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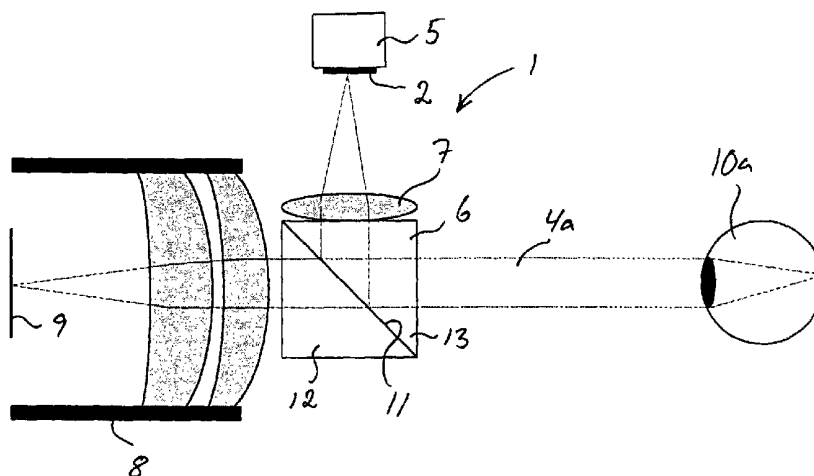
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(54) Title: A DEVICE, A USE AND A METHOD FOR TRACER STREAM SIMULATION



(57) Abstract: A device for tracer stream simulation at a biocular sight, which device comprises an aperture (3) which, when the device is mounted to a biocular sight, is intended to be located in front of the exit aperture of the sight so that a person looking into the sight will view, via said aperture (3), an image conveyed by the sight, and means (5) for generation in an image plane (2) of an image comprising a simulated tracer stream for a projectile, this image plane (2) being located at the side of the aperture (3) of the device. The device further comprising a beam splitter (6) which, when the device is mounted to a biocular sight, is arranged to project the image comprising the simulated tracer stream into one of the eyes of a person looking into the sight so that the field of view for this eye comprises an image conveyed by the sight with the image comprising the simulated tracer stream superposed, and the device is so designed that the field of view for the other eye of a person looking into the sight comprises the image conveyed by the sight without any image comprising simulated tracer stream superposed. The invention also relates to the use of the invention device for tracer stream simulation at a biocular sight in a weapon system and a method for tracer stream simulation.



WO 02/052218 A1

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A device, a use and a method for tracer stream simulation

10 FIELD OF THE INVENTION AND PRIOR ART

The present invention relates to a device and a method for tracer stream simulation at a biocular sight. The invention is particularly intended to be used for tracer stream simulation at a
15 biocular sight in a weapon system, such as for instance a tank.

A laser unit, which is mounted to the barrel and emits a laser beam in the pointing direction of the barrel when firing takes place, is often used in simulated firing. In this type of simulated
20 firing, it is often desirable to present for the marksman a simulated tracer stream representing the calculated trajectory of a simulated projectile fired from the weapon. In those cases where the marksman in the aiming of the barrel of the weapon is using a monocular sight, where the focusing is carried out on the in-
25 finity and with one eye, an image comprising a simulated tracer stream can without any major problems be superposed on the normal image conveyed by the sight. A unit reflecting the tracer stream image into the sight via a beam splitter arranged in front of or behind the sight is normally used in this connection. In
30 those cases where the sight is biocular and either of termic type or of a type where the image from the surroundings is directed into the sight via a stabilised main mirror, i.e. of the type of sight often used in a tank, problems do however arise. With those types of sights, the image with the simulated tracer stream can
35 not be reflected into the sight from a beam splitter arranged in front of the sight, i.e. at the end opposite the ocular.

A solution that has been tried for tracer stream simulation at said type of biocular sights has been to project an image comprising simulated tracer stream via a beam splitter arranged in front of the ocular of the sight. In this case, the image comprising the tracer stream has been projected into both of the eyes of the person looking into the sight via two separate ray paths, i.e. via a first ray path for the right eye and a second ray path for the left eye. With this solution, problems with double image of the tracer stream will however arise, since the distortion of the image in the lens system of the biocular sight is relatively high.

To make it possible to look into a biocular sight with both eyes in a comfortable manner, these are normally manufactured with and exit aperture having a diameter in the order of 80 mm. When applying the above-mentioned solution, the unit comprising the beam splitter and the other components required for the tracer stream simulation will become unwieldy large when the unit is to be adapted for tracer stream simulation at a biocular sight with an exit aperture of said size.

The alternative solution one has been reduced to using till now for tracer stream simulation at biocular sights of the mentioned type with relatively large exit aperture has been to record the sight image with tracer stream appearing thereon. The image is then shown on a monitor mounted at the side of the sight. This solution is costly. Furthermore, this solution implies that the person using the sight is not looking into the sight itself, but is viewing the sight image via the monitor, which reduces the realism in the training and causes problems with resolution and contrast.

Consequently, there is a need for a more appropriate solution for simulation of tracer stream at biocular sights of the above-mentioned type.

In this description and the subsequent claims, the term biocular sight refers to a sight which it is intended to look into with both eyes simultaneously via one and the same exit aperture. Consequently, a biocular sight comprises optical elements being common for both eyes.

OBJECT OF THE INVENTION

The object of the present invention is to achieve a device for tracer stream simulation at a biocular sight, by means of which device an image comprising simulated tracer stream in a simple and efficient manner can be superposed on the sight image conveyed by the sight.

SUMMARY OF THE INVENTION

According to the invention, said object is achieved by means of a device having the features defined in claim 1.

The inventional solution implies that the simulated tracer stream is only projected into one of the eyes of a person looking into the sight provided with the device. During the decades when a solution of the problem in question with tracer stream simulation at biocular sights has been searched for, there has all the time been an aspire to achieve a projection of the simulated tracer stream into both eyes of a person looking into the sight. Consequently, the solution according to the invention constitutes a new approach going in the opposite direction to the prevailing development within this technical field. With the inventional solution a number of advantages are obtained. Inter alia, the risk that a person looking into the sight will see a double image of the simulated tracer stream is completely eliminated. Furthermore, the diameter of the exit aperture will be about the half when projecting into one eye as compared with projecting into both eyes. This implies that the linear dimensions of the tracer stream generator can be reduced to the half and the volume is

thereby reduced to an eighth. The inventional device can for instance be made small enough for making it possible to mount the device at a biocular sight in a combat vehicle, such as a tank, where the space normally is very limited.

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Preferred embodiments of the inventional device will appear from the dependent claims and the subsequent description.

10 The invention also relates to the use of the inventional device for tracer stream simulation at a biocular sight in a weapon system, such as a tank, according to claim 8 and a method for tracer stream simulation according to claim 9.

BRIEF DESCRIPTION OF THE DRAWING

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The invention will in the following be more closely described by means of embodiment examples with reference to the appended drawing. It is shown in:

20 Fig 1 a schematical illustration of a device according to the invention as seen from the side,

Fig 2 a schematical illustration of a device according to the invention as seen from above,

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Fig 3 a sectional view of a device according to an embodiment of the invention mounted in front of a biocular sight, and

30 Fig 4 the device according to fig 3 as seen from the front.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

35 Fig 1 illustrates very schematically the construction of a device according to the invention as seen from the side. The device 1

comprises means for generation in an image plane 2 of an image comprising a simulated tracer stream from a projectile, this image plane 2 being located at the side of an aperture 3 (see fig 4) included in the device, so that the image plane 2 does not lie
5 directly in the field of view 4a, 4b of a person looking through the device via said aperture 3. Said means preferably consists of a cathode ray tube, schematically indicated at 5 in fig 1, in which case the image plane of the cathode ray tube consequently constitutes the image plane 2. Said means can for instance
10 also consist of a LCD-display of reflecting or transmitting type or of a light emitting diode array.

The device further comprises a beam splitter 6 arranged to project the tracer stream image generated in the image plane 2 into
15 one 10a of the eyes of a person looking through the device via said aperture 3. An ocular 7 is arranged between the beam splitter 6 and the image plane 2. The device 1 is intended to be placed in front of a biocular sight, schematically indicated at 8 in fig 1-3, so that a person looking into the sight 8 in one 10a of
20 his eyes (the right one in fig 2) will see an image generated in the image plane 9 of the sight with the image, comprising the simulated tracer stream, generated in the image plane 2 of the device superposed, and in his other eye 10b (the left one in fig 2) will see the image generated in the image plane 9 of the sight
25 without any image comprising simulated tracer stream superposed. In fig 2 it is clearly illustrated how the tracer stream image generated in the image plane 2 of the device only is projected via the beam splitter 6 into one of the eyes of a person looking into the sight.

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In the embodiment shown in fig 2, the beam splitter 6 has such an extension that it covers the fields of sight 4a, 4b for both eyes 10a, 10b of a person looking into the sight 8. As the beam splitter 6 only is arranged to project the tracer stream image into
35 one of the eyes, it is however sufficient that the beam splitter 6

has such an extension that it only covers the field of sight 4a for one of the eyes of a person looking into the sight 8.

5 The beam splitter 6 comprises a semi-transparent mirror 11, which is arranged to reflect rays of light from the image generated in the image plane 2 of the device and thereby project this image into one 10a of the eyes of a person looking into the sight 8. The semi-transparent mirror 11 is further arranged to allow rays of light from the image generated in the image plane 9 of
10 the sight to pass through. In the embodiment shown in fig 1 and 2, the beam splitter 6 comprises two pieces of glass 12, 13 with triangular cross-sectional shape, which are joined together by means of gluing so as to jointly form an element with rectangular cross-sectional shape. A mirror coating 11 is arranged in the
15 joint between the pieces of glass 12, 13. The mirror coating 11 can either consist of a separate layer-shaped element or be integrated with one of the pieces of glass. Other designs of the beam splitter 6 besides the one described above are of course also possible. The principle thing is that the beam splitter will
20 function as a semi-transparent mirror in the above-indicated manner.

Fig 3 shows an inventional device 1 mounted in front of the exit aperture of a biocular sight 8, preferably a biocular sight in a
25 tank. In the embodiment shown in fig 3, the device 1 comprises a casing 14 enclosing the means 5 for generation of the tracer stream image, the ocular 7 and the beam splitter 6. An aperture 3 is arranged at a front wall 15 of the casing, through which aperture a person looking into the sight is intended to direct his
30 eyes. This aperture 3 can with advantage be rectangular and can for instance have a size of about 35x80 mm. This shape and size of the aperture 3 is sufficient for allowing a person to look comfortably into the sight via the aperture 3 with both eyes. Owing to that the aperture 3 of the device has a smaller extension than the exit aperture of the sight, which as previously
35 mentioned normally has a diameter in the order of 80 mm, a part

of the space directly in front of the exit aperture of the sight can be used for accommodating the components included in the device 1, whereby the device 1 can be made more compact and space-saving. At the rear wall 16 of the casing, a not shown aperture is arranged, which aperture has essentially the same shape and size as the aperture 3 at the front wall 15 of the casing and which is arranged coaxially with this aperture. The device according to the embodiment shown in fig 3 further comprises a tube-shaped holding member 17, which is connected to the casing 14 and protrudes from the rear wall 16 of the casing. The tube-shaped holding member 17 has an inner diameter which is somewhat larger than the outer diameter of the sight, at the front end of the sight, so that the device 1 can be attached to the sight 8 by applying the holding member 17 so that it encloses the front part of the sight 8. A quick-action fastener 18, which is attached to the holding member 17, is adapted to secure the device 1 to the sight 8.

The means 5 for generation of simulated tracer stream included in the device 1 is suitably supplied with electric current from a separate current source placed at a distance from the device, in which case the device 1 is provided with a not shown connection for connecting up of current from said current source to said means 5.

The means 5 for generation of simulated tracer stream is via a not shown connection connectable to a computer unit, which preferably is arranged in a separate unit placed at a distance from the invention device. Said means 5 can of course also be connected to the computer unit via a wireless connection. This computer unit is adapted to control the tracer stream generation in dependence on given parameters and the aiming of the marksman of a weapon unit associated with the sight so that the simulated tracer light represents the tracer light from a simulated projectile fired from said weapon unit. The device according to the invention is particularly intended to be used for tracer

stream simulation at a biocular sight in a weapon system, such as a tank, in which case the simulated tracer stream is intended to represent the tracer stream from a simulated projectile fired by means of a weapon unit of the weapon system.

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The invention is of course not in any way limited to the preferred embodiments described above, on the contrary several possibilities to modifications thereof should be apparent to a person skilled in the art without therefor deviating from the basic idea of the invention as defined in the appended claims.

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Claims

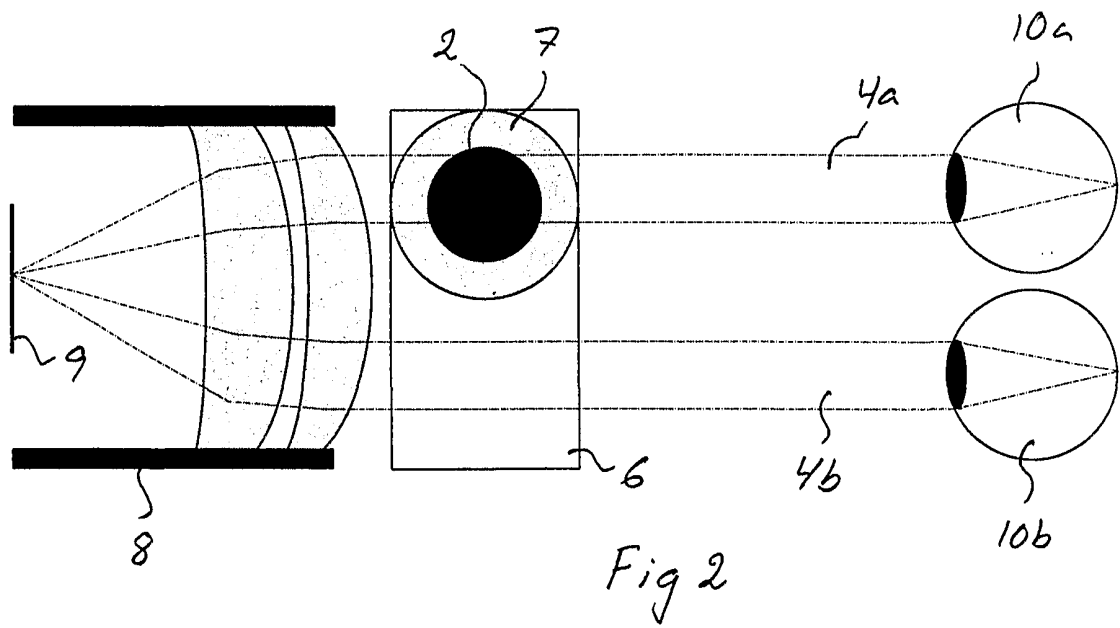
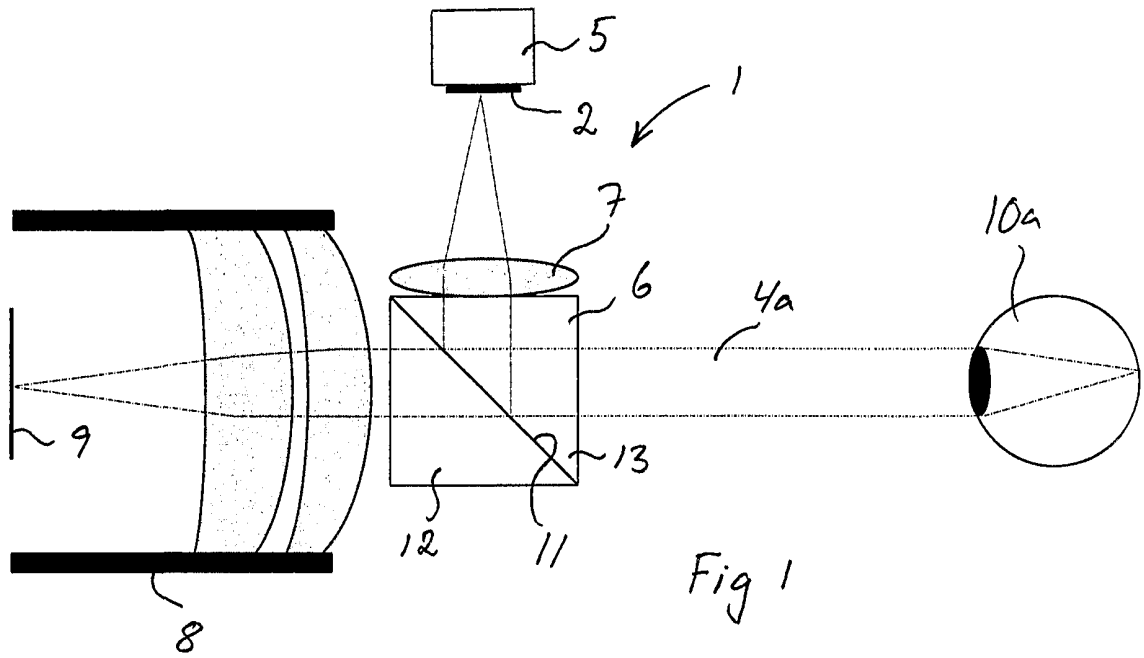
1. A device for tracer stream simulation at a biocular sight, which device comprises an aperture (3) which, when the device is mounted to a biocular sight, is intended to be located in front of the exit aperture of the sight so that a person looking into the sight will view, via said aperture (3), an image conveyed by the sight, and means (5) for generation in an image plane (2) of an image comprising a simulated tracer stream from a projectile, this image plane (2) being located at the side of the aperture (3) of the device, **characterized** in that the device comprises a beam splitter (6) which, when the device is mounted to a biocular sight, is arranged to project the image comprising the simulated tracer stream into one of the eyes of the person looking into the sight via the aperture (3) of the device so that the field of view for this eye comprises an image conveyed by the sight with the image comprising the simulated tracer stream superposed, and that the device is so designed that the field of view for the other eye of the person looking into the sight via the aperture (3) of the device comprises the image conveyed by the sight without any image comprising simulated tracer stream superposed.
2. A device according to claim 1, **characterized** in that the means (5) for generation of the image comprising the simulator tracer stream consists of a cathode ray tube.
3. A device according to claim 1, **characterized** in that the means (5) for generation of the image comprising the simulator tracer stream consists of a LCD-display.
4. A device according to any of the preceding claims, **characterized** in that the beam splitter (6) comprises a semi-transparent mirror (11).

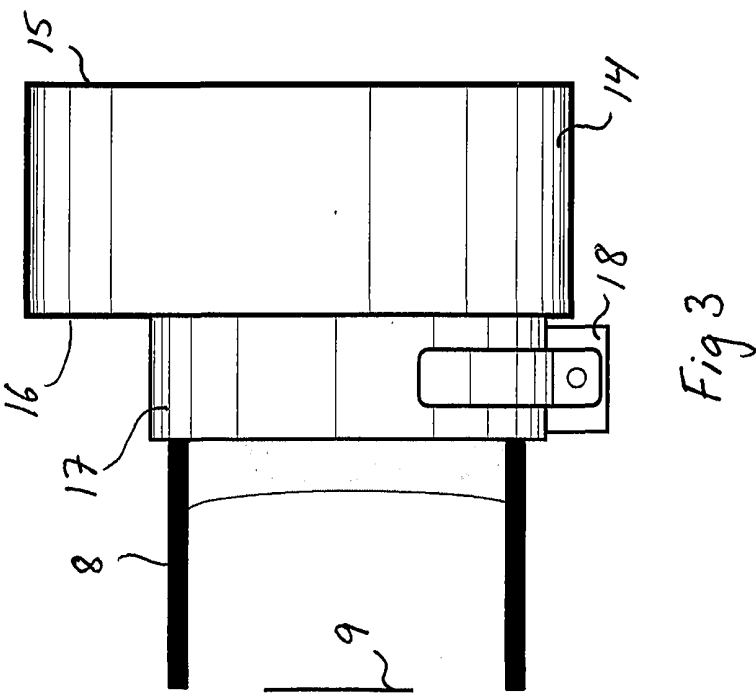
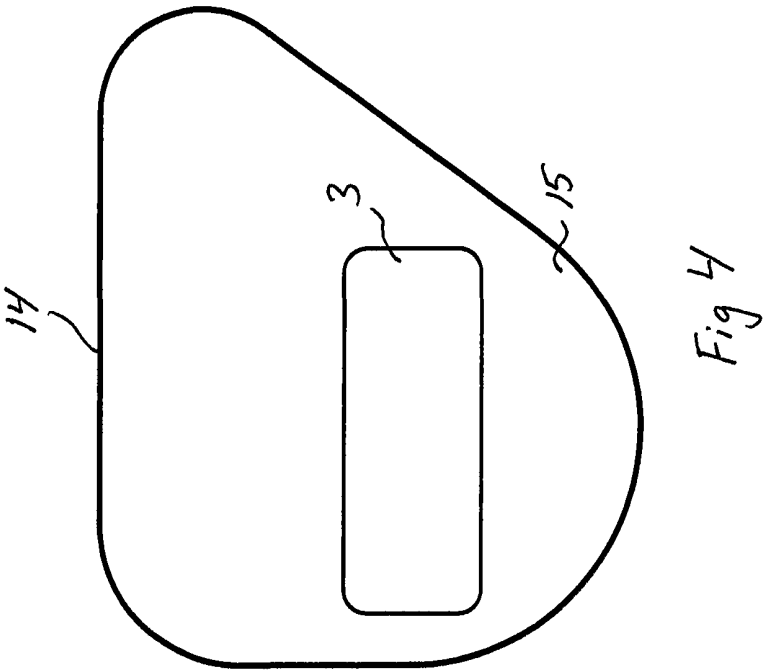
- 5
6. A device according to any of the preceding claims, **characterized** in that the beam splitter (6) comprises two joined pieces of glass (12, 13), a semi-transparent mirror coating (11) being arranged in joint between the pieces of glass.
- 10
7. A device according to any of the preceding claims, **characterized** in that the device comprises means (17, 18) for releasable attachment of the device in front of the exit aperture of a biocular sight.
- 15
8. Use of a device according to any of the preceding claims for tracer stream simulation at a biocular sight in a weapon system, such as a tank, the simulated tracer stream being intended to represent the tracer stream from a simulated projectile fired by means of a weapon unit of the weapon system.
- 20
9. A method for tracer stream simulation at a biocular sight, wherein an image comprising a simulated tracer stream from a projectile is generated in an image plane (2) located outside the field of view of a person looking into the sight, **characterized** in that the image comprising the simulated tracer stream by means of a beam splitter (6) is projected into one (10a) of the eyes of the person looking into the sight so that the field of view (4a) for this eye is made to comprise an image conveyed by the sight (8) with the image comprising the simulated tracer stream superposed, whereas no image comprising simulated tracer stream is projected into the other eye (10b) of the person looking into the sight so that the field of view (4b) for this other eye is made to comprise the image conveyed by the sight (8) with-
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out any image comprising simulated tracer stream superposed.

- 5 10. A method according to claim 9, characterized in that the image comprising the simulated tracer stream is generated by means of a cathode ray tube (5).
- 10 11. A method according to claim 9, characterized in that the image comprising the simulated tracer stream is generated by means of a LCD-display.
- 15 12. A device for tracer stream simulation at a biocular sight, which device comprises an aperture which, when the device is mounted to a biocular sight, is intended to be located in front of the exit aperture of the sight so that a person looking into the sight will view, via said aperture, an image conveyed by the sight, means for generation in an image plane of an image comprising a simulated tracer stream from a projectile, this image plane being located at the side of the aperture of the device, and a beam splitter which, when the device is mounted to a biocular sight, is arranged to project the image comprising the simulated tracer stream into one of the eyes of the person looking into the sight via the aperture of the device so that the field of view for this eye comprises an image conveyed by the sight with the image comprising the simulated tracer stream superposed, the device being so designed that the field of view for the other eye of the person looking into the sight via the aperture of the device comprises the image conveyed by the sight without any image comprising simulated tracer stream superposed.
- 20 25 30 35 13. A method for tracer stream simulation at a biocular sight, wherein an image comprising a simulated tracer stream from a projectile is generated in an image plane located outside the field of view of a person looking into the sight,

the image comprising the simulated tracer stream being projected by means of a beam splitter into one of the eyes of the person looking into the sight so that the field of view for this eye is made to comprise an image conveyed by the sight with the image comprising the simulated tracer stream superposed, whereas no image comprising simulated tracer stream is projected into the other eye of the person looking into the sight so that the field of view for this other eye is made to comprise the image conveyed by the sight without any image comprising simulated tracer stream superposed.





INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 01/02776

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: F41G 3/00, F41G 1/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: F41G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 4004077 C1 (MESSERSCHMITT-BÖLKOW-BLOHM GMBH), 6 June 1991 (06.06.91), figure 1, abstract --	1-13
A	EP 0718585 A1 (SWAROVSKI OPTIK KG), 19 December 1996 (19.12.96), figure 1, abstract --	1-13
A	US 3974585 A (DUNHAM), 17 August 1976 (17.08.76), figure 1, abstract -- -----	1-13

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Further documents are listed in the continuation of Box C.

☒

See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

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"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

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INTERNATIONAL SEARCH REPORT

Information on patent family members

28/01/02

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PCT/SE 01/02776

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
DE	4004077	C1	06/06/91	NONE	
EP	0718585	A1	19/12/96	AT 165152 T DE 59501905 D	15/05/98 00/00/00
US	3974585	A	17/08/76	NONE	