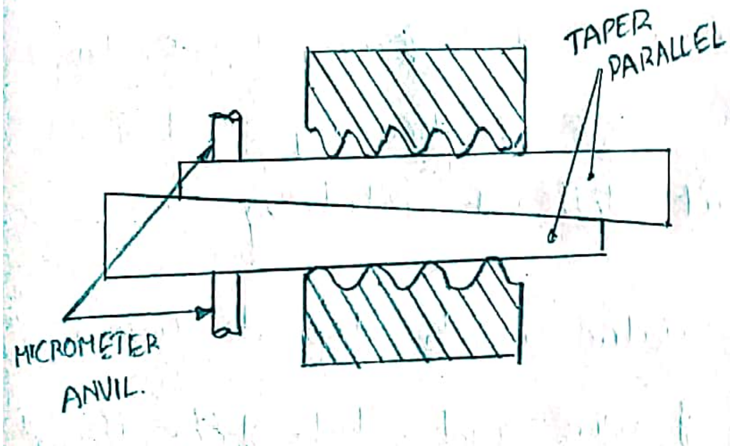
(i) **Drunken thread error:-** This is the one having erratic pitch, in which the advance of the helix is irregular in one complete revolution of the thread.

(ii) Periodic thread error.

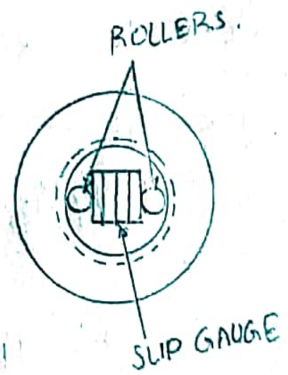
(iii) Progressive thread error.

Minor diameter of internal threads :-

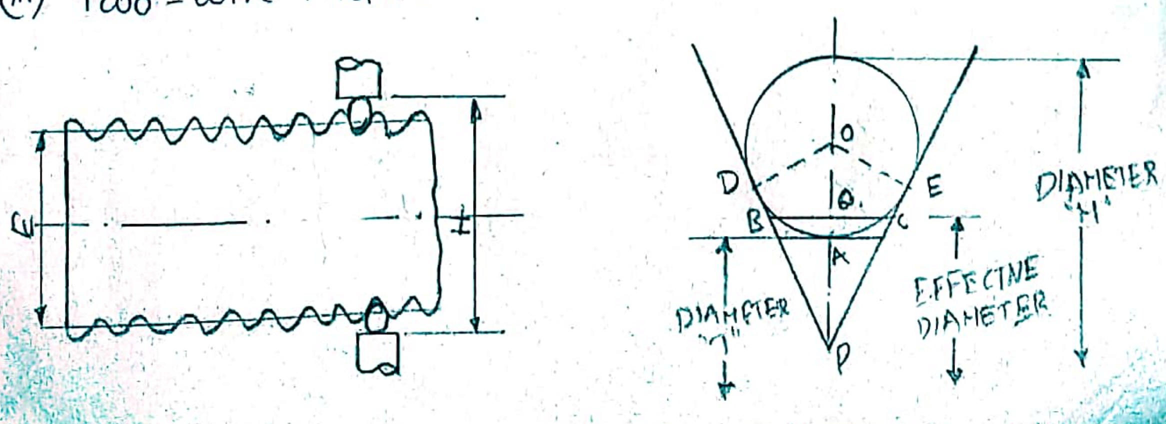
(i) Using taper parallels.



(ii) Using Rollers :-



(iii) Two-wire method :-



The effective diameter of a screw thread may be ascertained by placing two wires or rods of identical diameter between the flanks of the thread, as shown in figure and measuring the distance over the outside of these wires. The effective diameter E is then calculated as

$$E = T + P,$$

Where,

T = Dimension under the wires = M−2d.

M = Dimension over the wires

d = Diameter of each wire.

The wires used are made of hardened steel to sustain the wear and tear in use. These are given a high degree of accuracy and finish by lapping to suit different pitches.

P = It is a value which depends upon the dia of wire and pitch of the thread.