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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
02 June 2022 (02.06.2022)

WIPO | PCT

(10) International Publication Number
WO 2022/115091 A1

(51) International Patent Classification:
G02B 15/00 (2006.01) *G02B 17/00* (2006.01)

(21) International Application Number:
PCT/TR2021/051289

(22) International Filing Date:
25 November 2021 (25.11.2021)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2020/19076 26 November 2020 (26.11.2020) TR

(71) Applicant: **ROKETSAN ROKET SANAYİİ TİCARET A.Ş.** [TR/TR]; Kemalpaşa Mahallesi Şehit Yüzbaşi Adem Kutlu Sokak No:21, 06780 Elmadağ/Ankara (TR).

(72) Inventors: **KURŞUN, Bilgen Birkan**; Kemalpaşa Mahallesi Şehit Yüzbaşı Adem Kutlu Sokak No:21, 06780 Elmadağ/Ankara (TR). **SAKARYA, Doğan Uğur**; Kemalpaşa Mahallesi Şehit Yüzbaşı Adem Kutlu Sokak No:21, 06780 Elmadağ/Ankara (TR).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:
— *of inventorship (Rule 4.17(iv))*

Published:
— *with international search report (Art. 21(3))*
— *in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE*

(54) Title: MULTIPLE FIELD OF VIEW POINTS

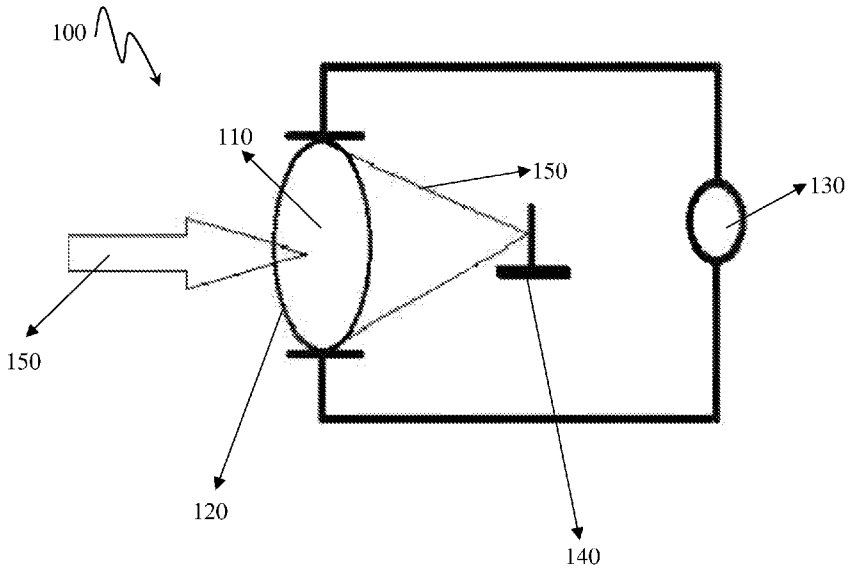

Figure -1

(57) Abstract: This invention relates to a system that enables obtaining multiple field of view points by applying different voltage differences with a single optic structure.

WO 2022/115091 A1

MULTIPLE FIELD OF VIEW POINTS

Technical field of invention

This invention relates to a system that enables obtaining multiple field of view points by applying different voltage differences with a single optic structure.

State of the art

Optical systems are used to create and record the images of objects or scenes. These systems generally work with variable magnification and provide more than one field of view. This allows the systems to obtain image data that can be continuous or divergent between narrow, medium and wide fields of view. Variable magnification can be obtained by moving one or more optical components throughout an imaging axis to change the field of view. Moving an intermediate lens throughout an imaging axis requires precision for the lens to be able to be aligned. Aligning the lens precisely takes a long time and causes shortage of time.

Application no "WO2007047769A2" in the state of the art was reviewed. The invention that is the subject to the application relates to apparatus and methods to obtain images particularly in more than one field of view. The invention has a compact, dispersed, multi-view optical system that has a flexible geometry and provides the selection of an appropriate rotational axis.

Application no "US20110188139A1" in the state of the art was reviewed. The invention that is the subject of the application relates to an optical system that has multiple fields of view to image an object and has a fully reflecting design. Optical system comprises having a number of different configurations for laser range finding and determining the components.

Application no "TR2020/08657" in the state of the art was reviewed. The invention that is the subject of the application is a multi-beam LIDAR optical system that comprises

multiple single-mode optic fibres configured to transmit and receive light-beams and multiple lenses configured to search and focus the light-beams between the multiple single-mode optic fibres and an inlet opening of the system; wherein, the system is configured to transmit and receive the light-beams over a 5° angular field of view.

In the methods in the prior art, a system that allows reducing the systems composed multiple optical structures to a single lens, reducing the number of moving parts to only a detector and forming multiple field of view configurations is not disclosed.

Conclusively, due to the above described problems and the insufficiency of the existing solutions made it necessary to make an improvement in the relevant technical field.

The Aims of the Invention

This invention relates to a system that enables obtaining multiple field of view points by applying different voltage differences with a single optic structure.

The most important aim of the invention is to provide a larger and smaller effective focal length with the mix the refractive index of which is changed.

Another important aim of the invention is to provide field of view point values in the intermediate values.

Another aim of the invention is to enable reducing the systems composed of multiple optical structures to a single lens.

Another aim of the invention is to ensure that the moving parts are eliminated or reduced only to the detector when required.

Another aim of the invention is to provide mountability and the ease to be positioned on the optical axis.

The structural and characteristic properties and all advantages of the invention will be more clearly understood with the figures given below and the detailed description

written with reference to these figures. Therefore, the assessment should also be made by taking these figures and the detailed description into account.

Description of Drawings

Figure-1; is the drawing providing the image of the multiple view point system that is the subject of the invention.

Figure-2; is the graphic providing the change in the refractive index of the water depending on the wavelength.

Figure-3; is the graphic providing the change in the refractive index of the NaCl depending on the wavelength.

Reference numbers

100. Multiple view point system
110. Mix
120. Container
130. Generator
140. Detector
150. Beam

Description of the Invention

This invention relates to a system that enables obtaining multiple field of view points by applying different voltage differences with a single optic structure. The multiple field of view point system (100) comprises the mix (110), container (120), generator (130), detector (140) and the beam (150)."

The mix (110) comprises a material at least one admixture of which can be ionised and has a different refractive index than the other admixtures in the mix (110). The mix (110) can be formed with all material combinations, all materials of which can be dissolved within one another and one material of which can be ionised. In one embodiment of the invention, the mixture (110) is formed with water and NaCl (sodium chloride) that can be ionised, both of which can be dissolved within each other. The mix (110) is prepared by selecting material in accordance with the wavelength

dependent refractive index of the beam (150) to be used. The container (120) contains the mix (110) in it and comprises being made of a material in a permeable structure depending on the wavelength of the beam (150) prepared by the mix (110). The container (120), comprises surfaces on its upper and lower ends enabling to apply voltage differences.

The generator (130) enables applying high voltage differences to the surfaces on the lower and upper ends of the container (120). The generator (130) ensures that the admixture that can be ionised moves away from the central parts of the mix (110) and is drawn to polars with voltage differences at the bottom and top of the container (120) by applying high voltage difference. By this way, obtaining a bigger effective focal length is ensured with the mix (110) the refractive index of which is changed. As a result, a system with a narrow field of view point is obtained. The generator (130) then removes the high voltage difference and enables the admixture to get mixed into the mix (110) again. By this way, a different refractive index is obtained and a smaller effective focal length is provided. As a result, an optical structure with wide field of view point is ensured. The generator (130) ensures obtaining also the field of view point values within the intermediate values by applying different mounts of voltage values such as narrow and wide view points.

The detector (140), in the case where the back focal length cannot be held in the same place, enables the detector (140) to be placed on an engine-driven structure and moved to the place where the new focal length is. The beam (150) ensures the generation of visible, near infra-red, middle infra-red or far infra-red wavelengths. Depending on the wavelength the beam (150) generates, material to be included into the mix (110) is chosen in accordance with the refractive index. The materials chosen for the mix (110) can be dissolved within one another and comprises an admixture that can be ionised.

With the multiple field of view point system (100), the system composed of multiple optical structure is reduced to one single lens. Also, it also ensures that the number of moving parts is reduced only to the detector (140), if required. With the multiple field of view point system (100), creating much more configurations than those three

configurations mentioned above will be possible. It also provides mountability and ease to be placed on the optical axis.

The beam (150) enters into the multiple field of view point system (100) shown in Figure 1 through the container (120) that contains the mix (110). The beam (150) entering into the multiple field of view point system (100) passes through the container (120) containing the mix (110) and reaches to the detector (140). Located in the body of the system, the detector (140), when the back focal length cannot be held in the same place in the current structure, is moved to where the new focal length is by being placed on an engine-driven structure, thereby changing the focal length of the beam (150). Meanwhile, the admixture that can be ionised is moved away from the central parts of the mix (110) and is drawn to polars with voltage differences at the bottom and top of the container (120) by applying high voltage difference. By this way, a bigger effective focal length is obtained with the mix (110) the refractive index of which is changed and thereby a system that has a narrow field of view point is obtained. The generator (130) then removes the high voltage difference and enables the admixture to get mixed into the fluid again, thereby obtaining an optical structure with a wide field of view point via a smaller effective focal length is ensured.

In Figures 2 and 3, the change in the refractive index of NaCl (sodium chloride) and of water, respectively, depending on the wavelength are shown. In an embodiment of the invention, said structure can be formed exemplarily with a mix (110) as a combination of NaCl and water in the visible region. The refractive indexes of NaCı and water are given on the figures. The refractive indexes of NaCı and water are different and NaCı can be ionised when voltage is applied.

CLAIMS

1. A multiple field of view points system (100) enabling obtaining images in more than one field of view points, comprising;
a mix (110) comprising a material at least one admixture of which can be ionised and has a different refractive index than the other admixtures in the mix (110),
a container (120) containing the mix (110) in it and comprising being made of a material in a permeable structure depending on the wavelength of the beam (150) prepared by the mix (110),
a generator (130) enabling applying high voltage differences to the surfaces on the lower and upper ends of the container (120),
a detector (140), in the case where the back focal length cannot be held in the same place, enabling the detector (140) to be placed on an engine-driven structure and moved to the place where the new focal length is,
a beam (150) ensuring the generation of visible, near infra-red, middle infra-red or far infra-red wavelengths.

2. Multiple field of view points system (100) according to Claim 1, comprising the mix (110) prepared by choosing a material in accordance with the wavelength dependent refractive index of the beam (150) to be used.

3. Multiple field of view points system (100) according to Claim 1, comprising at least one container (120) having surfaces on the lower and upper ends enabling the application of voltage difference.

4. Multiple field of view points system (100) according to Claim 1, comprising the generator (130) ensuring that the admixture that can be ionised moves away from the central parts of the mix (110) and is drawn to polars with voltage differences at the bottom and top of the container (120) by applying high voltage difference.

5. Multiple field of view points system (100) according to Claim 1, comprising the generator (130) that removes the high voltage difference and ensures a smaller

effective focal length by obtaining a different refractive index through enabling the admixture to get mixed into the mix (110) again.

6. Multiple field of view points system (100) according to Claim 1, comprising the generator that enables obtaining the view point values within the intermediate values by applying voltage values in different amounts.

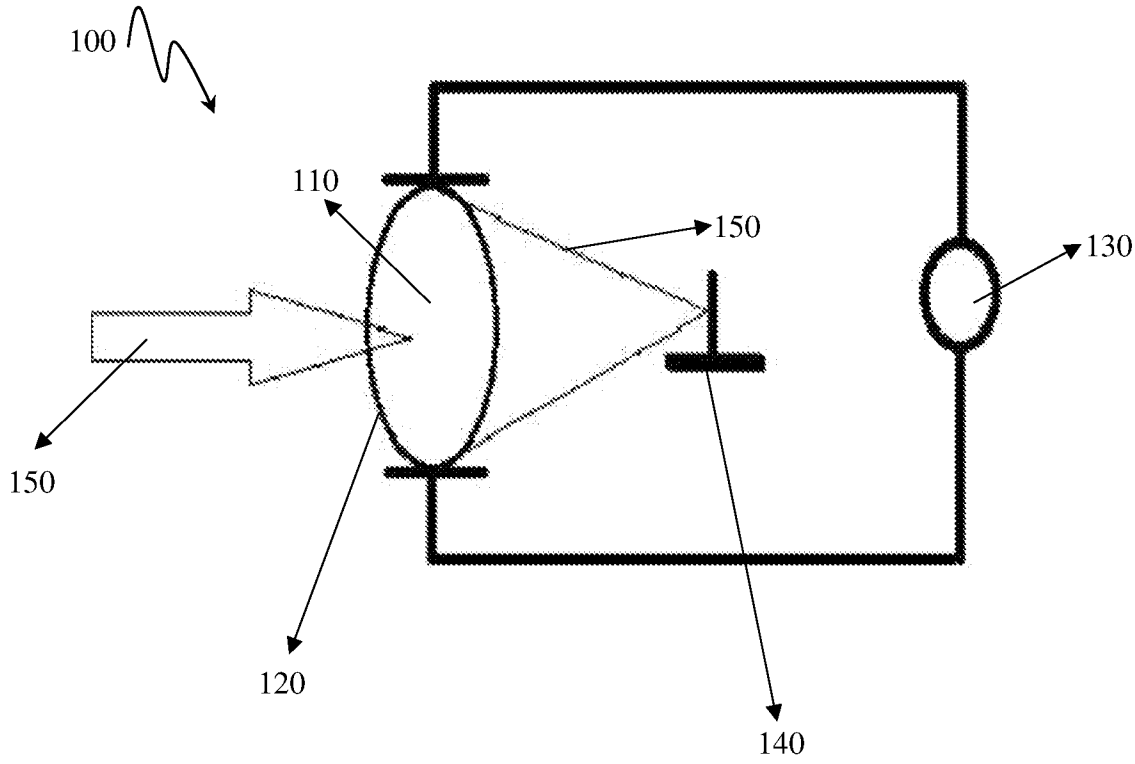

Figure -1

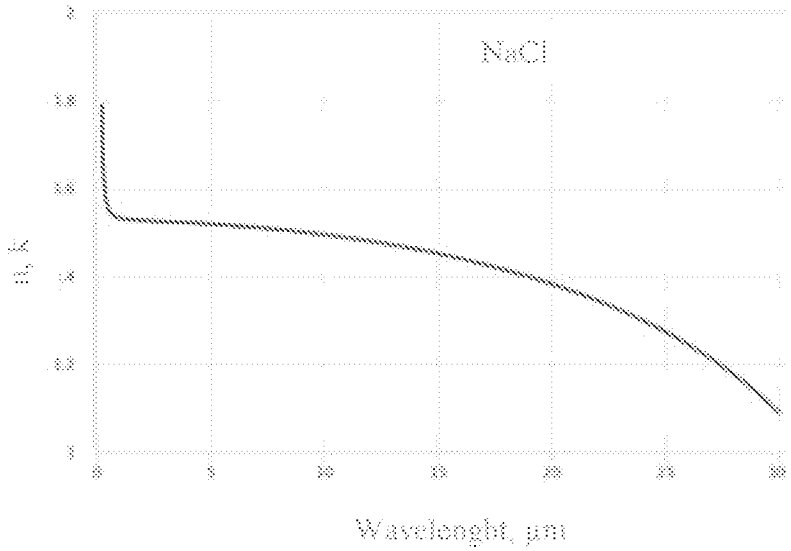

Figure -2

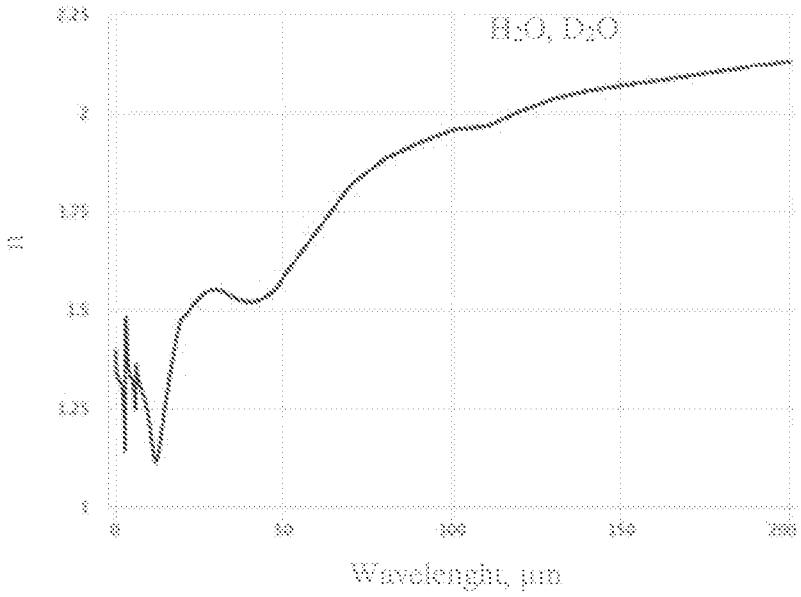

Figure -3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/TR2021/051289

A. CLASSIFICATION OF SUBJECT MATTER

G02B 15/00 (2006.01)i; G02B 17/00 (2006.01)i

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)

G02B 15/00; G02B 17/00

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

TURKPATENT database

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

EPODOC, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1946174 A2 (FLIR SYSTEMS [US]) 23 July 2008 (2008-07-23) The Whole Document	1-6
A	EP 2443502 A1 (CORNING INC [US]) 25 April 2012 (2012-04-25) The Whole Document	1-6
A	US 2006146399 A1 (RAYTHEON CO) 06 July 2006 (2006-07-06) The Whole Document	1-6

☐ 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

"D" document cited by the applicant in the international application

"E" earlier application or patent but published on or after the international filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or other means

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

"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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 February 2022	**25 February 2022**

Name and mailing address of the ISA/TR

Turkish Patent and Trademark Office (Turkpatent)
Hipodrom Caddesi No. 13
06560 Yenimahalle
Ankara
Turkey

Telephone No. **+903123031000**
Facsimile No. **+903123031220**

Authorized officer

SELAHATTİN YILDIRIM

Telephone No. **+903123691020**

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/TR2021/051289

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
EP 1946174 A2	23 July 2008	EP 1946174 A4	01 December 2010
		CA 2626024 A1	26 April 2007
		CA 2626024 C	11 September 2012
		IL 190809 D0	03 November 2008
		IL 190809 A	28 February 2013
		US 2007086087 A1	19 April 2007
		US 7471451 B2	30 December 2008
		WO 2007047769 A2	26 April 2007
		WO 2007047769 A3	07 June 2007
EP 2443502 A1	25 April 2012	CN 102460267 A	16 May 2012
		CN 102460267 B	15 October 2014
		IL 216998 D0	29 February 2012
		JP 2012530940 A	06 December 2012
		KR 20120039653 A	25 April 2012
		KR 101649774 B1	19 August 2016
		US 2010321808 A1	23 December 2010
		US 7952799 B2	31 May 2011
		US 2011188139 A1	04 August 2011
		US 8184368 B2	22 May 2012
		WO 2010148272 A1	23 December 2010
US 2006146399 A1	06 July 2006	US 7099077 B2	29 August 2006
		DE 602005006085 D1	29 May 2008
		DE 602005006085 T2	18 June 2009
		EP 1679538 A1	12 July 2006
		EP 1679538 B1	16 April 2008