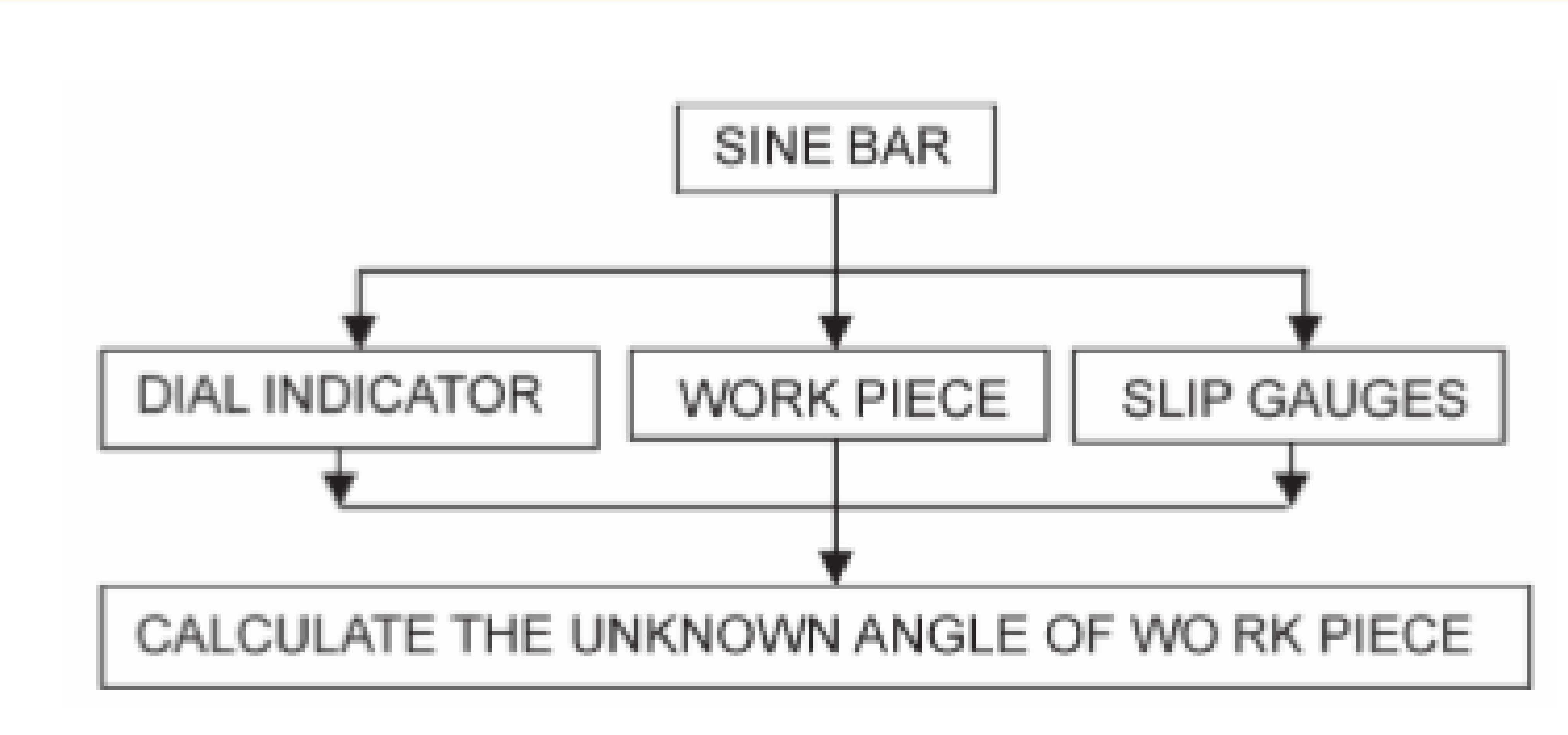
Experiment No: 7

- **Title:** To find unknown angle of a given component using Sine Bar.

Objectives:

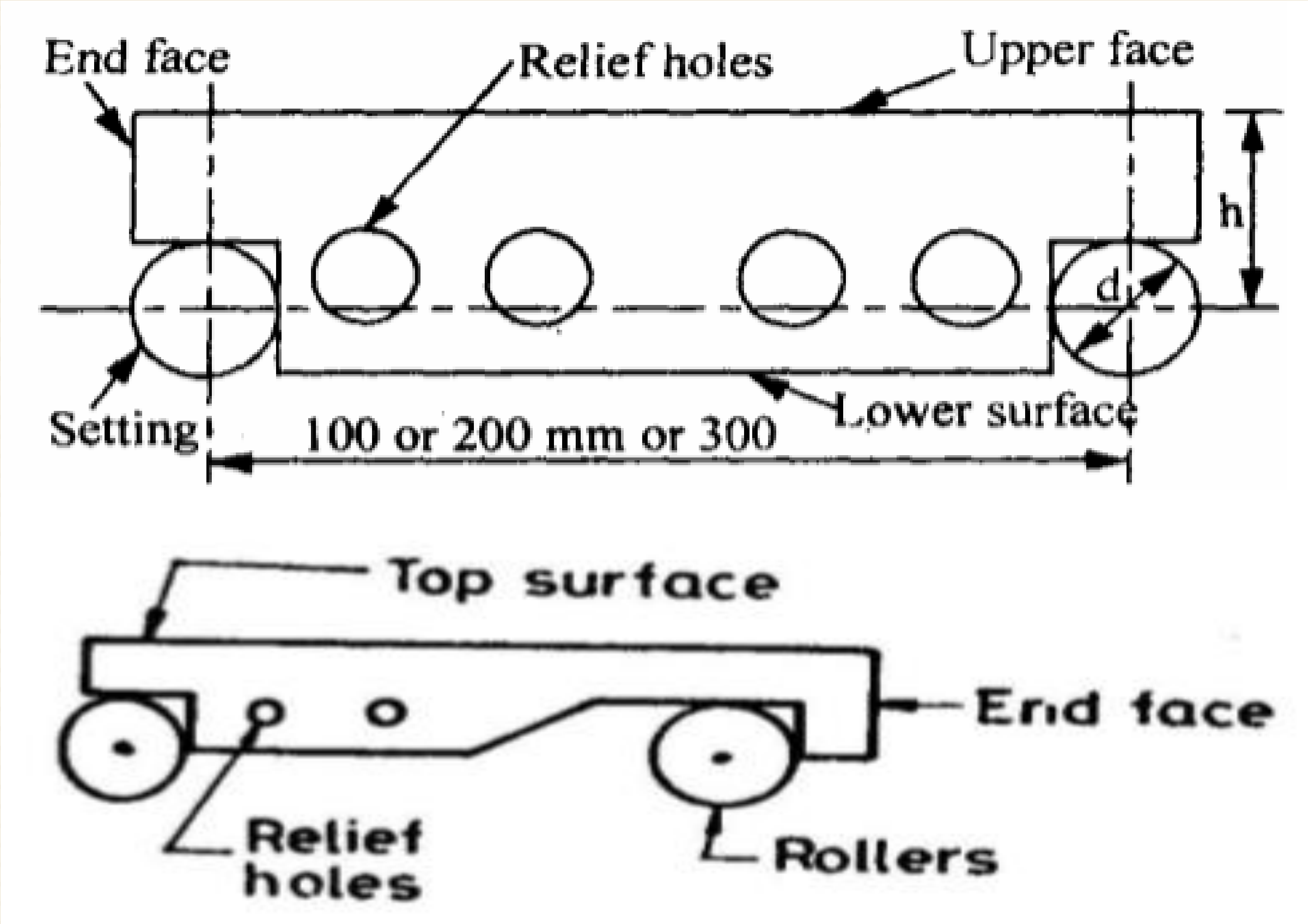
- i. Understand different parts of sine,
- ii. Know the principle, use and working of sine bar,
- Concept Structure:



SINE BAR
DIAL INDICATOR
WORK PIECE
SLIP GAUGES
CALCULATE THE UNKNOWN ANGLE OF WO RK PIECE

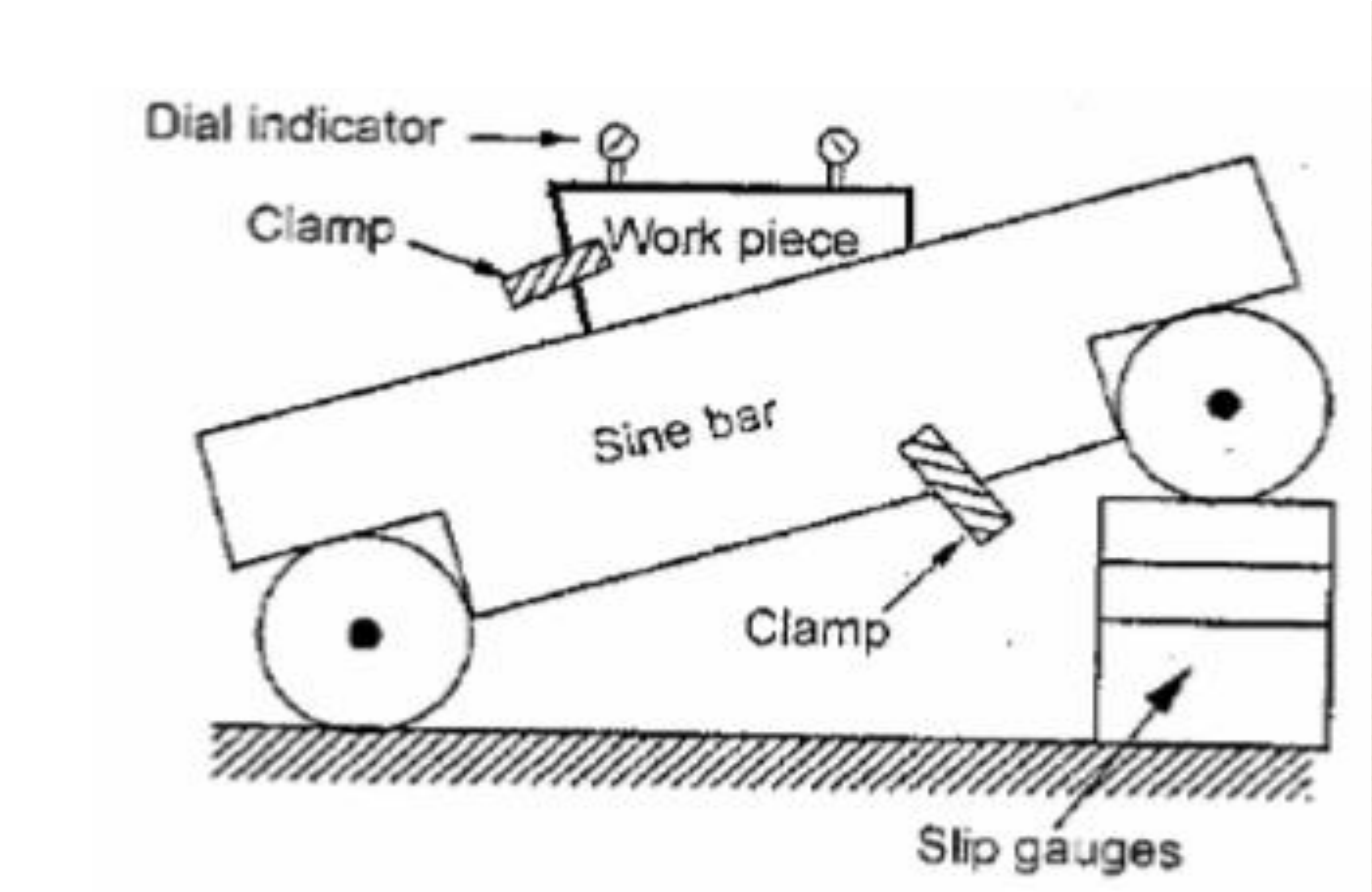
- **Sine Bar:**

Sine bar is a precision instrument used along with slip gauges for accurate angle measurements or angle setting. Sine bar consists of an accurate straight bar in which two accurately lapped cylindrical plugs or rollers are located with extreme position


End face
Relief holes
Upper face
h
d
Setting
100 or 200 mm or 300
Lower surface
Top surface
End face
Relief
holes
Rollers

- The straight bar are made of high carbon, high chromium, corrosion resistant steel and the surfaces are hardened, grounded and lapped.
- Ends of the straight bar are stepped so that the plugs can be screwed at each step.
- Plugs are the two rollers of same diameter fixed at a distance X between them and is called as length of the bar. This distance X is the Centre to Centre distance of plugs is which is generally 100, 200, 300 mm and so on.

- **Use of Sine bar:**
- The workpiece whose angle is to be measured is placed on sine bar. Below one roller of sine bar, slip gauges are placed.
- Slip gauges are added till the workpiece surface is straight.
- Dial indicator is moved from one end of workpiece till another end.
- Slip gauges are added till dial pointer does not move from zero position.


Dial indicator
Clamp
Work piece
Sine bar
Clamp
Slip gauges

Principle:-

- The use of sine bar is based on the laws of trigonometry.
- When sine bar set up is made for the purpose of angle measurement, sine bar itself forms hypotenuse of right angle triangle and slip gauges form the side opposite to the required angle.
- Sin θ= (h/L)   Therefore θ= sin-1(h/L) Angle θ is determined by an indirect method as a function of sine so this device is called as sine bar.
- Sine bar is always used in conjunction with slip gauge and dial indicator for the measurement of angle.

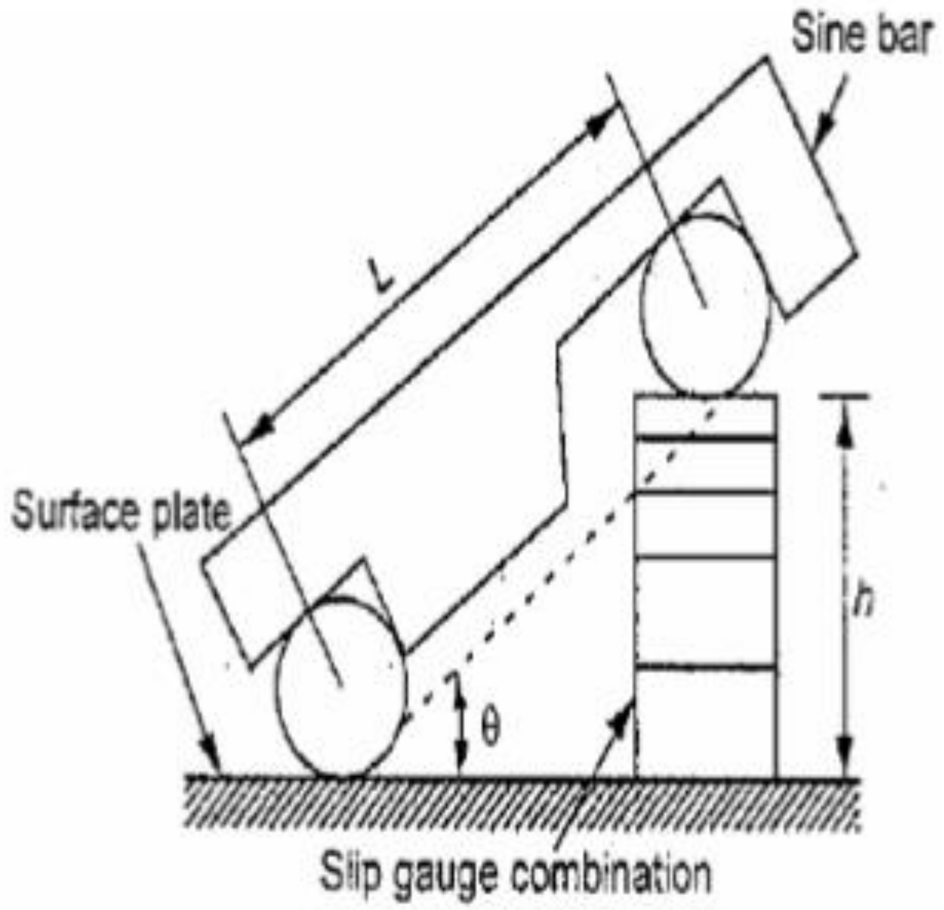
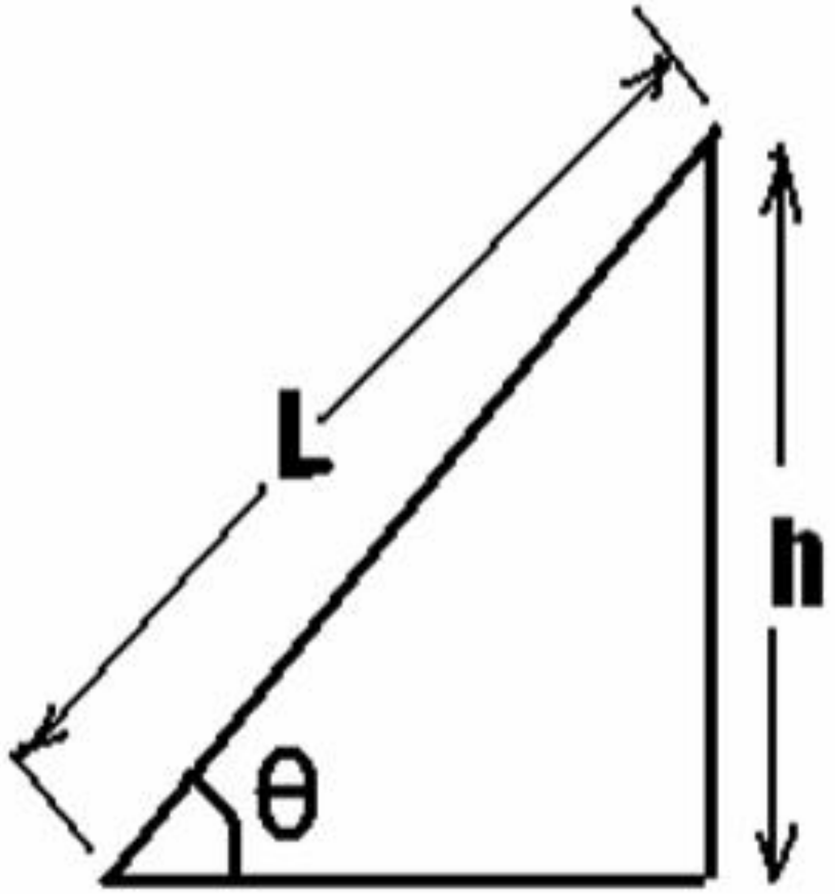


Fig. *Principle of sine bar*



Stepwise Procedure: -

- 1. Note the length of sine bar L =……….mm
- 2. Find the approximate angle of the component by using bevel protractor or any other suitable device. Let this angle be θ.
- 3. Calculate height of slip gauges (h) required from relation Sin θ= h/L, where L is the length of sine bar. h = L sin θ
- 4. Select & wring together the required slip gauges for dimension 'h' mm.
- 5. Place the work piece on sine bar & clamp to the angle plate if necessary
- 6. Dial indicator is clamped firmly in dial indicator stand and slight pressure applied so that plunger just touches one end of workpiece.

- 7. To check the parallelism of upper surface of workpiece, a dial indicator along with the stand is moved from one end of the work and moved to other end.
- 8. Note the deviation ‘h’. This deviation may be noticed by taking two readings of dial indicator at two ends of work piece top edge.
- 9. Add / subtract the slip gauges of height ‘dh’. Where dh = h *L/l ‘l’ is length of workpiece.
- 10. Adjust the slip gauges so that deviation of dial indicator is zero from one end to other end.
- 11. Calculate the height of slip gauges. Unknown angle = sin–1(Height of slip gauges/Length of sine bar) = sin-1(h/L) =

- **Observation and Calculations:**
- L = Distance between axes of supporting roller of sine bar = _______________mm
- h = height of slip gauge = __________ mm