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54 **Lamp.**

57 Positive lens surfaces 25 on one side of a lens plate 22 converge light rays towards respective light-transmitting interstices 23 in an otherwise opaque or light-absorbing baffle 24 disposed on the opposite side of the plate 22. This arrangement serves to reduce the visibility of the internal components of the lamp when viewed from the front, and at the same time minimises the occurrence of "ghost" signals produced by externally incident light. In order to reduce the spread of the light rays emerging from the opposite side of the baffle 24, each interstice 23 is associated with a formation 26 on the lens plate 22 which is specifically designed as a negative lens surface.

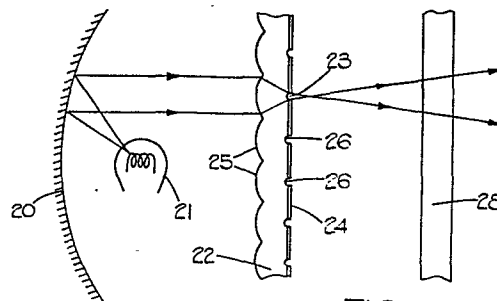


FIG. 4.

This invention relates to lamps, and is concerned with the prevention of so-called "ghost" signals caused by externally incident light being reflected within the lamp and then being re-emitted, giving the appearance
5 that the lamp is energised when in fact it is not.

Several systems have been proposed which prevent the occurrence of "ghost" signals by incorporating a baffle into the lamp, one such system being illustrated diagrammatically in Figure 1 of the accompanying
10 drawings. In this system, light from a light bulb 10 is reflected by a reflector 11 and then passes to a lens element 12 which is positioned immediately adjacent to the baffle (referenced 13) and which focusses individual pencils of light rays through
15 respective light-transmitting portions or interstices 14 of the baffle. With such a system, however, because of the need to converge the individual light pencils through the baffle interstices, depending upon the radius of curvature of the individual lens surfaces of
20 the lens element, the light emerging from the baffle may have an undesirably large spread rendering it unsuitable for use as the output beam of the lamp as it stands. In such a case, it is necessary to provide an additional lens element 15 on a side of the baffle 13
25 remote from the reflector 11 in order to modify the light spread in accordance with the desired characteristics of the output beam. However, the amount of control which can be exercised on these characteristics is limited due to the fact that the
30 light rays in each pencil are already substantially diverged when they reach the additional lens element 15.

In order to overcome this problem, it is necessary to reduce the spread of the light rays in each pencil as they emerge from the respective baffle interstice 14.

This can be achieved by enlarging the separation between the individual lenses 16 on the lens element 12 and the baffle 13 so that the light rays in each pencil do not have to be converged at such a large angle in order to pass through the appropriate interstice 14. However, this gives rise to difficulties since it is then necessary either to increase substantially the thickness of the lens element 12 as illustrated in Figure 2 of the accompanying drawings, or to separate the lens element 12 from the baffle 13 as indicated in Figure 3. If the thickness of the lens element 12 is increased, then the cost of the material used in its production will rise dramatically and the assembly of the lens element and baffle will be made unduly bulky. On the other hand, if the lens element is separated from the baffle, it will become difficult to ensure proper alignment of the lenses 16 with the interstices 14 and it will be necessary to increase the strength of the baffle since it will no longer be supported by the lens element 12.

An alternative solution to the problem is to reduce substantially the size and separation of the lenses 16, but this will require the size and separation of the baffle interstices 14 to be reduced also, and alignment of the lenses with the interstices will then become critical.

In published UK Patent Application No. 2079919 there is discussed a lamp wherein the spread of the light emerging from the baffle is reduced by employing negative lens surfaces which lessen the convergence of the light rays in each pencil before the latter pass through the respective baffle interstice. More particularly, two lens plates are provided between the baffle and a reflector of the lamp, the plate nearest

the reflector having positive lenses thereon which converge light rays towards a respective one of the baffle interstices, the plate nearest the baffle having the aforementioned negative lens surfaces formed on a side thereof which faces away from the baffle. Because the positive and negative lenses are provided on separate lens plates, the problem of accurate alignment still remains, and the use of two lens plates instead of one increases the bulk of the lamp and also its manufacturing cost.

It is an object of the present invention to overcome the above-described problems.

According to the present invention, there is provided a lamp including a baffle which is generally light-obstructing but which has a plurality of light-transmitting portions, and a light-transmitting member which is disposed behind the baffle with respect to the front of the lamp and which includes a plurality of light-deflecting devices, each light-deflecting device being composed of a positive lens surface which is provided on a side of the light-transmitting member facing away from the baffle and which converges light rays towards a respective light-transmitting portion of the baffle, and a formation on a side of the light-transmitting member which faces towards the baffle, each formation being specifically designed as a further lens element to reduce the spread of the light emerging from the opposite side of the baffle and being disposed optically adjacent to the respective light-transmitting portion of the baffle.

In Figure 6 of US Patent No. 4241388, there is shown a light-transmitting member for use in a lamp of the type shown in Figure 1 of the accompanying drawings,

wherein recesses are provided in a side of the member which faces towards the baffle. However, these recesses are provided solely for the purpose of facilitating the production of the baffle in situ on the light-transmitting member, and are not designed specifically to be lens surfaces, in contrast to the formations employed according to the invention.

Preferably, each formation is designed specifically as a negative lens surface.

10 A light-transmitting cover may be provided on a side of the baffle remote from the reflector. The cover can be plain or can have lensing thereon, and for certain applications it may be tinted, such as by being made of a neutral-density light-absorbing material.

15 Where the said formations reduce the spread of the light rays in only one plane, the spread of the light rays in a further plane at right-angles thereto can be determined by suitably configuring a reflector of the lamp, for example by providing flutes thereon.

20 Additionally or alternatively, the spread of said light rays can be determined by providing lensing on the light-transmitting cover as aforesaid, and/or by arranging for the positive lens surfaces to spread the light rays in said further plane.

25 Most advantageously, the baffle is secured to or mounted on the side of the light-transmitting member on which said formations are provided. In this case, the side of the light-transmitting member preferably has recesses therein, at least some of which constitute said formations, and the baffle can be produced by printing, painting or adhering a light-obstructing

30

material onto said side of the light-transmitting member except at the places where the recesses are provided.

The invention will now be further described, by way of example, with reference to the remaining figures of the accompanying drawings, in which:-

Figure 4 is a diagrammatic side view of a lamp according to the present invention;

Figures 5 and 6 are detailed views of parts of the lamp; and

Figures 7 to 11 show different forms of lensing which can be employed in the lamp.

Referring first to Figure 4, the lamp illustrated therein comprises a reflector 20 which directs light emitted by a light bulb 21 towards a lens element 22, the reflector being parabolic so that the light reaching the lens element comprises substantially parallel rays. The lens element 22 then focusses individual pencils of light rays through respective light-transmitting interstices 23 of a baffle 24 which is otherwise opaque, the size of the interstices being limited to that necessary to transmit the respective pencil of light rays. In this way, substantially all of the light emitted by the bulb 21 is transmitted through the baffle 24, while the small size of the interstices 23 substantially prevents external light from passing through the baffle, being reflected by the reflector 20 and then being re-emitted, so that the occurrence of "ghost" signals is prevented.

Referring now also to Figure 5, the lens element 22 is composed of a light-transmitting member (for example made of plastics material) which has a series

of positive lens surfaces 25 formed on a side thereof which faces the reflector 20 and a series of negative lens surfaces 26 formed on a side thereof which faces the baffle 24. The lens surfaces 25 are thus convex to the reflector, while the surfaces 26 are concave to the baffle. Each lens surface 26 is disposed immediately adjacent a respective one of the baffle interstices 23, and is optically aligned with a respective one of the lens surfaces 25, such that the lens surfaces 25 and 26 co-operate optically in pairs. In each such pair, the lens surface 25 serves to converge the light rays in a respective pencil to a degree sufficient to ensure that the whole pencil will pass through the respective baffle interstice 23 while maintaining the distance between the lens surface 25 and the baffle 24 comparatively small, while the lens surface 26 is specifically designed to reduce the convergence of said light rays when they are in the immediate vicinity of the interstice 23. In this way, the spread of the light emerging from the baffle can be substantially reduced as compared with the conventional systems described previously, without any need to increase the thickness of the lens element 22 or to separate it from the baffle.

The final spread of the light rays in each pencil emerging from the baffle will be dependent upon the radii of curvature of the two lens surfaces 25 and 26 and their mutual separation. There will, however, be a variation in the spread obtained due to the fact that the light rays reaching the lens element 22 are not all parallel, due for example to the finite size of the bulb filament. This variation may be employed to obtain the necessary characteristics in the output beam of the lamp, with the result that it is not necessary to provide an additional lens element for this purpose.

It will be manifest from the above that the lens surfaces 26 define recesses in one side of the lens element 22. These recesses can be employed to advantage to enable the baffle 24 to be produced by printing, painting or adhering an opaque material directly onto said side of the lens element, the presence of the recesses preventing the material from coming into contact with the lens element at the places where the interstices 23 are needed. By producing the baffle in this manner, no masking is required and the problems normally associated with aligning the interstices with the individual lens surfaces are avoided. As an example of this technique, the baffle can be produced by hot-foiling in the manner described in the above-mentioned US Patent No. 4241388. In some regions of the lens element 22, it may not be desirable to provide the negative lens surfaces 26, but recesses can nevertheless be provided on the side of the lens element so as not to impede the above-mentioned method of producing the baffle: in this case, the recesses will have flat base surfaces, as indicated at 27 in Figure 6. In the case where the baffle is produced by printing, the printing process can be arranged to produce decorative patterning and/or lettering.

Referring back to Figure 4, if the baffle 24 is left exposed there is a danger that it may be damaged, or its interstices may become blocked by dirt and the like. Accordingly, it is desirable to provide a light-transmitting cover 28 on a side of the baffle remote from the reflector 20, the cover forming the external surface of the lamp. The provision of the cover 28 also has the advantage that the exterior of the lamp can then be conformed to the shape of the apparatus to which the lamp is fitted. If the cover were not provided, then the external surface of the

lens element 22 would have to be so conformed instead, and this would impose severe restrictions on the type of baffle which could be employed. For example, if the external surface of the lens element were to be

5 non-developable from a flat plane, the baffle could not be made of sheet material adhered to the lens element. The cover 28 may be plain or may be provided with additional lensing thereon to assist in obtaining the desired characteristics in the output beam of the

10 lamp. In the event that such additional lensing is provided, it will be apparent that a much greater control of the beam characteristics can be obtained than in the case in the conventional arrangement described previously, due to the reduced divergence of

15 the light reaching the cover from the baffle 24. If it is desired to render the interior of the lamp less visible, a mask can be incorporated into the cover, or alternatively the cover may be tinted. In a particular example, the cover is made of neutral-density light-

20 absorbing material: this has a particular application where the lens element 22 is coloured and it is desired that its colouration should not be perceived from the exterior of the lamp when the bulb 21 is not energised.

Some examples of the type of lensing which can be

25 employed for the lens surfaces 25 and 26 will now be described with reference to Figures 7 to 11. In Figure 7, both the lens surfaces 25 and the lens surfaces 26 are formed by cylindrical lensing, i.e. they are curved in only one plane. Accordingly, the lens surfaces 25

30 and 26 affect the spread of the light only in their plane of curvature, and not in a further plane at right-angles thereto. In order to control the spread of the light in this further plane, the reflector 20 can be provided with suitable fluting and/or the cover

35 28 can be formed with appropriate lensing as

aforesaid. Alternatively, the lens surfaces 26 can be modified so that they are curved in said further plane also, either concavely or convexly to the reflector according to the desired characteristics of the output beam. Figure 8 shows an arrangement where the lens surfaces 25 are curved convexly in said further plane.

Instead of being curved in only one plane, the lens surfaces 26 can be curved in two mutually perpendicular planes. In this case, the lens surfaces 25 are preferably also curved in both of said mutually perpendicular planes. Figure 9 shows an example of such an arrangement wherein the lens surfaces 25 do not impinge upon one another. This arrangement does not, however, use the space available for the lens surfaces 25 in a particularly economic or efficient manner, and it is therefore preferred to overlap the lens surfaces 25 so that they form a rectangular or hexagonal grid pattern, as illustrated in Figures 10 and 11 respectively. The lens surfaces 25 and 26 may be part-spherical, or they may have different radii of curvature in said two mutually perpendicular planes. Alternatively, either or both of the lens surfaces 25 and 26 can be produced by the method described in our UK Patent No. 1387589, such that they each comprise a cylindrical mid-portion and two end portions each defined by part of a body of revolution. The lens surfaces 25 and/or 26 can be made of other configurations, for example to allow for the reflector 20 having a greater horizontal than vertical spread.

The type of lensing used does not have to be uniform over the whole lens element 22: different regions of the lens element can have different forms of lensing, depending upon the characteristics desired

for the output beam of the lamp. Although the lens element 22 would normally be produced by moulding, it could be manufactured by extrusion techniques or by rolling sheet material, for example.

5 In the above description, it has been assumed that each positive lens surface 25 will converge the respective pencil of light rays at a point behind the associated lens surface 26 with respect to the direction of light propagation. Hence, each lens
10 surface 26 is given a negative refractive power to reduce the convergence of the light rays before they pass through the respective baffle interstice 23. If however the radius of curvature of each positive lens surface 25 in relation to the thickness of the lens
15 element 22 is such that the pencil of light rays is converged in front of the associated lens surface 26 (i.e. so that the light rays are already diverging when they reach the latter), then the lens surface 26 will be given a positive refractive power to reduce the
20 divergence of the light rays as they pass through the respective baffle interstice 23.

 The lamp of the invention may be employed as a vehicle fog or headlamp. It does, however, have many other uses and can be advantageously employed anywhere
25 that "ghost" signals are likely to be dangerous or misleading. Where the lamp is used for signalling purposes, the lens element 22 will normally be coloured.

 The lamp has been described above as including a reflector 20, which is of course provided to
30 concentrate the light emitted by the bulb 21 onto the lens element 22. In an alternative construction (not

shown), the reflector 20 can be replaced by other forms of light-concentrating means, such as a Fresnel lens. In a further alternative, both the reflector 20 and the bulb 21 can be replaced by a reflex reflector or
5 retroreflector, i.e. a reflector which reflects back any light incident thereon and at the same time preferably colours same. In this case, the baffle 24 and the lens element 22 will not be provided to eliminate "ghost" signals, but rather to hide the
10 reflex reflector from normal view and thereby give the lamp a more pleasing appearance.

C L A I M S

1. A lamp including a baffle (24) which is generally light-obstructing but which has a plurality of light-transmitting portions (23), and a plurality of light-deflecting devices disposed behind the baffle (24) with
5 respect to the front of the lamp, each light-deflecting device including a positive lens surface (25) which converges the light rays towards a respective one of the light-transmitting portions (23) of the baffle (24)
10 and a further lens surface (26) which reduces the spread of the light rays emerging from the opposite side of the baffle (24), the positive lens surfaces (25) being provided on a side of a light-transmitting member (22) which faces away from the baffle (24),
15 characterised in that the same light-transmitting member (22) has on a side thereof which faces the baffle (24) formations (26) which are specifically designed as said further lens surfaces, each formation (26) being disposed optically adjacent to the
20 respective light-transmitting portion - (23) of the baffle (24).

2. A lamp as claimed in Claim 1, characterised in that said formations (26) are specifically designed as negative lens surfaces.

3. A lamp as claimed in Claim 1 or 2, characterised in that the baffle (24) is secured to or mounted on the side of the light-transmitting member (22) on which said formations (26) are provided.
- 5 4. A lamp as claimed in Claim 3, characterised in that said side of the light-transmitting member (22) has recesses therein, at least some of which constitute said formations (26), and the baffle (24) is produced by printing, painting or adhering a light-obstructing
10 material onto said side of the light-transmitting member (22) except at the places where the recesses are provided.
- 15 5. A lamp as claimed in any preceding claim, characterised in that a light-transmitting cover (28) is disposed on a side of the baffle (24) remote from the light-transmitting member (22).
6. A lamp as claimed in Claim 5, characterised in that the cover (28) is plain.
- 20 7. A lamp as claimed in Claim 5, characterised in that the cover (28) has lensing thereon.
8. A lamp as claimed in Claim 5,6 or 7, characterised in that the cover (28) is tinted.
- 25 9. A lamp as claimed in Claim 8, characterised in that the cover (28) is made of neutral-density light-absorbing material.
10. A lamp as claimed in any preceding claim, characterised in that the light-transmitting member (22) is coloured.

11. A lamp as claimed in any preceding claim,
characterised in that the further lens surfaces (26)
reduce the spread of said light rays in only one plane,
and the spread of said light rays in a further plane at
5 right-angles thereto is determined by suitably shaping
a reflector (11) which is disposed behind the
light-transmitting member (22).

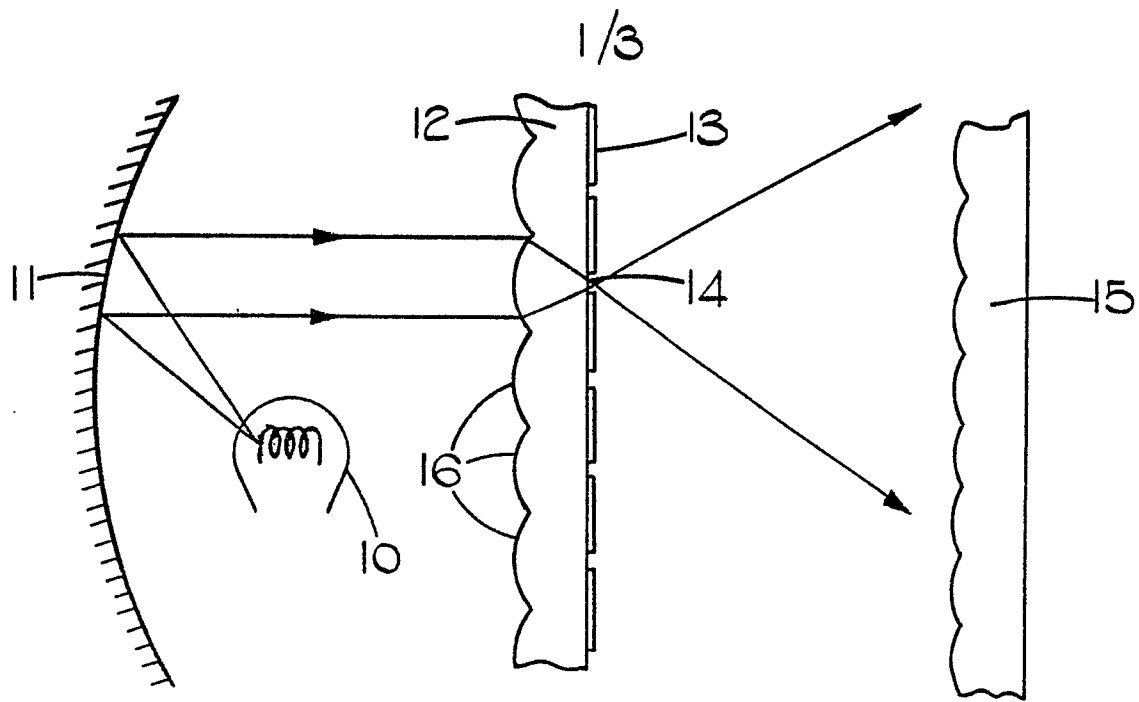


FIG. 1.

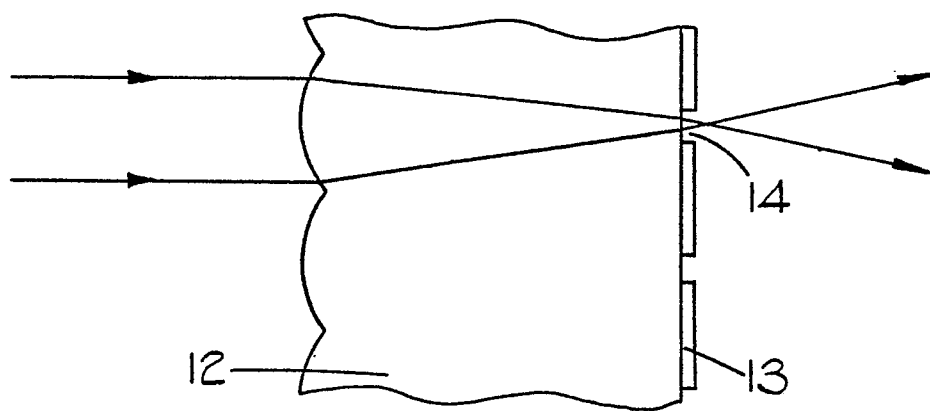


FIG. 2.

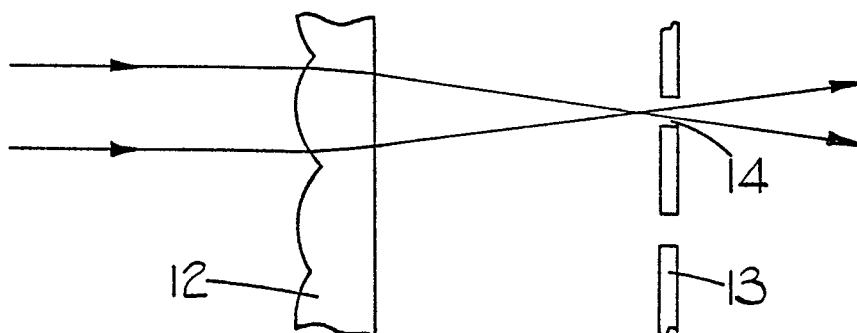


FIG. 3.

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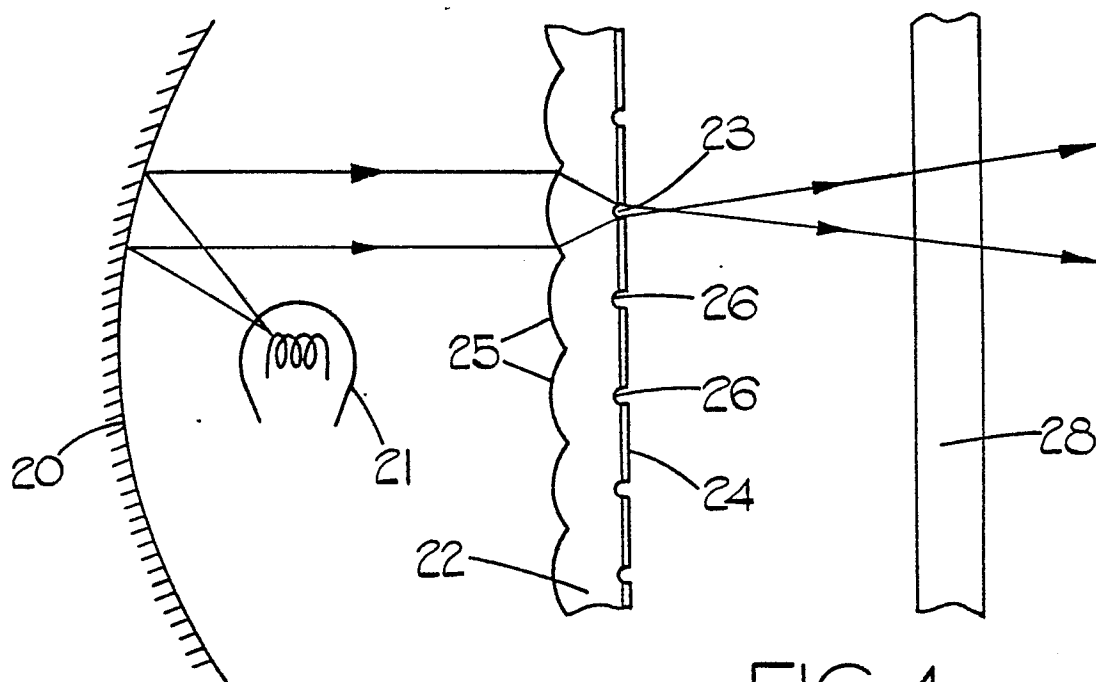


FIG. 4.

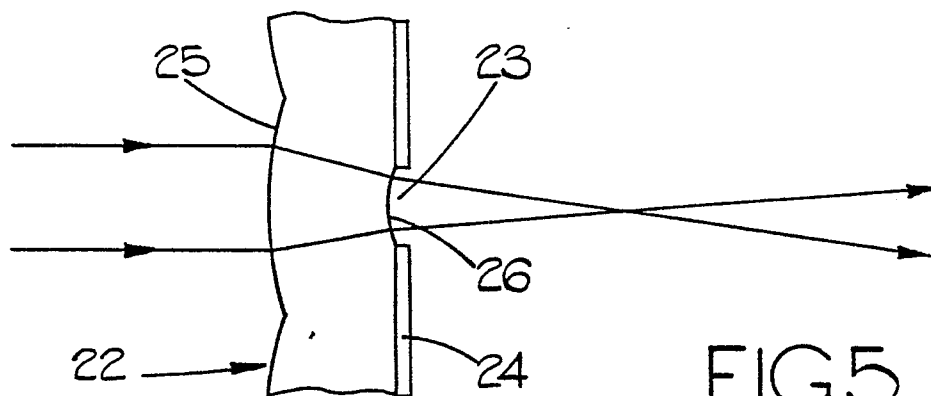


FIG. 5.

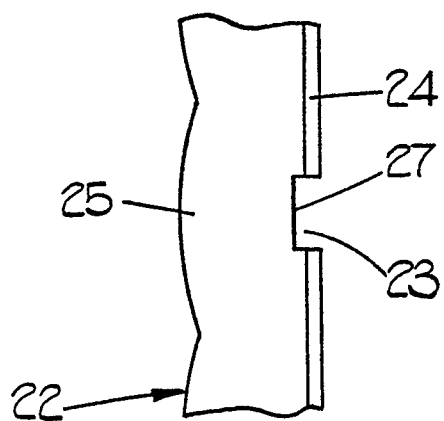


FIG. 6.

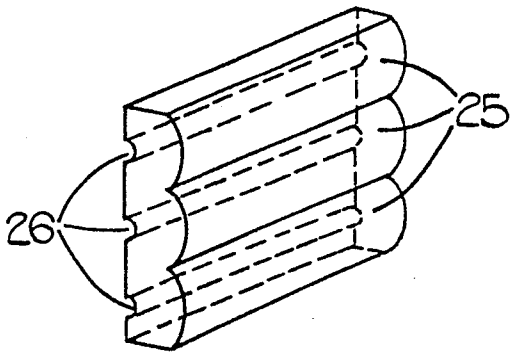


FIG. 7.

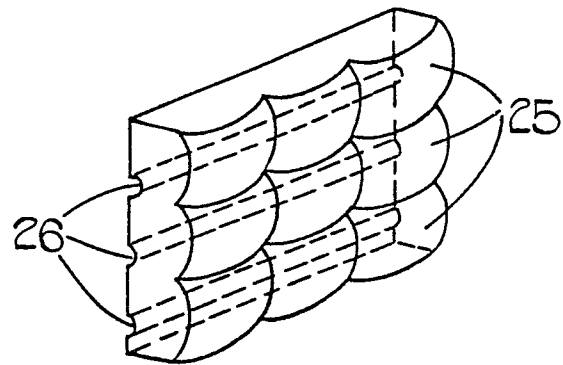


FIG. 8.

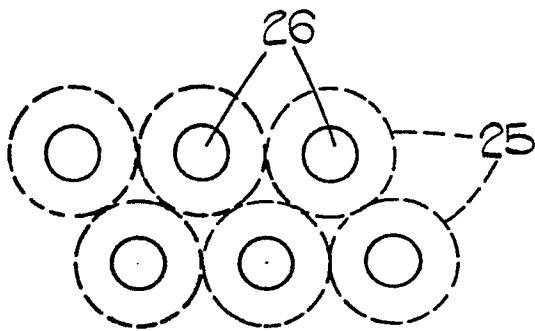


FIG. 9.

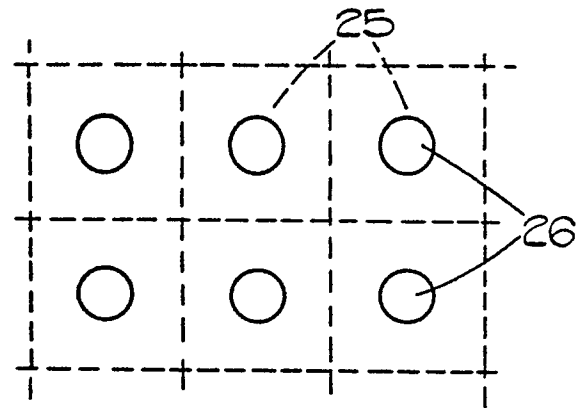


FIG. 10.

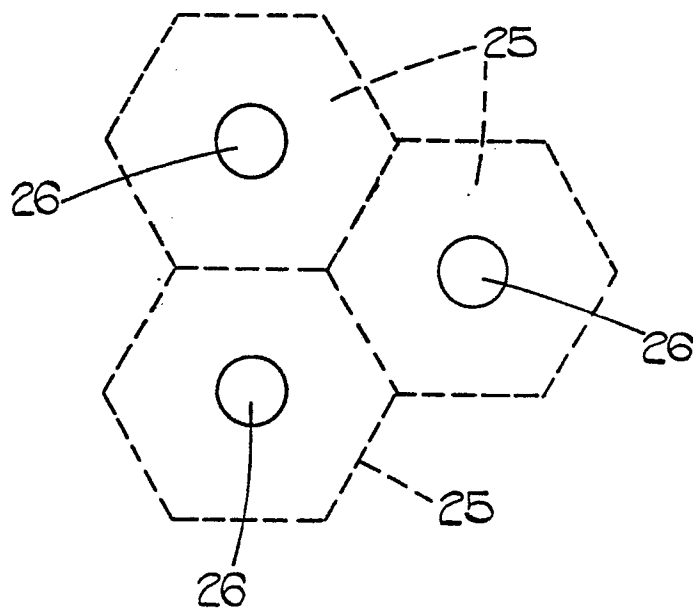


FIG. 11.



European Patent
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EUROPEAN SEARCH REPORT

0081361

Application number

EP 82 30 6459

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
X	DE-A-2 939 329 (ROBERT BOSCH) *Page 10, lines 4-13*	1,3,4, 5,7,10	F 21 Q 1/00
A	DE-A- 934 401 (HIEMSTRA) *Figure*	2	
D,A	US-A-4 241 388 (LUCAS) *Column 5, lines 29-33; figures 1,6*	2,6,7, 8,9	
A	US-A-2 907 249 (HJERMSTAD) *Figures 1-3*	10	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
			F 21 Q F 21 V
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 16-03-1983	Examiner FOUCRAY R.B.F.
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