

## PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

**PCT**

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

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Date of mailing  
(day/month/year) **22 MAY 2020**

Applicant's or agent's file reference  
MLEAP-235WO

**FOR FURTHER ACTION**

See paragraph 2 below

International application No.

PCT/US20/15735

International filing date (day/month/year)

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

IPC - G02B 6/00, 6/24, 6/26, 6/10, 27/01, 27/0101, 27/00; G02F 1/00, 1/1343, 1/1333, 1/133; (2020.01)

CPC - G02B 6/00, 6/24, 6/26, 6/10, 27/0172, 27/017, 27/01, 27/0101, 27/00; G02F 1/00, 1/134309, 1/1343, 1/1333, 1/133, 1/13, 1/01; G06T 19/006, 19/00, 15/00

Applicant

MAGIC LEAP, INC.

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US  
Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450, Alexandria, Virginia 22313-1450  
Facsimile No. 571-273-8300

Date of completion of this opinion

05 May 2020 (05.05.2020)

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## Box No. I Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of:
- the international application in the language in which it was filed.
  - a translation of the international application into \_\_\_\_\_ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2.  This opinion has been established taking into account the rectification of an obvious mistake authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(b)).
3.  With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this opinion has been established on the basis of a sequence listing:
- a.  forming part of the international application as filed:
    - in the form of an Annex C/ST.25 text file.
    - on paper or in the form of an image file.
  - b.  furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
  - c.  furnished subsequent to the international filing date for the purposes of international search only:
    - in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
    - on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4.  In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

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## Box No. IV Lack of unity of invention

1.  In response to the invitation (Form PCT/ISA/206) to pay additional fees the applicant has, within the applicable time limit:
- paid additional fees.
- paid additional fees under protest and, where applicable, the protest fee.
- paid additional fees under protest but the applicable protest fee was not paid.
- not paid additional fees.

2.  This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is

- complied with.
- not complied with for the following reasons:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fee must be paid.

Group I: Claims 1-15 are directed towards a display system comprising: a first absorptive optical filter.

Group II: Claims 16-33 are directed towards a display system comprising: a second waveguide structure and laterally displacing a second in-coupling optical element.

The inventions listed as Groups I-II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical features of Group I are at least a first absorptive optical filter transmissive to light of a first range of wavelengths and absorptive to light of wavelengths different from the first range of wavelengths; and a first in-coupling optical element configured to receive light transmitted through the first absorptive optical filter, which are not present in Group II.

The special technical features of Group II are at least a second waveguide assembly comprising: a second waveguide having a first major surface and a second major surface; and a second in-coupling optical element configured to receive a second incoming beam of light; wherein the second in-coupling optical element is configured to in-couple into the second waveguide light, from the second incoming beam of light, having a second wavelength range, wherein the first in-coupling optical element and the second in-coupling optical element are laterally displaced relative to one another by 5- 50% of a shortest width of the first and second in-coupling optical elements, as seen in a top-down view, which are not present in Group I.

The common technical features of Groups I and II are a display system comprising: a stack of waveguides comprising: a first in-coupling optical element configured to receive light; a first waveguide having a first major surface and a second major surface, wherein the first in-coupling optical element is configured to in-couple light of the first range of wavelengths into the first waveguide, which are previously disclosed by US 2018/0275350 A1 to MAGIC LEAP, INC (hereinafter "MAGICLEAP").

MAGIC LEAP discloses a display system comprising: a stack of waveguides comprising: a first in-coupling optical element configured to receive light; a first waveguide having a first major surface and a second major surface, wherein the first in-coupling optical element is configured to in-couple light of the first range of wavelengths into the first waveguide.

Since the common technical features are previously disclosed by the MAGIC LEAP reference, these common features are not special and so Groups I-II lack unity.

4. Consequently, this opinion has been established in respect of the following parts of the international application:

- all parts.
- the parts relating to claims Nos. 1-15

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**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**

## 1. Statement

Novelty (N)	Claims	4, 12, 14, 15	YES
	Claims	1-3, 5-11, 13	NO
Inventive step (IS)	Claims	NONE	YES
	Claims	1-15	NO
Industrial applicability (IA)	Claims	1-15	YES
	Claims	NONE	NO

## 2. Citations and explanations:

Claims 1-3 and 5 lack novelty under PCT Article 33(2) as being anticipated by a first embodiment of US 2018/0275350 A1 to MAGIC LEAP, INC (hereinafter "MAGICLEAP").

As per claim 1, the first embodiment of MAGICLEAP discloses a display system (display device 1700A-1700C; figure 18C; paragraph [0174]) comprising: a stack of waveguides (multiple waveguides 1700A-1700C are shown in a stack formation in figure 18C; paragraph [0174]) comprising: a first absorptive optical filter transmissive to light of a first range of wavelengths and absorptive to light of wavelengths different from the first range of wavelengths (CLCG 1750A contains components (first absorptive optical filter) which transmit a wavelength range which includes  $\lambda_2$  (a first range of wavelengths), and is absorptive to a different wavelength range  $\lambda_3$  as shown in figure 18C; paragraph [0174]); a first in-coupling optical element configured to receive light transmitted through the first absorptive optical filter (optical waveguide device 1700B (a first in-coupling optical element) receives light from CLCG 1750A as shown in figure 18B and 18C; paragraph [0174]); and a first waveguide having a first major surface and a second major surface (waveguide 1704C (a first waveguide) has a wide top surface (first major surface) and a wide bottom surface (second major surface) as shown in figure 18C; paragraph [0174]), wherein the first in-coupling optical element is configured to in-couple light of the first range of wavelengths into the first waveguide (optical waveguide device 1700B connects light of wavelength  $\lambda_1$  into waveguide 1704C; figure 18C; paragraph [0174]).

As per claim 2, the first embodiment of MAGICLEAP discloses the display system of claim 1. MAGICLEAP further discloses wherein the first in-coupling optical element is on the first major surface of the first waveguide or the second major surface of the first waveguide (optical waveguide device 1700B is on top (on the first major surface) of waveguide 1704C as shown in figure 18C; paragraph [0174]).

As per claim 3, the first embodiment of MAGICLEAP discloses the display system of claim 1. MAGICLEAP further discloses further comprising a second absorptive optical filter on one or both of the first or second major surfaces of the first waveguide (CLCG 1750C, which contains absorptive components (second absorptive optical filter), is shown on the bottom (second major surface) of waveguide 1704C as shown in figure 18C; paragraph [0174]), wherein, as seen in a top-down view, the first absorptive optical filter is laterally displaced from the second absorptive optical filter (the absorptive components of CLCG 1750C and CLCG 1750A are not laterally aligned (laterally displaced) as shown in figure 18C; paragraph [0174]).

As per claim 5, the first embodiment of MAGICLEAP discloses the display system of claim 1. MAGICLEAP further discloses wherein the first in-coupling optical element is configured to transmit light having a range of wavelengths different from the first range of wavelengths (optical waveguide device 1700B transmits light of wavelengths  $\lambda_1$ , which is different than  $\lambda_2$ , as shown in figure 18C; paragraph [0174]).

Claims 1, 6-11, and 13 lacks novelty under PCT Article 33(2) as being anticipated by an alternative embodiment of MAGICLEAP.

As per claim 1, the alternative embodiment of MAGICLEAP discloses a display system (display device 1400B; paragraph [0132]) comprising: a stack of waveguides (multiple waveguides are shown in a stack formation in figure 14B; paragraph [0132]) comprising: a first absorptive optical filter transmissive to light of a first range of wavelengths and absorptive to light of wavelengths different from the first range of wavelengths (diffraction grating 1008 (first absorptive optical filter) transmits a wavelength range which includes  $\lambda_2$  (a first range of wavelengths), and diffracts (absorptive to) a different wavelength range  $\lambda_1$  as shown in figure 14B; paragraph [0132]); a first in-coupling optical element configured to receive light transmitted through the first absorptive optical filter (waveguide 1204 and diffraction grating 1208 form a single waveguide device 2 (a first in-coupling optical element) which receives light from diffraction grating 1008 as shown in figure 14B; paragraph [0132]); and a first waveguide having a first major surface and a second major surface (waveguide 1304 (a first waveguide) has a wide top surface (first major surface) and a wide bottom surface (second major surface) as shown in figure 14B; paragraph [0132]), wherein the first in-coupling optical element is configured to in-couple light of the first range of wavelengths into the first waveguide (waveguide device 2 connects light of wavelength  $\lambda_3$  into waveguide 1304; figure 14B; paragraph [0132]).

\*\*\*-Continued Within the Next Supplemental Box-\*\*\*

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**Box No. VII Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:

Claims 3-8, 10, 11, and 14 are objected to under PCT Rule 66.2(a)(iii) as containing the following defects in the form or contents thereof:

Claims 3-8, 10, 11, 14 contain the phrasing "the display system of any of claims" but only specify a single claim of which they depend upon. These claims have been corrected to "the display system of claim".

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**Box No. VIII Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claims 8 and 12 are objected to under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because these claims are indefinite for the following reasons:

In lines 4-5 of claim 8, "the incoming beam of light" lacks antecedent basis. For the purposes of this written opinion, as best understood, "the incoming beam of light" has been interpreted to "an incoming beam of light" to restore antecedent basis.

In line 1 of claim 12, "the third optical filter" lacks antecedent basis. For the purposes of this written opinion, as best understood, "the third optical filter" has been interpreted to "a third optical filter" to restore antecedent basis.

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**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

-\*\*\*-Continued from Box V: Citations and Explanations-\*\*\*-

As per claim 6, the alternative embodiment of MAGICLEAP discloses the display system of claim 1. MAGICLEAP further discloses wherein the stack of waveguides further comprises: a second waveguide having a first major surface and a second major surface (waveguide 1404 (second waveguide) has a wide top surface (first major surface) and wide bottom surface (second major surface); figure 14B; paragraph [0132]); a second in-coupling optical element configured to in-couple light, transmitted through the first absorptive optical filter and the first in-coupling optical element and having a second range of wavelengths different from the first range of wavelengths, into the second waveguide (diffraction grating 1308 (second in-coupling optical element) transmits light from diffraction grating 1008 and waveguide device 2 into waveguide 1404 with a wavelength  $\lambda_3$  (second range of wavelengths) which is different than  $\lambda_2$ ; figure 14B; paragraphs [0132], [0135], [0137]).

As per claim 7, the alternative embodiment of MAGICLEAP discloses the display system of claim 6. MAGICLEAP further discloses wherein at least a portion of the first in-coupling optical element and at least a portion of the second in-coupling optical element laterally overlap with each other, as seen in a top down view (diffraction grating 1008 overlaps laterally with diffraction grating 1308 from a top-down view as shown in figure 14B; paragraph [0132]).

As per claim 8, the alternative embodiment of MAGICLEAP discloses the display system of claim 6. MAGICLEAP further discloses further comprising: a third waveguide rearward of the first waveguide, the third waveguide having a first major surface and a second major surface (waveguide device 2 contains waveguide 1204 (third waveguide) which is shown rearward of waveguide 1304 in figure 14B; paragraph [0132]); and a third in-coupling optical element configured to in-couple light, from an incoming beam of light, having a third wavelength range into the third waveguide (diffraction grating 1008 and waveguide 1004 form a single waveguide device 1 (third in-coupling optical element) which transmits an incoming beam of light of wavelength  $\lambda_1$  (third wavelength range); figure 14B; paragraph [0132]).

As per claim 9, the alternative embodiment of MAGICLEAP discloses the display system of claim 8. MAGICLEAP further discloses wherein the third in-coupling optical element is on one of the first major surface of the third waveguide or the second major surface of the third waveguide (waveguide device 1 is on the top of waveguide 1204 as shown in figure 14B; paragraph [0132]).

As per claim 10, the alternative embodiment of MAGICLEAP discloses the display system of claim 8. MAGICLEAP further discloses wherein at least a portion of the third in-coupling optical element laterally overlaps with the first in-coupling optical element and the second in-coupling optical element (waveguide device 1 overlaps with waveguide device 2 and diffraction grating 1308 as shown in figure 14B; paragraph [0132]).

As per claim 11, the alternative embodiment of MAGICLEAP discloses the display system of claim 8. MAGICLEAP further discloses further comprising a fourth absorptive optical filter forward of the third in-coupling optical element and between the second waveguide and the third waveguide (diffraction grating 1208 (fourth absorptive optical filter) absorbs light and is positioned forward of the waveguide device 1 and is positioned between waveguide 1404 and waveguide 1204 as shown in figure 14B; paragraph [0132]).

As per claim 13, the alternative embodiment of MAGICLEAP discloses the display system of claim 6. MAGICLEAP further discloses wherein the second in-coupling optical element is on the first major surface of the second waveguide or the second major surface of the second waveguide (diffraction grating 1308 is on top (on the first major surface) of waveguide 1404 as shown in figure 14B; paragraph [0132]).

Claim 14 lacks an inventive step under PCT Article 33(3) as being obvious over the alternative embodiment of MAGICLEAP in view of the first embodiment of MAGICLEAP.

As per claim 14, the alternative embodiment of MAGICLEAP discloses the display system of claim 13. In the alternative embodiment, MAGICLEAP further discloses wherein the second waveguide is forward of the first waveguide (waveguide 1404 is forward of waveguide 1304 as shown in figure 14B; paragraph [0132]), further comprising: a third absorptive optical filter on a major surface of the second waveguide (diffraction grating 1408 (third absorptive optical filter) absorbs light and is on the bottom of waveguide 1404 as shown in figure 14B; paragraph [0132]). In the alternative embodiment, MAGICLEAP does not disclose an optical filter laterally displaced from the second in-coupling optical element, the optical filter configured to absorb in-coupled light having a wavelength different from the second range of wavelengths. In the first embodiment, MAGICLEAP discloses an optical filter laterally displaced from the second in-coupling optical element (CLCG 1750C contains absorptive components (optical filter) and CLCG 1750A contains absorptive components (second in-coupling optical element), the components being not laterally aligned (laterally displaced) as shown in figure 18C; paragraph [0174]), the optical filter configured to absorb in-coupled light having a wavelength different from the second range of wavelengths (CLCG 1750C contains absorptive components which absorb wavelength  $\lambda_1$  which is different than wavelength  $\lambda_2$  (a wavelength different from the second range of wavelengths); figure 18C; paragraph [0174]). It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the optical filter of a first embodiment of MAGICLEAP to include an optical filter laterally displaced from the second in-coupling optical element, the optical filter configured to absorb in-coupled light having a wavelength different from the second range of wavelengths, as taught by a second embodiment of MAGICLEAP, in order to gain the advantages of varying the ways which light reaches the eye through a display to hide image rigidity and create fluidity, and absorb different wavelengths to modify how an image is projected in a virtual reality display as to create the perception of distant or closer objects, or create color filters of an environment to search for color specific features.

-\*\*\*-Continued Within the Next Supplemental Box-\*\*\*-

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## Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

-\*\*\*-Continued from Previous Supplemental Box-\*\*\*-

Claim 4 lacks an inventive step under PCT Article 33(3) as being obvious over the first embodiment of MAGICLEAP in view of EP 0 063 447 A1 to MINNESOTA MINING AND MANUFACTURING COMPANY (hereinafter "MINNESOTA").

As per claim 4, the first embodiment of MAGICLEAP discloses the display system of claim 1. The first embodiment of MAGICLEAP further discloses the first absorptive optical filter (CLCG 1750A; figure 18C; paragraph [0159]). The first embodiment of MAGICLEAP does not disclose wherein an optical filter comprises a dye. MINNESOTA discloses wherein an optical filter comprises a dye (a pleochroic dye is added to a cholesteric liquid crystal for light absorbing; paragraph [0023]). It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the optical filter of the first embodiment of MAGICLEAP to include wherein an optical filter comprises a dye, as taught by MINNESOTA, in order to gain the advantages of blocking, absorbing, or transmitting light of a specific color with a material that is well known, easily produced, and well-studied.

Claims 12 and 15 lack an inventive step under PCT Article 33(3) as being obvious over the alternative embodiment of MAGICLEAP in view of MINNESOTA.

As per claim 12, the alternative embodiment of MAGICLEAP discloses the display system of claim 11. In the alternative embodiment, MAGICLEAP further discloses a third optical filter (the display device 1400B contains diffraction grating 1408 (third optical filter); figure 14B; paragraph [0132]). The alternative embodiment of MAGICLEAP does not disclose wherein an optical filter comprises a dye. MINNESOTA discloses wherein an optical filter comprises a dye (a pleochroic dye is added to a cholesteric liquid crystal for light absorbing; paragraph [0023]). It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the optical filter of a first embodiment of MAGICLEAP to include wherein the third optical filter comprises a dye, as taught by MINNESOTA, in order to gain the advantages of blocking, absorbing, or transmitting light of a specific color with a material that is well known, easily produced, and well-studied.

As per claim 15, the alternative embodiment of MAGICLEAP discloses the display system of claim 14. In the alternative embodiment, MAGICLEAP further discloses the third absorptive optical filter (the display device 1400B contains diffraction grating 1408 (third optical filter); figure 14B; paragraph [0132]). The alternative embodiment of MAGICLEAP does not disclose wherein an optical filter comprises a dye. MINNESOTA discloses wherein an optical filter comprises a dye (a pleochroic dye is added to a cholesteric liquid crystal for light absorbing; paragraph [0023]). It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the optical filter of the alternative embodiment of MAGICLEAP to include wherein the third optical filter comprises a dye, as taught by MINNESOTA, in order to gain the advantages of blocking, absorbing, or transmitting light of a specific color with a material that is well known, easily produced, and well-studied.

Claims 1-15 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.