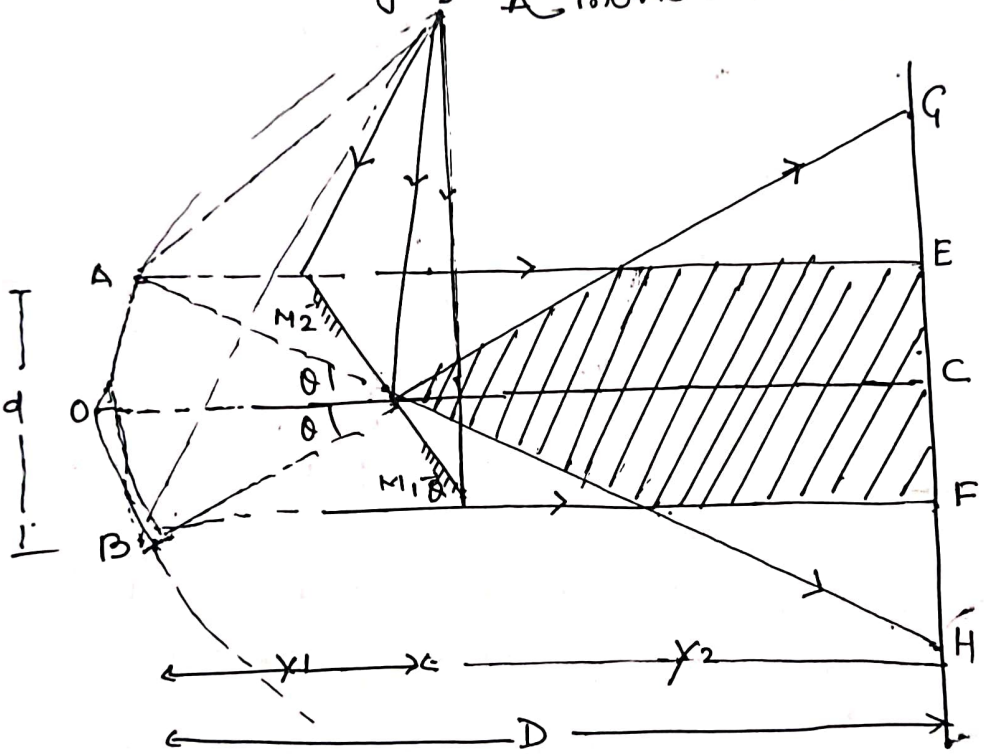
PHYSICS

OPTICS

TOPIC :- Interference by using Fresnel's Mirrors

Fresnel produced the interference fringes by using two plane mirrors M_1 and M_2 arranged at an angle of approx 180° so that their surfaces are nearly coplanar. A monochromatic source of light used-



Light from source S incident on the two mirror M_1 and M_2, after reflection, appears to come from two virtual sources A and B at some distance d. Therefore A and B act as two virtual sources and interference fringes are obtained on the screen. These fringes are obtained of the equal width and are alternately dark and bright.

Principle :- A and B are two coherent sources at a distance d apart.

D = distance from source to virtual sources.

M_1 and M_2 = Two reflected rays from M_1 and M_2 overlap between E and F (shaded) and interference fringes formed

Here $D = Y_1 + Y_2$

Fringe width $\beta = \frac{\lambda D}{d}$

A point on the screen will be at the centre of a bright fringe, if

it distance from C is $\frac{n\lambda D}{d}$

where $n = 0, 1, 2, 3, \ldots$ and

it will be ~~dark~~ at the centre of a dark fringe.

if it distance from C $-\frac{(2n+1)\lambda d}{2d}$

where $n = 0, 1, 2, 3, \ldots$

For fringe to be formed the following conditions must be

(i) The mirror M_1 and M_2 should be made from optically flat glass and silvered on the front surface.

(ii) NO surface should take place from the back of the mirrors.

(iii) The polished should extend up to the line of intersection of the two mirror and

(IV) The line of intersection must be parallel to the line sources.

xx— Calculation of distance between two virtual sources A and B :-

Suppose the distance between the points of intersection of the mirrors and distance source S is Y_1

The angle of seperation between A and B is 2θ

$$d = 2\theta Y_1$$

When white light is used the central fringes C is white whereas other fringes on both sides of C are coloured because the fringes width depends upon the wave length. Therefore the no. of fringes seen in the field of view with monochromatic sources of light are more