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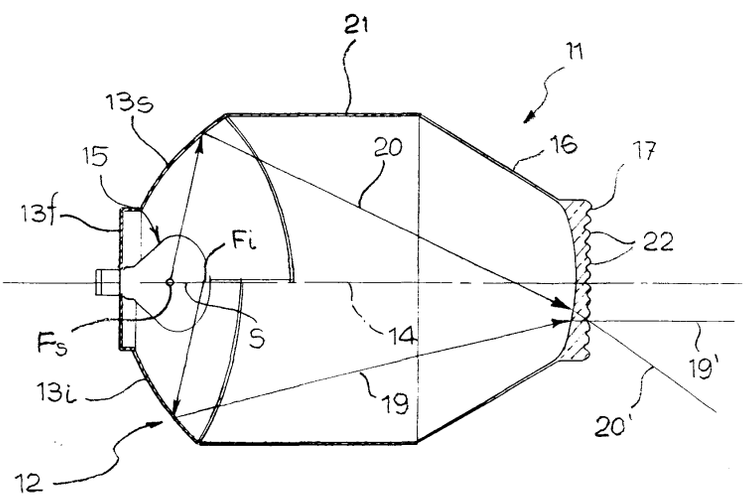
(54) Vehicle head-lamp, particularly for a moped

(57) A vehicle head-lamp, particularly for mopeds, comprises a reflector including an upper portion (13s) and a lower portion (13i) defining separated ellipsoidal surfaces, having separated foci. The light source (S) associated with the head-lamp extends from one focus (F_i) of the lower portion (13i) of the reflector to a point intermediate between said focus and a focus (F_s) of the upper portion (13s) of the reflector. At the front of the head-lamp there is provided an aspherical diverging lens (17) having an outer face with a plurality of cylindrical micro-lenses (22), for deviating downwardly the light rays directed above the horizon line passing through the optical axis of the head-lamp.

Fig_2



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Description

[0001] The present invention relates to vehicle head-lamps, particularly for mopeds, of the type comprising a body defining an ellipsoidal reflector having an optical axis, a light source supported by the body adjacent to a focus of the ellipsoidal reflector and a lens carried by the body in front of the reflector and the light source.

[0002] A known reflector of the above identified type, which has been used on mopeds, is shown by way of example in figure 1 of the annexed drawings. With reference to this figure, the head-lamp, generally designated by reference numeral 1, comprises a body 2 defining an ellipsoidal reflector 3 having an optical axis 4. With body 3 there is associated a light source constituted by an incandescence lamp 5, whose filament is located at one of the two foci F of the ellipsoidal body defining the reflector 3. The body 3 includes a front frusto-conical portion 6 converging at the front towards the optical axis 4, whose front end carries a thick converging lens 7. In this know solution, a diaphragm is further provided which is located between the reflector 3 and the lens 7 and extending throughout the whole area of the cross-section of the head-lamp below a horizontal plane containing the optical axis 4. Due to this feature, the light rays which would tend to direct above the horizontal plane, such as the ray 9 in figure 1, which are reflected by the lower portion of the ellipsoidal reflector 3, are intercepted, whereas ray 10 reflected by the upper portion of the reflector 3 are directed downwardly, below the optical axis 4 and are then caused to further converge by lens 7. This known arrangement is chosen in order to obtain a light distribution of the type shown in figure 4. This figure shows the isolux lines, i. e. the lines of uniform light intensity on a screen illuminated by the head-lamp and located at a determined distance therefrom. The present regulations require that there is no surface of the screen illuminated above the horizontal line, while the maximum peak of light intensity must be reached at a central area immediately below the horizontal line. The solution of figure 1 achieves this result, but at the price a loss of about one half of the light flow at the output, because of the presence of diaphragm 8, so that the efficiency of the head-lamp is very low.

[0003] The object of the present invention is that of providing a vehicle head-lamp, particularly for mopeds, of the general type indicated at the beginning of the present description, which is able to provide a light pattern of the type shown in figure 4, but with a much higher efficiency with respect with the known devices.

[0004] In view of achieving this object, the invention provides a vehicle head-lamp having the features indicated at the beginning of the present description and further characterized in that:

- the reflector has an upper portion and a lower portion which are separated from each other by a horizontal plane containing the optical axis of the reflector,
- the upper and lower portions of the reflector define two ellipsoidal surfaces which are different from each other, and have separate foci,
- the light source is constituted by an incandescence lamp whose filament extends from one focus of the lower portion of the reflector to a point intermediate between said focus and a focus of the upper portion of the reflector.

[0005] Due to the above indicated structure and arrangement, the head-lamp according to the invention is able to provide a light pattern of the type shown in figure 4 of the annexed drawings, with no need of making use of a diaphragm of the type of the diaphragm 8 in figure 1. The reflector upper portion contribute to generate the portion under the optical axis of the light pattern. Due to that the light source is spaced from the focus of the reflector upper portion, the rays of the beam converge into the lower portion of the lens located in front of the head-lamp.

[0006] According to a further preferred feature of the invention, this front lens is an aspherical diverging lens, which is relatively thin, and has an outer surface defining a plurality of cylindrical micro-lenses. This lens causes the rays reflected by the reflector upper portion to further deviate downwardly, below the horizon line.

[0007] The reflector lower portion contributes to generate the light peak immediately below the horizon, as well as to generate the pattern area immediately surrounding this peak. The light source extends at the focus of the lower ellipsoidal portion, so that the reflected rays would contribute to generate the image above the horizon line. However the diverging lens causes these rays to deviate downwardly so that they give a contribution to the light peak below the optical axis.

[0008] Due to the absence of the diaphragm which is provided in the known solution, obviously a higher efficiency is achieved. Moreover, by using the cylindrical micro-lenses on the front face of the lens an enlarged light pattern is obtained at the output.

[0009] Further features and advantages of the invention will become apparent from the description which follows with reference to the annexed drawings, given purely by way of non limiting example, in which:

figure 1 is a diagrammatic axial cross-sectional view of a head-lamp according to the prior art,
figure 2 is an axial cross-section of a preferred embodiment of the head-lamp according to the invention,
figure 3 is a diagrammatic view of the reflector of the head-lamp according to the invention, showing the principle of operation thereof, and
figure 4 shows the light pattern which can be obtained by the head-lamp according to the invention.

[0010] With reference to figure 2, the head-lamp ac-

cording to the invention, generally designated by 11, comprises a body 12 defining a reflector including an upper portion 13s and a lower portion 13i. The two portions 13s, 13i define two different ellipsoidal surfaces, having the same optical axis 14. If designates a focus of the lower portion 13i. F_s designates a focus of the upper portion 13s of the reflector, located at the rear of focus F_i, with reference to the output direction of the light beam. The body of the composite reflector 13s, 13i extends into a cylindrical portion 21 which in turn is connected to a front portion 16 which supports a diverging aspherical lens 17 at its front. The lens 17 is relatively thin and has a plurality of cylindrical micro-lenses 22 on its outer surface. With reference also to figure 3, the filament S of a lamp 15 constituting the light source of the head-lamp which is supported by a bottom portion 13f of the body of the reflector extends from focus F_i to a point intermediate the two foci F_i, F_s, adjacent to the latter.

[0011] Due to this arrangement, the head-lamp shown in figures 2, 3 is able to provide a light pattern of the type shown in figure 4 with no need of using the diaphragm 8 of figure 1.

[0012] As already indicated in the foregoing, the upper portion 13s of the reflector contributes to generate the portion of the pattern of figure 4 below the horizon line. Since the light source S is spaced from focus F_s, the rays 20 reflected by the upper portion 13s of the reflector converge into the lower portion of the aspherical lens 17, which in turn causes them to further deviate downwardly (figure 2), below the horizon line.

[0013] The lower portion 13i of the reflector contributes to generate the light peak (P area in figure 4) and the area of the image immediately surrounding this peak. Since the source S extends at focus F_i, the rays 19 reflected by the lower portion 13i would contribute to generate the image above the horizon line. However, the diverging lens 17 causes the rays 19 to deviate downwardly so as to keep them below the horizon line (see ray 19' in figure 2). In other words, the lens 17 deviates the light which would tend to go above the horizon line below the latter, thus generating the light cut-off which is visible in figure 4 at the horizon line, while keeping a high peak value at the P area immediately below the horizon line.

[0014] The absence of a diaphragm of the type of diaphragm 8 of the known solution shown in figure 1 insures a high efficiency of the head-lamp. The cylindrical micro-lenses 22 located on the outer face of the lens 17 also provide for enlarging the output pattern horizontally.

[0015] Naturally, while the principle of the invention remains the same, the details of construction and the embodiments may widely vary with respect to what has been described and illustrated purely by way of example, without departing from the scope of the present invention.

Claims

1. Vehicle head-lamp, particularly for a moped, comprising a body (12) defining an ellipsoidal reflector (13s, 13i) having an optical axis (14), a light source (S) supported by the body (12) adjacent to a focus of the ellipsoidal reflector (13s, 13i) and a lens (17) carried by the body in front of the reflector (13s, 13i) and the light source (S),
   characterized in that:
   - the reflector has an upper portion (13s) and lower portion (13i), which are separated from each other by a horizontal plane containing the optical axis (14) of the reflector,
   - the upper and lower portions (13s, 13i) of the reflector define different ellipsoidal surfaces, having foci (I_f, F_s) which are separated from each other,
   - the light source (S) extend from one focus (F_i) of the lower portion (13i) of the reflector to a point intermediate between said focus and a focus (F_s) of the upper portion of the reflector.

2. Head-lamp according to claim 1, characterized in that said focus (F_s) of the upper portion (13s) of the reflector is located at the rear of the focus (F_i) of the lower portion (13i) of the reflector, with reference to the output direction of the light beam from the head-lamp.

3. Head-lamp according to claim 1, characterized in that said lens (17) located at the front of the head-lamp is a relatively thin diverging aspherical lens (17).

4. Head-lamp according to claim 3, characterized in that said lens (17) has an outer face with a plurality of cylindrical micro-lenses (22).

Fig_1

PRIOR ART

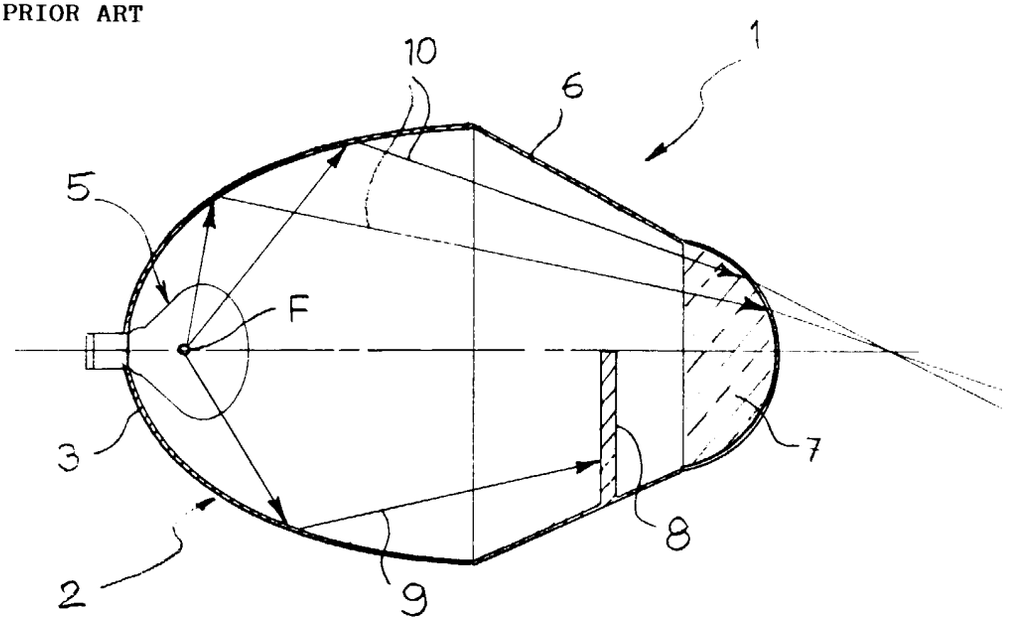


Fig_2

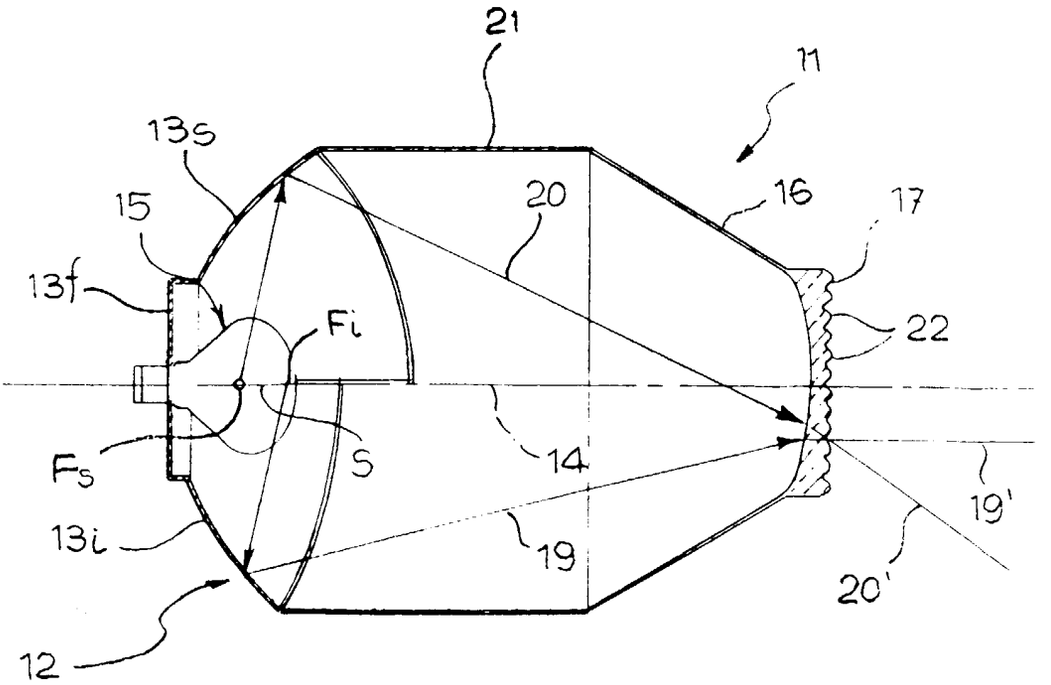


Fig_3

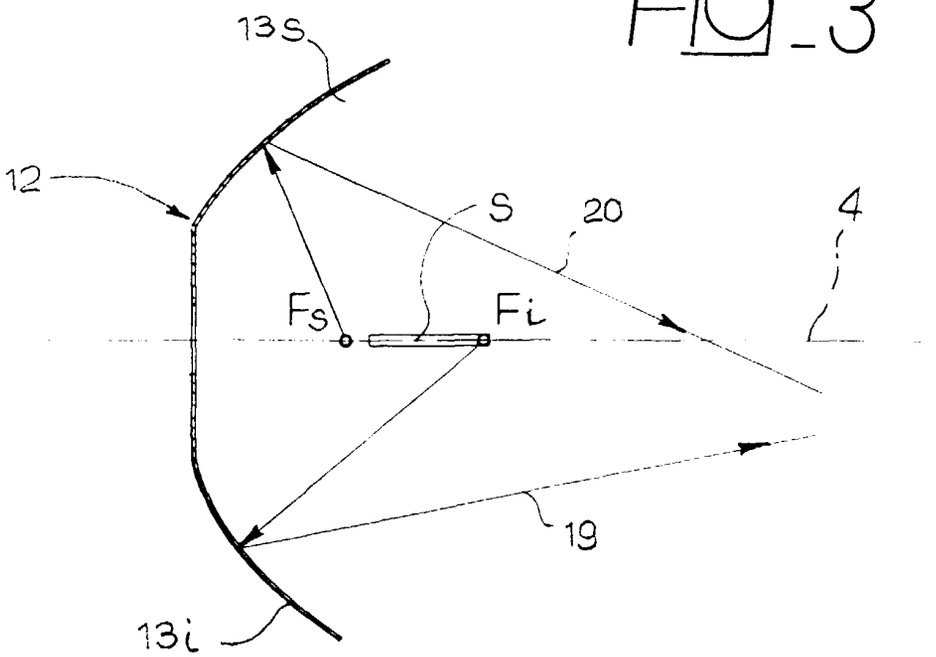
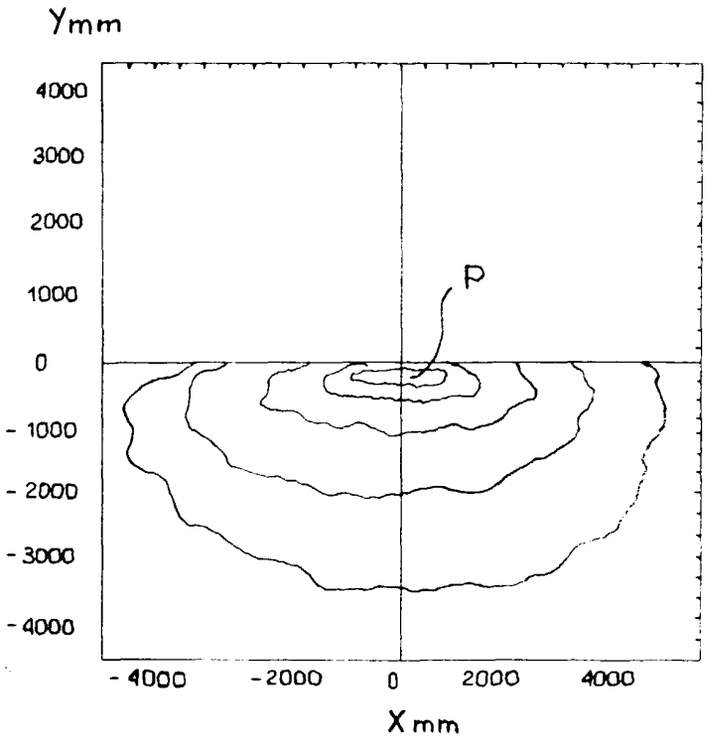

13s
12
S
20
4
Fs
Fi
19
13i

Fig_4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