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(54) Title of invention

Leading mark indicator

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(73) Proprietor
Inogon Licens AB (Sweden),
Kavelvagen 10
S—890 23 Sjalevad
Sweden

(72) Inventors
Lars Andres Bergkvist
Ivan Forsen

(74) Agent and/or
Address for Service
Mewburn Ellis & Co.,
2/3 Cursitor Street
London EC4A 1BQ

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(56) Documents cited
SE B 422117 (=WO 82/01078)
SE B 400,644 (=GB 1575640)
SE B 354354 (=GB 1294449)

(continued on next page)

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2 118 717 B — continuation

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IPC [2] G02B 27/38
National CL 42c: 6/01
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SE,NO,DK,FL classes as above

Fig. 1

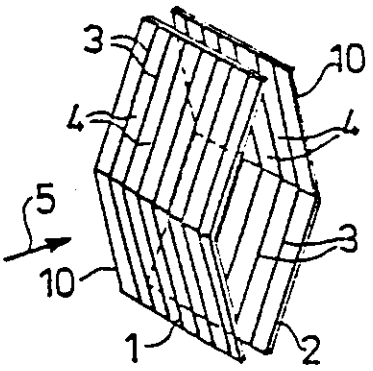


Fig. 2

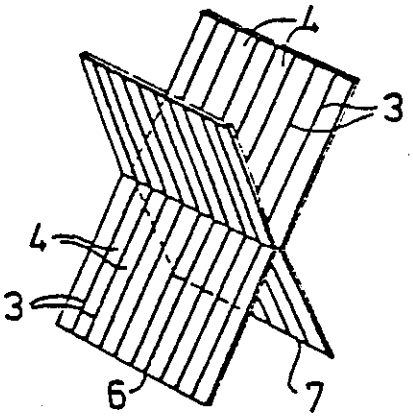


Fig. 3

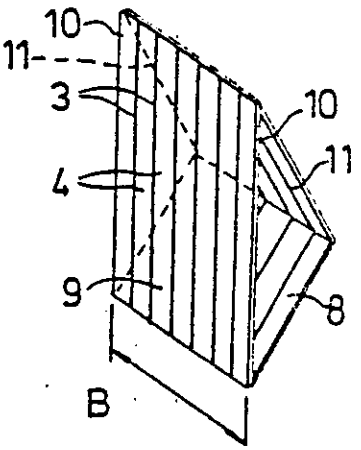


Fig. 4

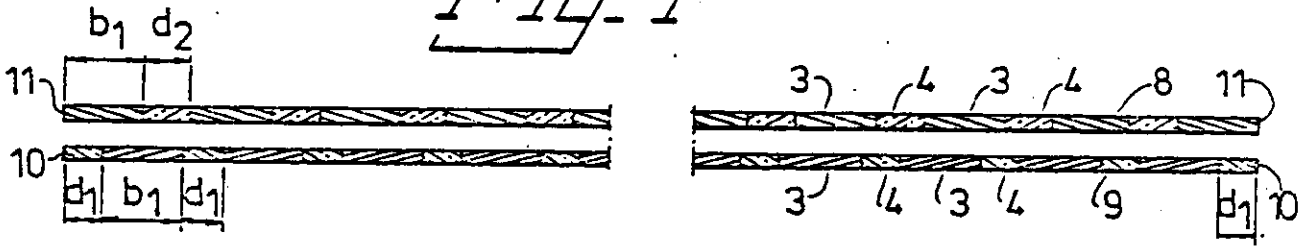


Fig. 6

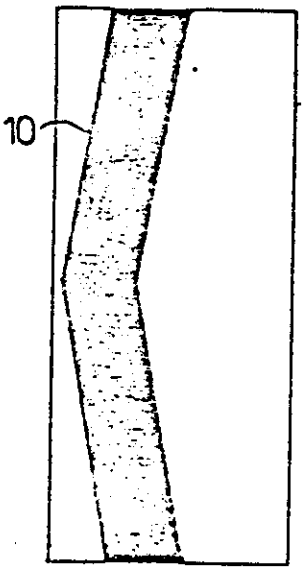


Fig. 5

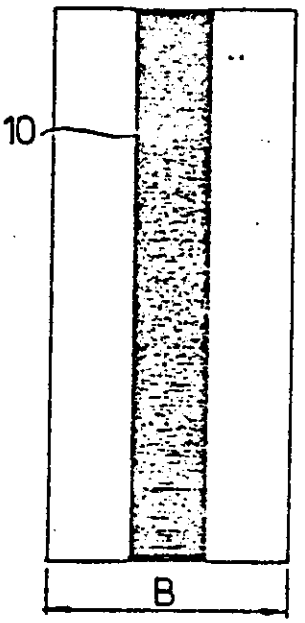
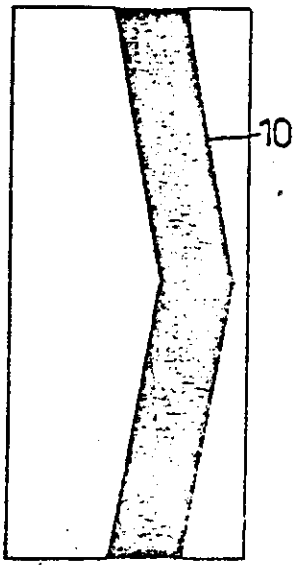


Fig. 7



"Leading mark indicator"

This invention relates to a path or direction indicator, more precisely to an instrument for indicating to an observer a definite direction.

A known device of this kind is disclosed in SE-PS 8006622-8 (WO 82/01078).

This known device comprises a screen in front and a screen behind, which include opaque lines separated by transparent interstices, whereby an interference pattern, so-called moiré pattern, arises when an observer views the device. Each of the screens comprises a plate, which is bent centrally to form an obtuse angle, and they are positioned relative to each other by attachment means. In one embodiment the screen plates are positioned so that the obtuse angles face toward each other and the lines on the front screen plate are more closely spaced than those on the screen plate behind. Alternatively, the obtuse angles face away from each other, and the lines on the front screen plate are more widely spaced than those on the screen plate behind.

According to this known device, a number of dark interference strips are produced, which are

parallel to each other when the device is viewed in a direction perpendicular to the plane of the screen plates, i.e. in the direction or along the path which the device is intended to indicate.

When the device is viewed from a direction lying outside the path or direction which the device is intended to indicate, an interference pattern is formed which consists of a great number of parallel strips which form a number of arrows, or more properly a fisbone pattern, where interference strips produced by the upper screen surfaces are angled relative to the interference strips produced by the lower screen surfaces.

Devices of this kind here referred to are known also from SE-PS Nos. 7611513-8 (UK 1,575,640) and 354,354 (UK 1,294,449), which relate to an instrument with which the moiré pattern is used for bringing about indications of a certain horizontal or vertical plane for an observer.

SE-PS 7611513-8 (UK 1,575,640) relates to a device in which three screens are used and a predetermined plane is indicated by a great number of parallel interference strips, and the observers being outside said plane is indicated by the appearance of an interference pattern including lines with a sharp bend or angle.

SE-PS 354354 (UK 1,294,449) relates to a

device in which two screen plates are arranged angularly relative to each other, and the devision of the screens, i.e. the number of opaque lines per length unit perpendicular to the opaque lines, is chosen so that an interference pattern arises, which is intended to be read in terms of the pattern symmetry. It is extremely difficult to determine accurately the indicated plane by means of such a pattern.

All of said known devices, thus, are designed to form a great number of interference strips, the angles of which in one direction or the other form discontinuous angle variations or asymmetric patterns when an observer is outside the plane or direction which the device is intended to indicate.

The total width of opaque lines normally is such that it exceeds or is substantially equal to the total width of transparent interstices.

This implies that such an instrument is difficult to read, especially from a large distance. There are two main reasons for this. The first reason is that an observer receives only the light which is transmitted through the screens, i.e. light of a surface of about half the device surface perpendicular to the viewing direction.

It is, for example for navigation purposes, essential that as great a proportion as possible of luminous surface is obtained in order to increase the

visibility of the device, especially at a long distance or in bad weather.

The second reason is due to the face that a large number of dark interference strips and light interspaces by necessity means that each interference strip and each interspace is relatively narrow in comparison with its length, with the result that reading of the interference pattern is difficult, especially at long distances or in bad weather.

The present invention relates to a device of the aforesaid kind, which, it is believed, provides a substantially more distinct indication is substantially easier to read at a long viewing distance.

According to the present invention there is provided a device for indicating to an observer a predetermined path or direction by the use of a moiré interference pattern, the device comprising a front screen and a rear screen both having opaque lines separated by transparent interstices, at least one of the screens being bent centrally about an obtuse angle so that the separation between the screens is not the same at all points,

the said opaque lines having the same width on the two screens but the opaque lines of one screen having a different spacing (interstice width) from the opaque lines of the other so as to provide one screen with one additional opaque line over the width of the

screen, the line spacing (interstice width) in the screen not provided with the additional line being in the range of 0.5 to 0.9 times with width of the said opaque lines,

the front screen and the rear screen being positioned relative to each other so that, when viewed in the said predetermined direction, a central opaque line of one of the screens overlies a central transparent interstice of the other.

Preferably the line spacing (interstice width) in the screen not provided with the said additional line is in the range of 0.5 to 0.8 times the width of the said opaque lines.

Embodiments of the invention, given by way of example, will now be described with reference to the accompanying drawings in which:

Figure 1 shows a first embodiment of the invention;

Figure 2 shows a second embodiment of the invention;

Figure 3 shows a third embodiment of the invention;

Figure 4 is a schematic view of the location of the screen lines relative to each other in the front and rear screens;

Figure 5 is a view of a device embodying the invention seen in the predetermined direction;

Figure 6 is a view of the device of Figure 5 seen to the right of the predetermined direction;

Figure 7 is a view of the device of Figure 5 seen to the left of the predetermined direction.

In Figure 1 a device according to a first embodiment of the invention is shown schematically. Each screen 1,2 includes opaque lines 3 spearated by transparent interstices 4. The screens 1,2 are positioned overlapping so that an observer viewing the screens from a direction indicated schematically by the arrwo 5 looks through both the front and the rear screens. Hereby an interference pattern, known as a moiré pattern, arises when the observer views the device.

The screens 1,2 have different divisions, i.e. different numbers of opaque lines per unit length perpendicular to the opaque lines. In the present device the front screen plate 1 is provided with a division which is denser than that of the rear screen plate 2, i.e. the front screen 1 has the said additional line provided by the different line spacing. Each screen 1,2 comprises a plate, which is bent centrally to form an obtuse angle. The angle can be between 120° and 170° or smaller or greater, depending on the desired sensitivity of the interference pattern to the deviation of an observer from the predetermined path or direction. When the angle is small (screen more bent), the interference pattern changes a lot for a

small deviation from the predetermined path or direction. At a greater angle (screen less bent) the interference pattern changes only a little for a large deviation from the predetermined path or direction.

In Figure 2 a second embodiment device is shown, in which the screens 6,7 are arranged so that the obtuse angles face away from each other.

In this case the front screen plate 6 is provided with a sparser division than the rear screen plate 7, i.e. the rear screen 7 has the said additional line provided by the different line spacing.

In Figure 3 a third embodiment device is shown, in which the rear screen 8 is formed as a screen plate which, like the screen plates 1,2,6,7 of Figures 1 and 2, consists of a rectangular or square plane plate which, after having been provided with a screen running parallel to two sides is bent perpendicularly to the screen lines at the said angle. This implies that each screen plate has parallel sides and each screen line is parallel to two opposed parallel sides. The front screen 9 in figure 3 consists of a planar screen plate, which also is provided with screen lines parallel to its sides. According to this embodiment, the front screen plate 9 has a denser screen division than the rear screen plate 8, i.e. the front screen 9 has the additional line provided by the different line spacing. The angle between screens in the rear

screen plate 8 is chosen so that the tangent (tan) for half the angle is half the tangent (tan) for half the angle for the screens in Figures 1 and 2, the sensitivity thereby remaining the same.

According to the present invention, the screens are designed so that only one interference strip is obtained across the entire surface of the device (see Figure 5).

When the device is viewed from a direction to the right of the predetermined path, the interference pattern shown in Figure 6 is seen, and when the device is viewed from a direction to the left of the predetermined path, the interference pattern shown in Figure 7 is seen. The arrow-shape of the interference patterns, thus, indicates the correction direction for movement into the predetermined path.

This is effected according to the invention, in that the difference between the two screens in screen division density provides one of the screens 1, 7,9 with only the opaque line more than the other one of the screens 2,6,8, whereby only one interference strip 10 is obtained. This is illustrated in Figure 4 where the front screen 9 has opaque lines with a width of b_1 and transparent lines with a width of d_1. The rear screen 8 also has opaque lines with a width of b_1, but transparent interstices with a slightly greater width d_2.

In order for the interference strip 10 to arise in a symmetric position (centrally) on the screen when the observer is on the predetermined path, the screens are positioned in relation to each other so that the central opaque line on one of the screens overlaps symmetrically a transparent interstice on the other screen, which interstice constitutes the centre of that other screen.

At the outer edges of the device the opaque lines of the front screen are offset relative to the opaque lines of the rear screen, the screens having passed through a position of mutual registration.

According to a preferred embodiment, in the rear screen 8 an opaque line is located immediately at each of its edges 11, while in the front screen 9 the opaque line located closest to the respective edge 10 of the screen 9 runs at a distance d_1 from the edge 10.

When N_1 designates the number of lines 4 in the front screen 9, and N_2 is the number of lines 4 in the rear screen 8, and when B is the width of the screens, and using the designations in Figure 4, the screens are designed so that the following relations are met.

$$N_1 = \frac{B - d_1}{b_1 + d_1} \qquad (1)$$

$$N_2 = N_1 - 1 \qquad (2)$$

$$b_1 + d_2 = \frac{B - b_1}{N_2 - 1} \qquad (3)$$

This can be applied to any of the embodiments of Figures 1, 2 and 3. Furthermore, what is said concerning the front screen applies to the rear screen, and vice versa, when it is desired that the deviation direciton, instead of the correction direction, shall be indicated by the interference strip 10.

In these embodiments the width of the interference strip 10 is at maximum one third of the width B of the device, i.e. of the screen plates 1,2,6,7,8,9.

This is brought about by the transparent interstices 4 of the front screen being at least about 0.5 times the width of the opaque lines 3, i.e. one period ($b_1 + d_1$) is at least 1,5 x b_1. By increasing the transparent interstice so that one period is 1,6 x b_1, the width of the interference strip decreases to about one quarter of the width B of the screens.

The period under all circumstances shall be smaller than 2,0 x b_1, because a period of 2,0 x b_1 implies that the transparent interstices are as wide as the opaque lines. The period is preferably smaller than 1,8 x b_1, and more preferably between about

1,5 x b_1 and 1,6 x b_1. When a period exceeding 1,8 x b_1 is chosen, the interference strip will be too narrow in most of the applications for good visibility, which then decreases.

An increase in the width of the transparent interstice implies that the line spacing difference between the screens increases, which in its turn implies a lower sensitivity - measured as deviation from the predetermined path necessary for the interference strip to deflect. However, a greater contrast between the interference strip and surrounding light surfaces is obtained.

According to a preferred embodiment, the screens are designed so that the front screen has a division period of 1,5 x b_1 to 1,6 x b_1.

This design, thus yields a relatively narrow interference strip, with very good contrast to surrounding light surfaces, and a very high sensitivity at the aforesaid angle of the screens according to Figures 1 and 2 of about 150° and a corresponding angle of the screens according to Figure 3 of about 120°.

Practical experiments have shown that the eye sees a deviation juch more easily when there is only one interference strip, especially at long distances, compared with when the interference pattern consists of a great number of interference strips.

The visibility, further, increases substantially in that the light surfaces of a device according to the invention are proportionally greater than in known devices of the kind here referred to.

The device is preferably provided with light sources in the form of sodium lamps or high-pressure lamps behind the rear screen, so that yellow light is transmitted through the screens in the direction to the observer.

The present invention must not be regarded as restricted to the embodiments set forth above. The rear screen for example, can be made wider than the front screen whereby opaque lines are located in those portions of the rear screen which project out to the side of line-free portions on the front screen, in order to thereby additionally to increase the area of the light surfaces. These additional lines, provided by the extra width of the rear screen, should not be confused with the previously referred to one additional line provided by the difference in line spacing between the two screens. As mentioned earlier, this one additional line may occur in either the front or the rear screen.

The opaque lines, further, instead of being designed on a plate, can consist of clamped strips or corresponding means.

The invention, thus, can be varied within the scope of the attached claims.

CLAIMS.

1. A device for indicating to an observer a predetermined path or direction by the use of a moire interference pattern, the device comprising a front screen and a rear screen both having opaque lines separated by transparent interstices, at least one of the screens being bent centrally about an obtuse angle so that the separation between the screens is not the same at all points,

the said opaque lines having the same width on the two screens but the opaque lines ofone screen having a different spacing (interstice width) from the opaque lines of the other so as to provide one screen with one additional opaque line over the width of the screen, the line spacing (interstice width) in the screen not provided with the additional line being in the range of 0.5 to 0.9 itmes the width of the said opaque lines,

the front screen and the rear screen being positioned relative to each other so that, when viewed in the said predetermined direction, a central opaque line of one of the screens overlies a central transparent interstice of the other.

2. A device according to claim 1 in which the line spacing (interstice width) in the screen not provided with the said additional line is in the range of 0.5 to 0.8 times the width of the said opaque lines.

3. A device according to claim 2 in which the line spacing (interstice width) in the screen not provided with the said additional line is in the range of 0.5 to 0.6 times the width of the said opaque lines.

4. A device according to any one of claims 1 to 3 in which the said rear screen is bent centrally about an obtuse angle and the said front screen is planar, the obtuse angle of the rear screen facing the front screen and the screen provided with the said additional line being the rear screen.

5. A device according to any one of claims 1 to 4 in which the rear screen is wider than the front screen and is thereby provided with additional said opaque lines.

6. A device for indicating to an observer a predetermined path or direction substantially as herein described with reference to and as illustrated in the accompanying drawings.

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Title LEADING MARK INDICATOR

Applicant/Proprietor
INOGON LICENS AB, Incorporated in Sweden, Kavelvagen 10, S-890 23 Sjalevad, Sweden [ADP No. 00515247001]

Inventors
LARS ANDRES BERGKVIST, Vastmansvagen 16, S-890 23 Sjalevad, Sweden [ADP No. 03071123001]

IVAN FORSEN, Postlada 1301, S-890 11 Sidensjo, Sweden [ADP No. 03071131001]

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Address for Service
MEWBURN ELLIS, 2/3 Cursitor Street, London, EC4A 1BQ, United Kingdom [ADP No. 00000109001]

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PROPRIETOR(S)

Inogon Licens AB, Incorporated in Sweden, Kavelvagen 10, S-890 23 Sjalevad, Sweden

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