FRESNEL'S BIPRISM

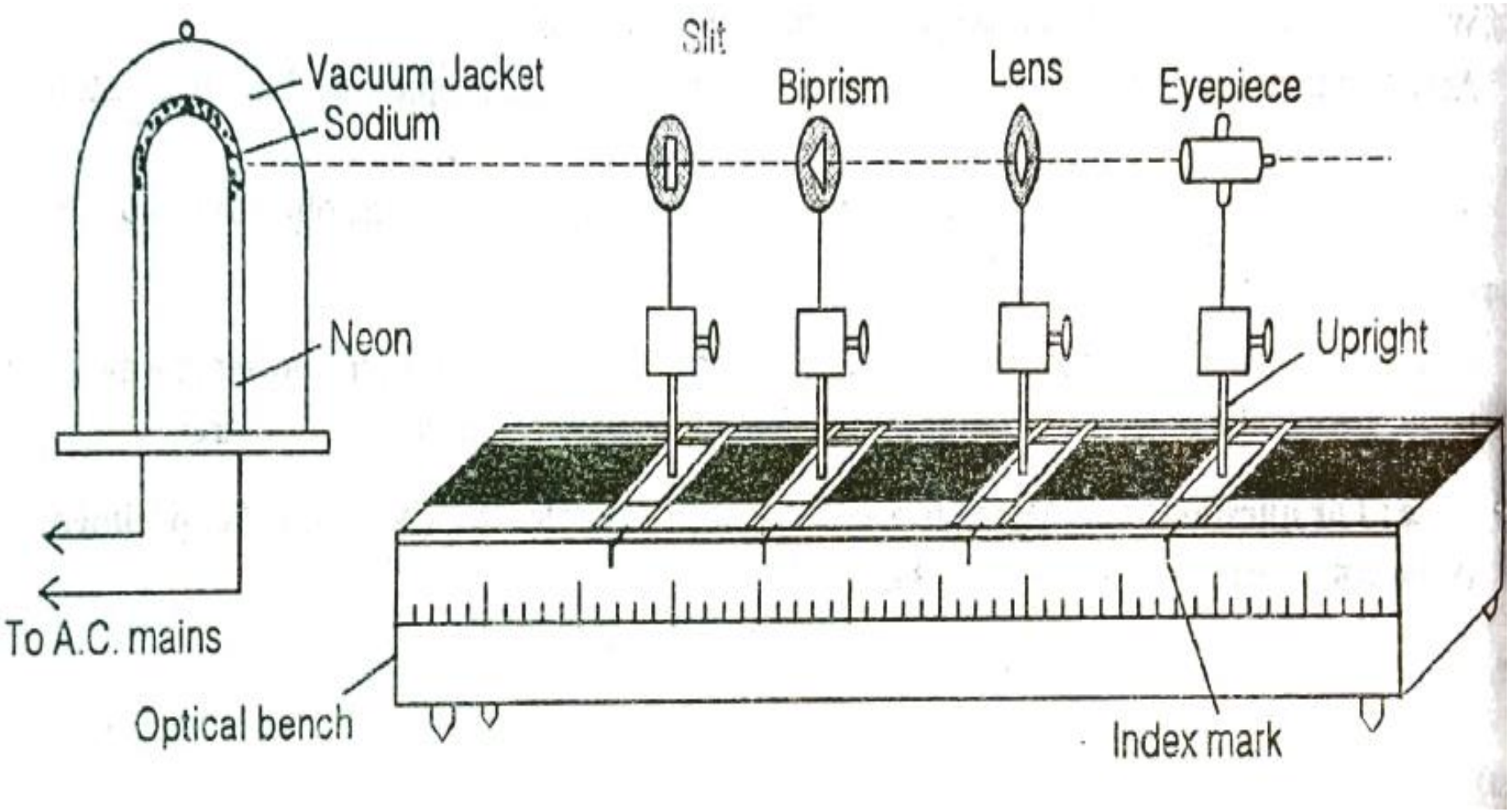
EXPERIMENT

Aim/Objective

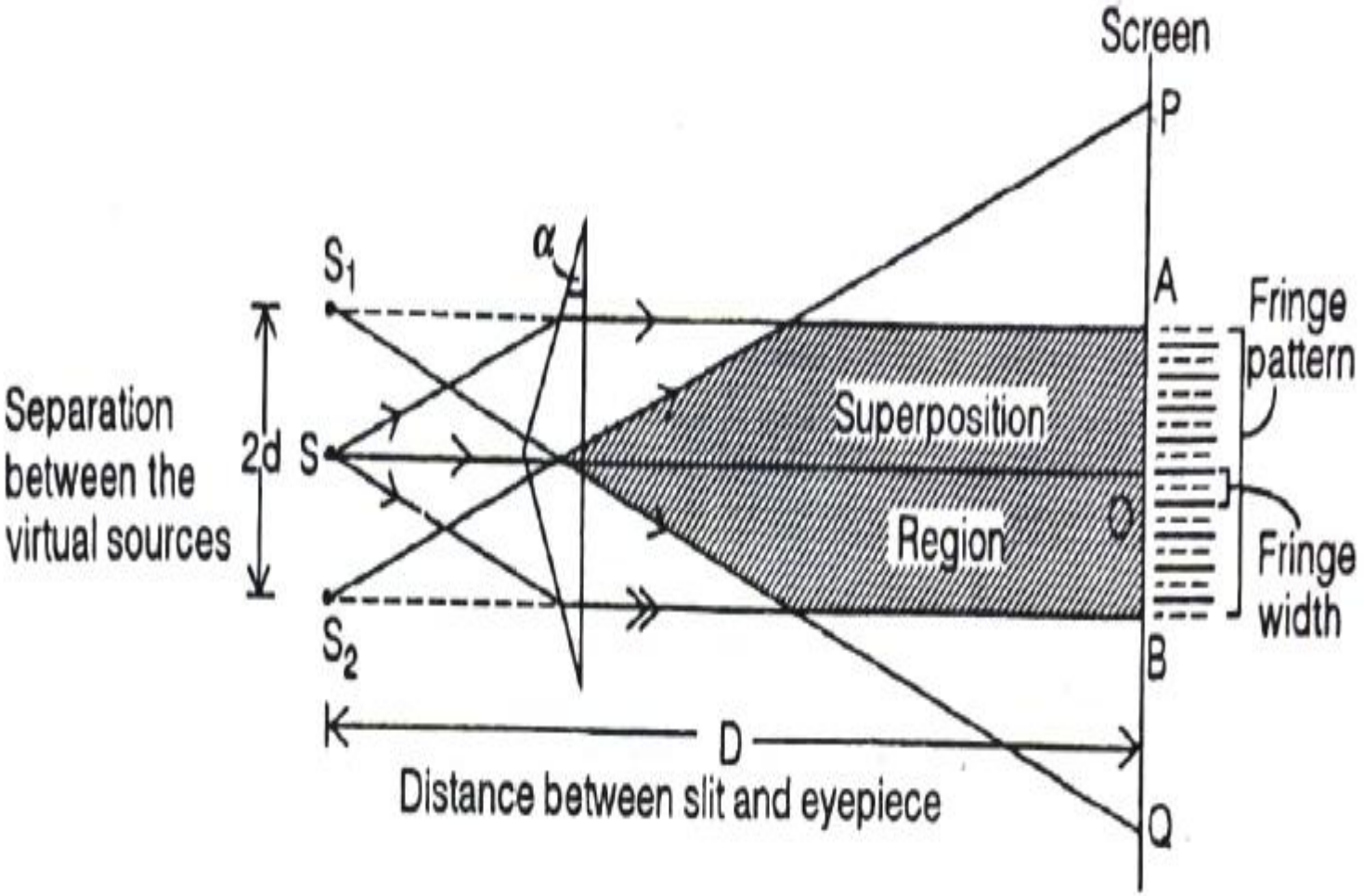
To determine the wavelength of sodium light by Fresnel's Biprism method.

Apparatus Required

- A monochromatic source of light (source of sodium light),
- Optical bench with 4 uprights,
- Biprism,
- Vertical slit,
- Convex lens of short focal length,
- Micrometer eyepiece.



Apparatus Setup



Formation of virtual sources and fringes

Formula used

In the case of biprism experiment the mean wavelength

$$\lambda = \beta \frac{2d}{D}$$

Where β = fringe width

$2d$ = distance between the two virtual sources **D**

= distance between the slit and the eyepiece

Observation Tables

Observation of β: (fringe width)

No of division on the vernier scale =
Least count of Vernier =

No of fringe	Micrometer reading(a)			No of fringe	Micrometer reading(b)			Difference for 10 fringe	Mean for 10 fringe	Fringe width (mm) β = [Mean/10]
	MS	VS	Total (mm)		MS	VS	Total (mm)			
1 2 3 4 5 6 7 8 9 10				11 12 13 14 15 16 17 18 19 20						

Measurement of D:

Position of the slit (a) = ----------cm
Position of the eyepiece (b) = ----------cm
Observation value of D (b-a) = ----------cm

Deviation method for 2d

We know for a prism of very small refracting angle, the deviation produced is given by $\delta = (\mu - 1)\alpha$ where μ = R.I (refractive index). of prism and α refracting angle, α is in radian.

Therefore total angle between S_1B and S_2B is $2\delta = 2(\mu - 1)\alpha$ ...(1)

From fig. 7, $\tan\delta = \frac{d}{a}$ or, $\delta = \frac{d}{a}$ [for small δ]

or, $d = a\delta \quad \therefore 2d = 2a\delta$ ...(2)

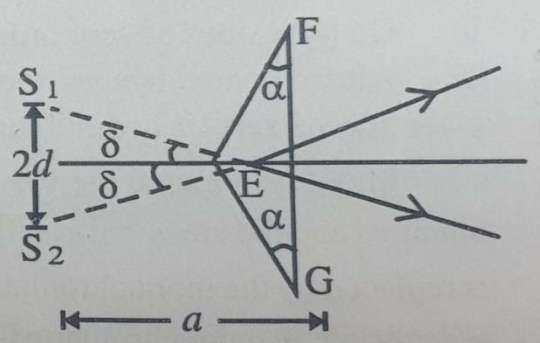


Fig. 7

From equation (1) and (2) we have $2d = 2a(\mu - 1)\alpha$, ...(3)

here α is in radian hence $2d$ is calculated.

Results: The wavelength of sodium light as determined by calculation=.....Å

Standard value of wavelength (λ) = 5893 Å

$$\text{Percentage error} = \frac{\text{Observed value} - \text{Standard value}}{\text{Standard value}} \times 100\% = \cdots \%$$

Precautions

1. The setting of uprights at the same level is essential.
2. The slit should be vertical and narrow.
3. Crosswire should be fixed in the center of the fringe while taking observations for fringe width.
4. The micrometer screw should be rotated only in one direction to avoid backlash error.
5. The fringe width should be measured at a fairly large distance.
6. Convex lens of shorter focal length should be used (f = 25 cms. approx.)
8. Motion of eyepiece should be perpendicular to the lengths of the bench.

Viva questions

1. What is biprism ?
2. Why fresnel biprism is used for ?
3. Write the name of apparatuses used in experiment ?
4. What is monochromatic light?
5. What are coherent sources?
6. How to determine wavelength by using fresnel’s biprism experiment , explain with details ?
7. Where are coherent sources situated in your experiment?
8. Is this experiment similar to Young's double slit experiment ?
9. What do you mean by interference of light?
10. Is this experiment, satisfied the light is wave or particle ?
11. How many types of interference are there?
12. What are two methods to find 2d?
13. What is fringe width?
14. Why should slit be narrow?
15. What is lateral shift?