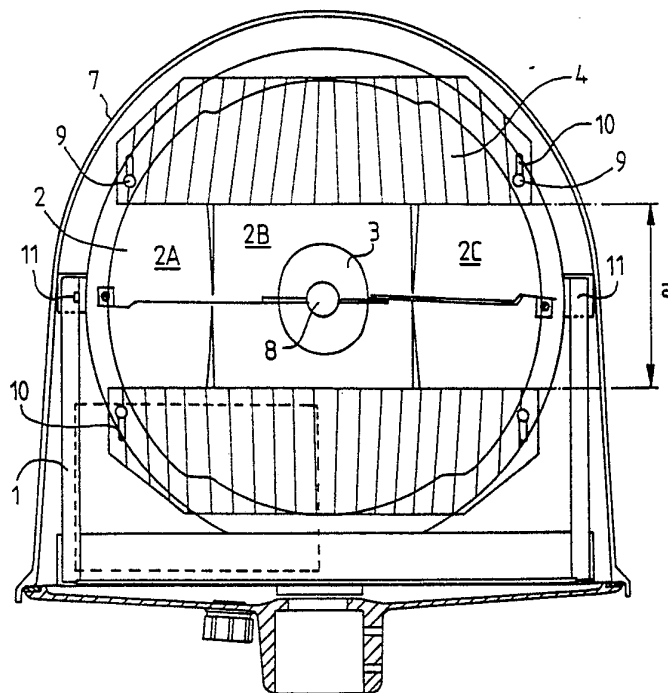




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification <sup>5</sup> : B64F 1/20, F21Q 3/02</p>	<p>A1</p>	<p>(11) International Publication Number: WO 92/15484 (43) International Publication Date: 17 September 1992 (17.09.92)</p>
<p>(21) International Application Number: PCT/FI92/00039 (22) International Filing Date: 12 February 1992 (12.02.92) (30) Priority data: 911153 7 March 1991 (07.03.91) FI (71) Applicant (for all designated States except US): IDMAN OY [FI/FI]; Mattila, SF-04600 Mäntsälä (FI). (72) Inventor; and (75) Inventor/Applicant (for US only): KASURINEN, Esko [FI/FI]; Mustanniemenrinne 2 A, SF-00760 Helsinki (FI). (74) Agent: OY KOLSTER AB; Stora Robertsgatan 23, P.O. Box 148, SF-00121 Helsinki (FI).</p>		<p>(81) Designated States: AT (European patent), BE (European patent), CH, CH (European patent), DE, DE (European patent), DK, DK (European patent), ES, ES (European patent), FR (European patent), GB, GB (European patent), GR (European patent), IT (European patent), LU (European patent), MC (European patent), NL (European patent), SE, SE (European patent), US.  Published With international search report.</p>

(54) Title: AN ILLUMINATOR, ESPECIALLY A RUNWAY APPROACH FLASHLIGHT



(57) Abstract

The invention relates to an illuminator, especially a runway approach flashlight, for forming a directable, generally rectangular light beam, comprising a light source, such as a xenon lamp, an illuminator body (1), and a reflector supported to it and comprising a generally cup-like rear reflector (2) fitted behind the light source, and means for directing the light beam. To achieve a light beam of a desired shape and to enable it to be directed, the reflector further comprises an ellipsoidal counter reflector (3) fitted in front of the light source, the main axis of the counter reflector being substantially parallel to the shorter side of the light beam, and the reflector (2, 3) is supported to the illuminator body by means of joints (11), so that the reflector can be tilted with respect to the illuminator body (1).

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An illuminator, especially a runway approach flashlight

This invention relates to an illuminator, especially a runway approach flashlight, for forming a directable, generally rectangular light beam, comprising a light source, such as a xenon lamp, an illuminator body, and a reflector supported to it and comprising a generally cup-like rear reflector fitted behind the light source.

Finnish Published Specification 66074, for instance, discloses an illuminator of substantially the above-described type for similar purposes. The runway approach flashlight according to the invention should radiate a flashing light so as to form a beam having the shape of a horizontal rectangle in cross-section. This beam has to be directed at a predetermined angle with respect to the horizontal plane. Within the area of the beam, the effective light intensity values have to be adjustable in compliance with various specifications both as concerns the width of the beam and the maximum/minimum ratio of the intensities. In the above-mentioned known arrangement, the illuminator with its casing has been made tiltable for directing the beam by providing the back portion of the casing with a joint with respect to which the front edge of the casing can be lifted by means of an adjusting screw. This way of adjustment requires that the electronics controlling the illuminator unit should be placed in a housing separate from the illuminator in order that the tiltable structure would not be too heavy and clumsy. On the other hand, the directing of this kind of illuminator, that is, the adjustment of the angle of tilt, has to be checked at least after the illuminator has

been installed e.g. on a light support possibly several metres above the surface of the earth. In this known arrangement, the light beam itself is shaped by an elliptical rear reflector and optical means positioned in front of a light source. The light distribution in the illuminator is fixed and cannot be adjusted in compliance with various specifications, but possible changes in the distribution of light have to be made by modifying the structure of the illuminator unit itself.

The object of the present invention is to provide an illuminator in which the light beam is more easily and more simply adjustable in both shape and direction than in the illuminators known from the prior art. This is achieved by means of an illuminator according to the invention, which is characterized in that the reflector further comprises an ellipsoidal counter reflector fitted in front of the light source, the main axis of the counter reflector being substantially parallel to the shorter side of the light beam.

The arrangement of the invention also provides an illuminator in which the illuminator casing need not be tilted for directing the light beam but the light beam is directed by tilting only the reflector and the light source supported to it.

Two prismatic refraction plates of transparent material are supported preferably to the rear reflector, substantially in the plane of its mouth, in such a way that they cover the mouth of the rear reflector with the exception of a substantially centrally positioned area of uniform width. By means of these prismatic refraction plates, both the dimensions and the intensity distribution of the rectangular light beam emitted by the illuminator can

be varied. Preferably, the refraction plates are supported to the rear reflector so as to be adjustable. As to the maximum/minimum ratio of the light beam intensities, it is preferable that light can be  
5 guided to the corner areas of the primary beam by means of the refraction plates, whereby the refracting angle of the refraction plates may be about  $15^\circ$  and the directional angle within the range from 2 to  $5^\circ$ . The width of the area of uniform width between  
10 the refraction plates also affects substantially the maximum/minimum ratio of the intensities.

Furthermore, it is preferable that the rear reflector is divided into three sections substantially parallel with the shorter side of the light beam  
15 in such a way that when light beams emitted from the light source and returned from the front reflector are reflected from the two outermost sections, they are directed sidewardly, forming an acute angle with respect to the light beams reflected from the middle  
20 section. In this way the light reflected from the rear reflector can be spread outward within its edge areas, and the length of the longer side of the light beam having a rectangular cross-section, that is, the width of the light beam can be adjusted to some  
25 extent by the selection of the above-mentioned acute angle. This acute angle is preferably about  $6^\circ$ .

In order to be able to direct the light beam in the illuminator according to the invention with respect to the horizontal plane more simply than previously, the reflector is supported pivotally to the  
30 illuminator body. It is also to be preferred that the illuminator body comprises a levelling means which is arranged to indicate the position in which the illuminator body is positioned substantially horizontally,  
35 and the reflector comprises a scale plate

which can be adjusted positionally with respect to the illuminator body and which indicates the angle of tilt of the reflector with respect to the illuminator body. In this way it can be ensured as early as at  
5 the assembly stage of the illuminator that the scale plate attached to the illuminator body is in an appropriate position in view of the vertical position of the reflector; at the installation site, the reflector thus only has to be tilted at a desired  
10 angle of tilt by means of the marks of the scale plate. Of course, it is thereby assumed that the illuminator body can be positioned on a horizontal supporting surface, which, on the other hand, can also be checked by means of the levelling means  
15 provided in the illuminator body.

In the following, the illuminator according to the invention will be described in more detail with reference to the attached drawings, in which

Figure 1 is a front view of an illuminator  
20 according to the invention, that is, as viewed in the direction of the light beam;

Figure 2 is a cross-sectional view of the illuminator of Figure 1 substantially at right angles to the light beam,

25 Figure 3 is a front view of a refraction plate contained in the reflector of the illuminator;

Figure 4 is a side view of the refraction plate of Figure 3; and

30 Figure 5 shows an arrangement comprised in the illuminator according to the invention for adjusting the angle of tilt of the reflector.

The illuminator according to the invention shown in Figure 1 comprises an outermost water-proof casing 7 the front surface of which is transparent  
35 and which encloses the reflector means of the

illuminator, and, if required, also the electronic means controlling the illuminator. This is possible as the illuminator casing can be positioned steadily on the underlying surface and need not be tilted for directing the light beam. The illuminator itself comprises an illuminator body 1 having a base portion and column-like portions projecting upwardly from the base portion, a reflector and an associated light source being supported on the column-like portions.

5 The reflector comprises a generally cup-like rear reflector 2 which is fitted behind the light source and an ellipsoidal counter reflector 3 fitted in front of the light source. The main axis of the counter reflector is vertical, that is, parallel to the shorter side of the light beam, and the counter reflector further comprises a central opening 8 for allowing the passage of light emitted from the light source straight in the right direction. The rear reflector 2 is formed of a blank having the shape of a paraboloid generated by rotation and divided into three vertical sections 2A, 2B and 2C. The division is carried out in such a way that light beams originating from the light source and reflected from the two outermost sections 2A and 2C are directed sidewardly, thus forming a smallish acute angle with respect to light beams reflected from the middle section 2B. This smallish acute angle may be e.g. about 6°. Furthermore, two prismatic refraction plates 4 of transparent material are supported to the rear reflector 2, substantially in the plane of its mouth, in such a way that they cover the mouth of the rear reflector 2 with the exception of a substantially centrally positioned area of uniform width. The width of this area is a and its longitudinal axis is parallel to the longer side of the rectangular light

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beam of the illuminator. The distance  $a$  should be adjustable. By way of example, Figure 1 shows a simple arrangement in which the refraction plates 4 are supported to the rear reflector 2 by means of screws 9 in such a way that the screws penetrate the refraction plates through elliptical openings 10. In this way the distance between the refraction plates 4 can be adjusted sufficiently.

As already mentioned above, the entity formed by the rear reflector, the counter reflector and the refraction plates is supported on the columns of the illuminator body 1 by means of joints 11 provided in the columns, the joints being attached to the rear reflector substantially at the ends of its horizontal axis.

Figures 3 and 4 show the refraction plate 4 in more detail. As appears from the figures, the prisms of the refraction plate have a directional angle which is about  $2.5^\circ$  in Figure 3. This directional angle preferably ranges between about  $2^\circ$  and  $5^\circ$ . In Figure 4, in turn, the angle of refraction of the refraction plates is about  $15^\circ$ . These given angle values are not critical but they can be adjusted to some extent in compliance with the specifications imposed on the light beam of the illuminator in each particular case.

Figure 5 shows an arrangement comprised in the illuminator according to the invention, which enables the angle of tilt of the illuminator to be set in advance before the installation of the illuminator on a light support or other similar supporting surface. The arrangement shown in Figure 5 comprises a levelling means attached to the illuminator body 1, such as a water level 5 which enables the illuminator body 1 to be positioned horizontally. In this posi-

tion, the reflector structure, in turn, will be positioned vertically, that is, the light beam reflected from it will be horizontal. In this position, a scale plate 6 attached to the reflector is locked in a position 0° by means of screws 12, as shown in Figure 5. Thereafter the light beam of the illuminator can be directed at a desired angle by tilting the reflector so that the scale plate 6 will indicate this desired angle value at the edge of the illuminator body 1. Thereafter the reflector can be locked in this tilted position by means of a screw 13 bearing against the illuminator body 1. In this way the reflector can be tilted reliably in advance at the desired angle of tilt. This arrangement avoids the use of separate, external directing devices difficult in use in the installation of the illuminator. After the installation, the direction can always be checked by means of the water level 5. This is because the water level 5 indicates if the installation surface of the illuminator is horizontal, whereby the angle of tilt of the reflector is the angle indicated by the scale 6. By means of the scale shown in Figure 5, the reflector can be tilted 3 to 10° upward from the vertical plane, that is, the light beam can be lifted through a corresponding angle upward from the horizontal plane.

The illuminator according to the invention, especially a runway approach flashlight, is described above only by means of one exemplifying structural embodiment, and it is to be understood that the principles according to the invention can be realized by means of other similar structural arrangements without, however, deviating from the scope of protection defined in the attached claims.

## Claims:

1. An illuminator, especially a runway approach  
flashlight, for forming a directable, generally rect-  
angular light beam, comprising a light source, such  
5 as a xenon lamp, an illuminator body (1), and a  
reflector supported to it and comprising a generally  
cup-like rear reflector (2) fitted behind the light  
source, c h a r a c t e r i z e d in that the re-  
10 flector further comprises an ellipsoidal counter re-  
flector (3) fitted in front of the light source, the  
main axis of the counter reflector being substantial-  
ly parallel to the shorter side of the light beam.

2. An illuminator according to claim 1,  
15 c h a r a c t e r i z e d in that two prismatic  
refraction plates (4) of transparent material are  
supported to the rear reflector (2), substantially in  
the plane of its mouth, in such a way that they cover  
the mouth of the rear reflector (2) with the excep-  
20 tion of a substantially centrally positioned area of  
uniform width.

3. An illuminator according to claim 2,  
c h a r a c t e r i z e d in that the refracting  
angle of the refraction plates (4) is about 15° and  
25 their directional angle ranges from about 2° to about  
5°.

4. An illuminator according to claim 2 or 3,  
c h a r a c t e r i z e d in that the refraction  
plates (4) are supported to the rear reflector (2) so  
30 as to be adjustable, enabling the width (a) of said  
area of uniform width to be varied.

5. An illuminator according to any of claims 1  
to 4, c h a r a c t e r i z e d in that the rear  
reflector (2) is divided into three sections (2A, 2B,  
35 2C) substantially parallel to the shorter side of the

light beam in such a way that light beams originating from the light source and reflected from the two outermost sections (2A, 2C) are directed sidewardly, thus forming an acute angle with respect to light  
5 beams reflected from the middle section (2B).

6. An illuminator according to claim 5, characterized in that said acute angle is about 6°.

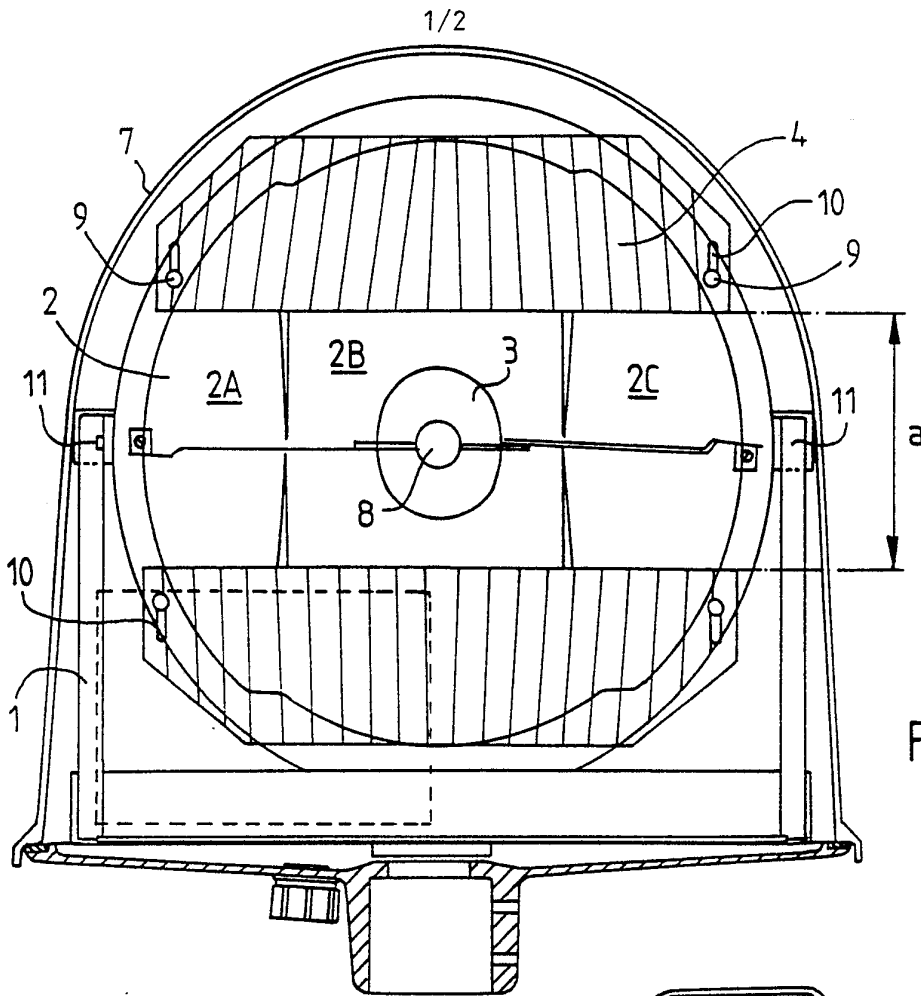
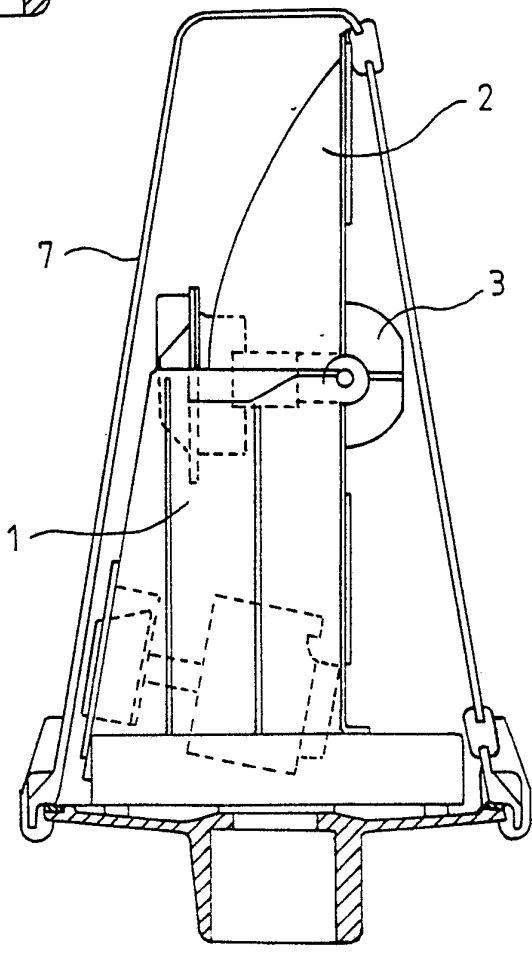


FIG. 2



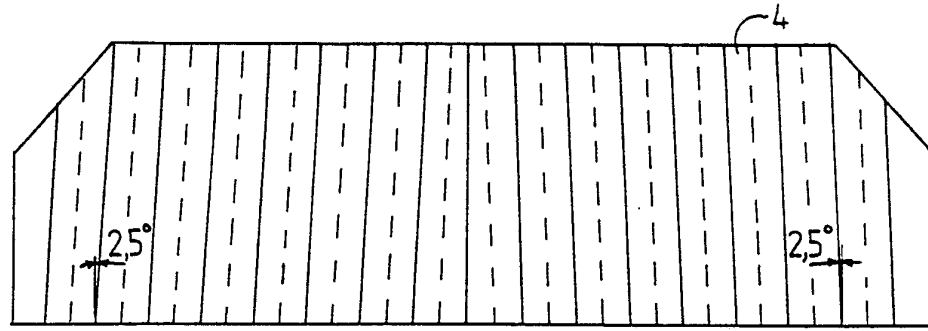


FIG. 3

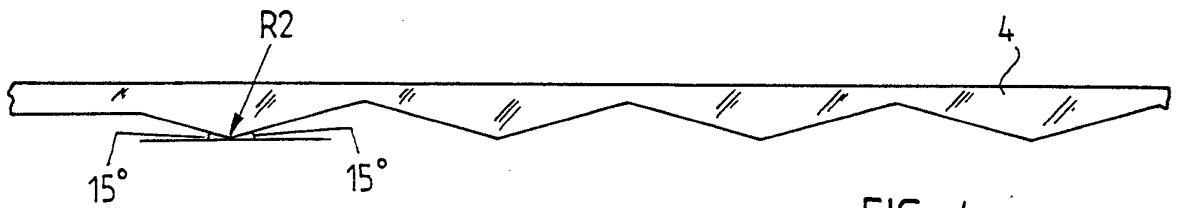


FIG. 4

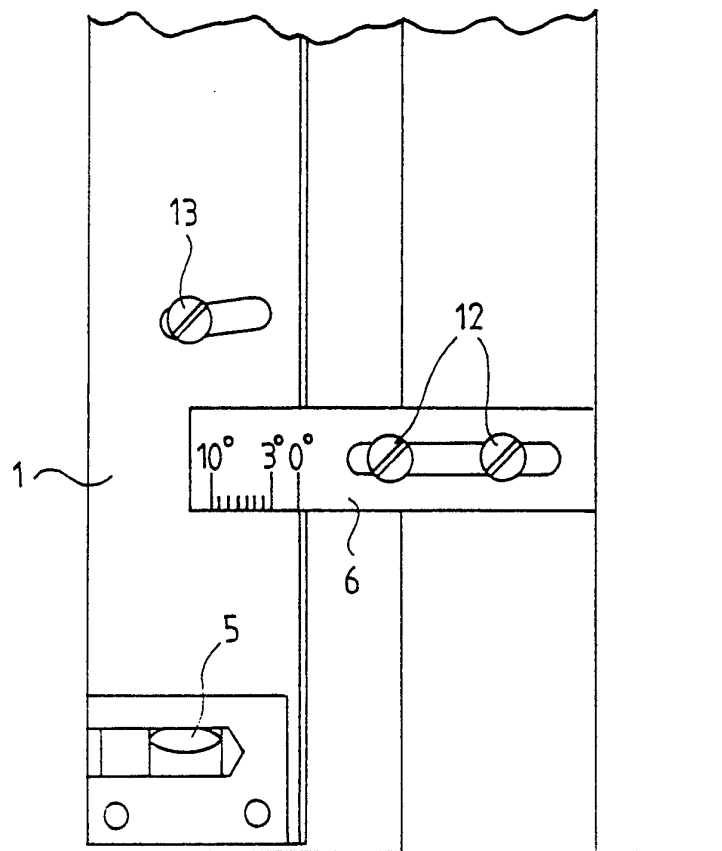


FIG. 5

# INTERNATIONAL SEARCH REPORT

International Application No PCT/FI 92/00039

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC5: B 64 F 1/20, F 21 Q 3/02		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
IPC5	B 64 F, F 21 Q, F 21 M, F 21 V	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched <sup>8</sup>		
SE,DK,FI,NO classes as above		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>		
Category *	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
A	US, A, 3443086 (VITOLDS RIKIS) 6 May 1969, see column 2, line 19 - column 3, line 11; figures 1-2 --	1
A	DE, A1, 3810297 (OKA-KANO & OEHMICHEN KG FORSCHUNGS-U. ENTWICKLUNGSGESELLSCHAFT FÜR LICHTTECHNIK) 5 October 1989, see abstract; figure 6 --	1
A	US, A, 1571714 (ROBERT N. FALGE ET AL) 2 February 1926, see page 1, line 78 - line 80; figures 1-3 --	2-4
A	US, A, 4254456 (JAMES L. GRINDLE ET AL) 3 March 1981, see column 2, line 38 - column 4, line 11; figure 3 --	5-6
<p>* Special categories of cited documents:<sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
4th June 1992		1992 -06- 15
International Searching Authority		Signature of Authorized Officer
SWEDISH PATENT OFFICE		Åke Vångborg <i>Åke Vångborg</i>

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	CH 374291 (CHARLES H. J. ANDERSON) 14 February 1964, see page 2, line 62 - line 81; figures 1-2 -- -----	1-6

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO. PCT/FI 92/00039**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on 30/04/92. The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 3443086	69-05-06	NONE	
DE-A1- 3810297	89-10-05	JP-A- 2132403	90-05-21
US-A- 1571714	26-02-02	NONE	
US-A- 4254456	81-03-03	CA-A- 1158621	83-12-13
CH- - 374291	64-02-14	NONE	