Law of imagery and magnification for a divergent lens

Principle and equipment

Principle

Principle

Demonstrate that the equations $1/f = 1/g + 1/b$ und $B/G = -b/g$ are valid for divergent lenses.

Equipment

Position No.	Material	Order No.	Quantity
1	Demo Physics board with stand	02150-00	1
2	PHYWE Multitap transformer, DC: 2/4/6/8/10/12 V, 5 A / AC: 2/4/6/8/10/12/14 V, 5 A	13533-93	1
3	Lamp,halogen,mag.held,12V/50W	08270-20	1
4	Light box 12V/20W,w.magn.base	09804-00	1
5	Opt. block,planoconcave,magn.held	08270-03	1
Additonal material:			
	Ruler		
	Water-soluble white board pen		

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Set-up and procedure

- Delimit the optical axis on the magnet optics panel.
- Mark the vertex S of the lens (on a co-ordinate point) and the (virtual) focal point F (f = -360 mm).
- Adjust the position of the optical block (concave lens).
- Draw an object arrow, e.g., with G = 50 mm, g = 150 mm (cf. Fig. 1).
- Using the lamp (parallel beam) and the light box (midpoint beam), each with a one-slit diaphragm, allow a parallel and a midpoint beam to pass through the arrow head.
- Draw the paths the light beams as completely as possible.
- Remove the lamp and the lens.
- Complete the light paths and draw the image arrow.
- Draw in and label *-f*, *g*, *-b*, *G* and *B* (Fig.1).
- Measure *-f*, *g*, *-b*, *G* and *B*.

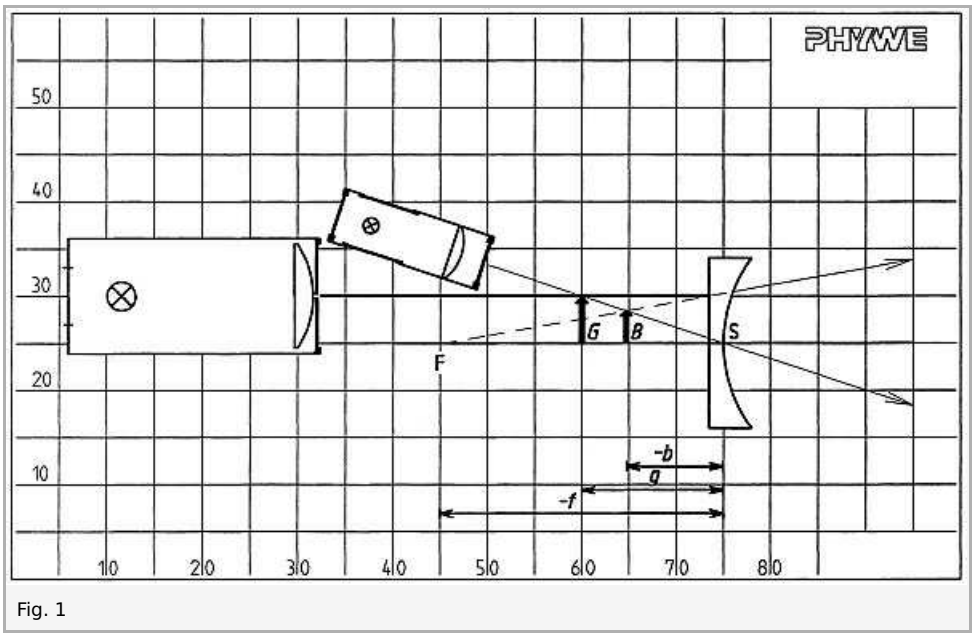

Fig. 1

Observation and evaluation

Observation

g = 150 mm
b = -100 mm
f = -300 mm
G = 50 mm
B = 30 mm

Evaluation

$1/g$ = 0.0066 mm^{-1} $1/b$ = -0.0100 mm^{-1}
$1/f$ = -0.0033 mm^{-1}

Therefore $1/f = 1/g + 1/b$.

B/G = 30 mm / 50 mm = 0,60
b/g = -100mm / 150mm =-0.66

Therefore $B/G = -b/g$ (as an approximation).

Remark
Due to the small value of B, its measurement can contain a large margin of error. The value for b is also relatively uncertain as the lines (rays) which intersect at the image point always form unfavourable angles.

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