

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Cimbria Srl,

Petitioner

v.

3U Vision SRL,

Patent Owner

Patent 11,666,947

Post Grant Review No.

PGR2024- 00018

Prosecution History of US Patent 11,666,947

Exhibit 1015



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE

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APPLICATION NO.	ISSUE DATE	PATENT NO.
17/505,866	06-JUN-23	11666947

Avi Avraham Jencmen

17 Yizhak Rabin St

Modiin, 7174906

EGRANT NOTIFICATION

Your electronic patent grant (eGrant) is now available, which can be accessed via Patent Center at <https://patentcenter.uspto.gov>

The electronic patent grant is the official patent grant under 35 U.S.C. 153. For more information, please visit <https://www.uspto.gov/electronicgrants>



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/505,866	06/06/2023	11666947	SHJ943-US	7769

150161 7590 05/17/2023
Avi Avraham Jencmen
17 Yizhak Rabin St
Modiin, 7174906
ISRAEL

ISSUE NOTIFICATION

The projected patent number and issue date are specified above. The patent will issue electronically. The electronically issued patent is the official patent grant pursuant to 35 U.S.C. § 153. The patent may be accessed on or after the issue date through Patent Center at <https://patentcenter.uspto.gov/>. The patent will be available in both the public and the private sides of Patent Center. Further assistance in electronically accessing the patent, or about Patent Center, is available by calling the Patent Electronic Business Center at 1-888-217-9197.

The USPTO is implementing electronic patent issuance with a transition period, during which period the USPTO will mail a ceremonial paper copy of the electronic patent grant to the correspondence address of record. Additional copies of the patent (i.e., certified and presentation copies) may be ordered for a fee from the USPTO's Certified Copy Center at <https://certifiedcopycenter.uspto.gov/index.html>. The Certified Copy Center may be reached at (800)972-6382.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Patents Stakeholder Experience (OPSE), Stakeholder Support Division (SSD) at (571)-272-4200.

INVENTOR(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional inventors):

Andrea UZZO, Imola (BO), ITALY;

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

3U VISION SRL, Imola (BO), ITALY;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

150161 7590 01/27/2023
Avi Avraham Jencmen
17 Yizhak Rabin St
Modiin, 7174906
ISRAEL

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

	(Typed or printed name)
	(Signature)
	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/505,866	10/20/2021	Andrea UZZO	SHJ943-US	7769

TITLE OF INVENTION: SELECTOR MACHINE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$480	\$0.00	\$0.00	\$480	04/27/2023

EXAMINER	ART UNIT	CLASS-SUBCLASS
RODRIGUEZ, JOSEPH C	3653	209-587000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

1 _____

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY AND STATE OR COUNTRY)

3U VISION SRL

Imola (BO), ITALY

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Avi Avraham Jencmen/

Date 2023-04-24

Typed or printed name Avi Avraham Jencmen

Registration No. 76188



UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
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ELECTRONIC PAYMENT RECEIPT

APPLICATION #
17/505,866

RECEIPT DATE / TIME
04/23/2023 11:37:29 PM ET

ATTORNEY DOCKET #
SHJ943-US

Title of Invention

SELECTOR MACHINE

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 7769

FILED BY Avi Jencmen

PATENT CENTER # 61968038

AUTHORIZED BY -

CUSTOMER # 150161

FILING DATE 10/20/2021

CORRESPONDENCE
ADDRESS -

FIRST NAMED
INVENTOR Andrea UZZO

Payment Information

PAYMENT METHOD
CARD / 1787

PAYMENT TRANSACTION ID
E20234MN39165205

PAYMENT AUTHORIZED BY
Avi Jencmen

FEE CODE	DESCRIPTION	ITEM PRICE(\$)	QUANTITY	ITEM TOTAL(\$)
2501	UTILITY ISSUE FEE	480.00	1	480.00
TOTAL AMOUNT:				\$480.00

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage

submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
17/505,866

RECEIPT DATE / TIME
04/23/2023 11:37:29 PM ET

ATTORNEY DOCKET #
SHJ943-US

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CONFIRMATION # 7769

FILED BY Avi Jencmen

PATENT CENTER # 61968038

FILING DATE 10/20/2021

CUSTOMER # 150161

FIRST NAMED INVENTOR
Andrea UZZO

CORRESPONDENCE ADDRESS -

AUTHORIZED BY -

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
SHJ943-US_Issue Fee.pdf	1	Issue Fee Payment (PTO-85B)	133 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
SHJ943-US_Issue Fee.pdf	29B910806B68B24CC57077AF531F53559104D3989F0CF1430F F1A43C080B8B7CBD257880A26167BF8D29F55D4E1307F06B7 C3D3A864AA5FF39DC5957975ACFEE

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as

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New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/505,866	10/20/2021	Andrea UZZO	SHJ943-US	7769
150161	7590	04/11/2023		
Avi Avraham Jencmen 17 Yizhak Rabin St Modiin, 7174906 ISRAEL			EXAMINER RODRIGUEZ, JOSEPH C	
			ART UNIT	PAPER NUMBER
			3653	
			NOTIFICATION DATE	DELIVERY MODE
			04/11/2023	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

office@il-ip.com

Corrected Notice of Allowability	Application No. 17/505,866	Applicant(s) UZZO, Andrea	
	Examiner JOSEPH C RODRIGUEZ	Art Unit 3653	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to IDS, 3/23/2023.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-15. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☒ All b) ☐ Some* c) ☐ None of the:

1. ☒ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892) 2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____ 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____ 4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____	5. ☐ Examiner's Amendment/Comment 6. ☐ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____
---	--

/JOSEPH C RODRIGUEZ/ Primary Examiner, Art Unit 3653	
---	--

Doc code: IDS

PTO/SB/08a (01-10)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 07/31/2012. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number 17505866

Filing Date 2021-10-20

First Named Inventor Andrea UZZO

Art Unit 3653

Examiner Name JOSEPH C RODRIGUEZ

Attorney Docket Number SHJ943-US

U.S.PATENTS

Remove

Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	10288594	B2	2019-05-14	BLANC	
	2	4558786	A	1985-12-17	LANE	

If you wish to add additional U.S. Patent citation information please click the Add button.

Add

U.S.PATENT APPLICATION PUBLICATIONS

Remove

Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	20110002536	A1	2011-01-06	Thomasson et al.	

If you wish to add additional U.S. Published Application citation information please click the Add button.

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FOREIGN PATENT DOCUMENTS

Remove

Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²ⁱ	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	2578180	GB	A	2020-04-22	Hensoldt Optronics GmbH		
	2	2992973	EP	A1	2016-03-09	The Boeing Company		

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)

Application Number	17505866
Filing Date	2021-10-20
First Named Inventor	Andrea UZZO
Art Unit	3653
Examiner Name	JOSEPH C RODRIGUEZ
Attorney Docket Number	SHJ943-US

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1	PhD thesis of Riccardo Gasbarrone; INNOVATIVE TECHNIQUES AND APPLICATIONS SENSORS FOR THE CHARACTERIZATION OF RAW MATERIAL; PhD in Electrical, Materials and Nanotechnology Engineering Materials and Raw Materials Engineering ; D Ing. Riccardo Gasbarrone; Prof. Giuseppe Bonifazi; 02/25/2020	
	2	Youtube: https://www.youtube.com/watch?v=T-hWEhDqVMU ; Cimbria - SEA TRUE - The true full-colors sorters; May 26, 2018; Cimbria S.r.l.	
	3	Youtube: https://www.youtube.com/watch?v=1kw5ECULbs8 ; Cimbria SEA CHROME Electronic Sorting - advanced vision-based electronic sorter; Aug 28, 2014; Cimbria	

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/JOSEPH C RODRIGUEZ/	Date Considered	04/04/2023
--------------------	----------------------	-----------------	------------

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	17505866
Filing Date	2021-10-20
First Named Inventor	Andrea UZZO
Art Unit	3653
Examiner Name	JOSEPH C RODRIGUEZ
Attorney Docket Number	SHJ943-US

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Avi Avraham Jencmen/	Date (YYYY-MM-DD)	2023-03-23
Name/Print	Avi Avraham Jencmen	Registration Number	76188

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	17505866
	Filing Date	2021-10-20
	First Named Inventor	Andrea UZZO
	Art Unit	3653
	Examiner Name	JOSEPH C RODRIGUEZ
	Attorney Docket Number	SHJ943-US

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	2	2992973	EP	A1	2016-03-09	The Boeing Company		

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	17505866
Filing Date	2021-10-20
First Named Inventor	Andrea UZZO
Art Unit	3653
Examiner Name	JOSEPH C RODRIGUEZ
Attorney Docket Number	SHJ943-US

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	1	PhD thesis of Riccardo Gasbarrone; INNOVATIVE TECHNIQUES AND APPLICATIONS SENSORS FOR THE CHARACTERIZATION OF RAW MATERIAL; PhD in Electrical, Materials and Nanotechnology Engineering Materials and Raw Materials Engineering ; D Ing. Riccardo Gasbarrone; Prof. Giuseppe Bonifazi; 02/25/2020	
	2	Youtube: https://www.youtube.com/watch?v=T-hWEhDqVMU ; CIMBRIA - SEA TRUE - The true full-colors sorters; May 26, 2018; CIMBRIA S.r.l.	
	3	Youtube: https://www.youtube.com/watch?v=1kw5ECULbs8 ; CIMBRIA SEA CHROME Electronic Sorting - advanced vision-based electronic sorter; Aug 28, 2014; Cimbria	

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H04N 5/335 (2011.01)

(56) Documents Cited:
EP 2557414 A2 **WO 2018/119209 A1**
CN 105357487 A **US 20160077253 A1**
US 20140110585 A1 **US 20120154792 A1**
US 20120062740 A1

(58) Field of Search:
INT CL **G01J, G01N, G06T, H04N**
Other: **WPI, EPODOC, Patent Fulltext**

(54) Title of the Invention: **Camera system**
Abstract Title: **Shortwave infrared camera system comprising at least two different spectral filters**

(57) A camera system 1 comprises at least one infrared detector device 2 sensitive to electromagnetic radiation in the shortwave infrared range from approximately 900 nm to approximately 1700 nm and including a plurality of sensor elements arranged next to one another in rows and columns for capturing individual spatial picture elements. The system also comprises at least one optical unit 3 that images electromagnetic radiation incident on the camera system onto the at least one infrared detector device, and at least two different spectral filters 4x, 4y, 4z, 4w disposed or disposable upstream of the at least one infrared detector device and that are each light transmissive in different shortwave infrared spectral regions. A control and processing device 5 captures a picture of at least approximately the same scene using the at least one infrared detector device with the at least two different spectral filters (4x, 4y, 4z, 4w) so that picture signals of the recorded scene are produced in the different shortwave infrared spectral regions, wherein each spatial picture element captured by the at least one infrared detector device is provided with spectral information items corresponding to the at least two different upstream spectral filters (4x, 4y, 4z, 4w).

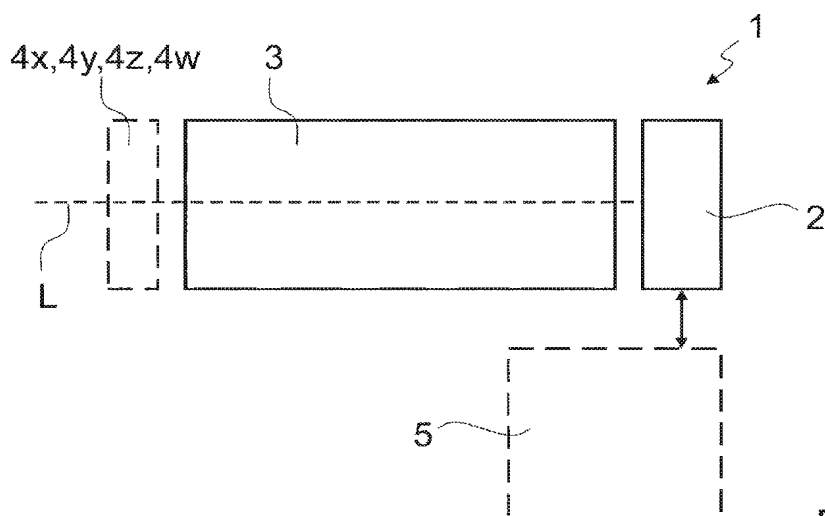


Fig. 1

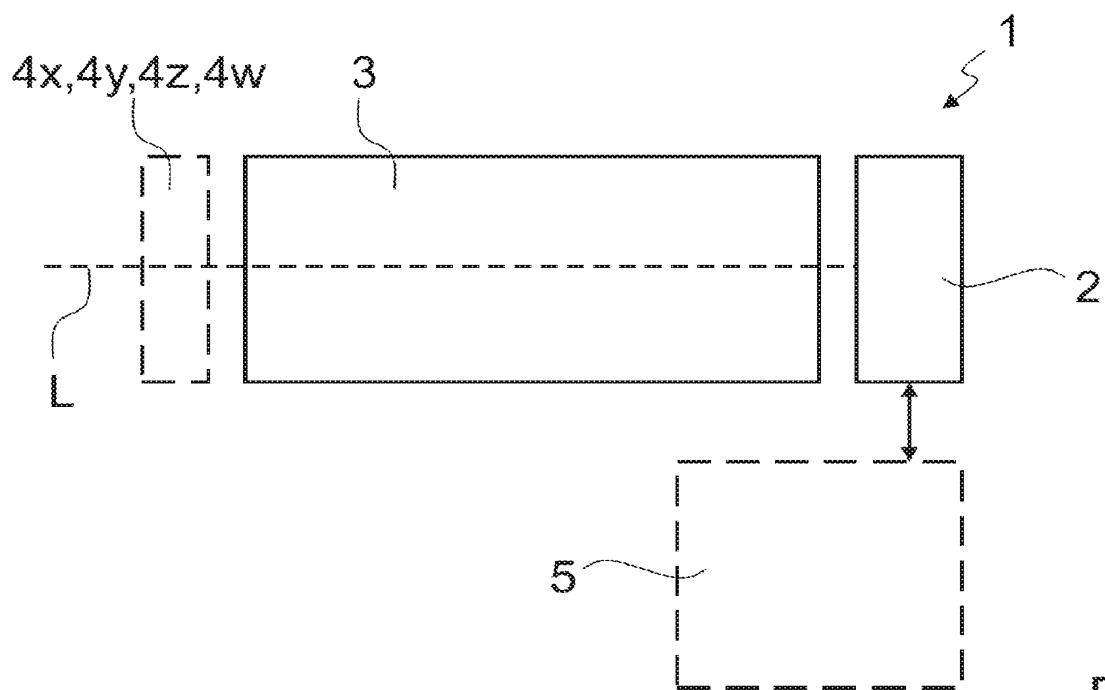


Fig. 1

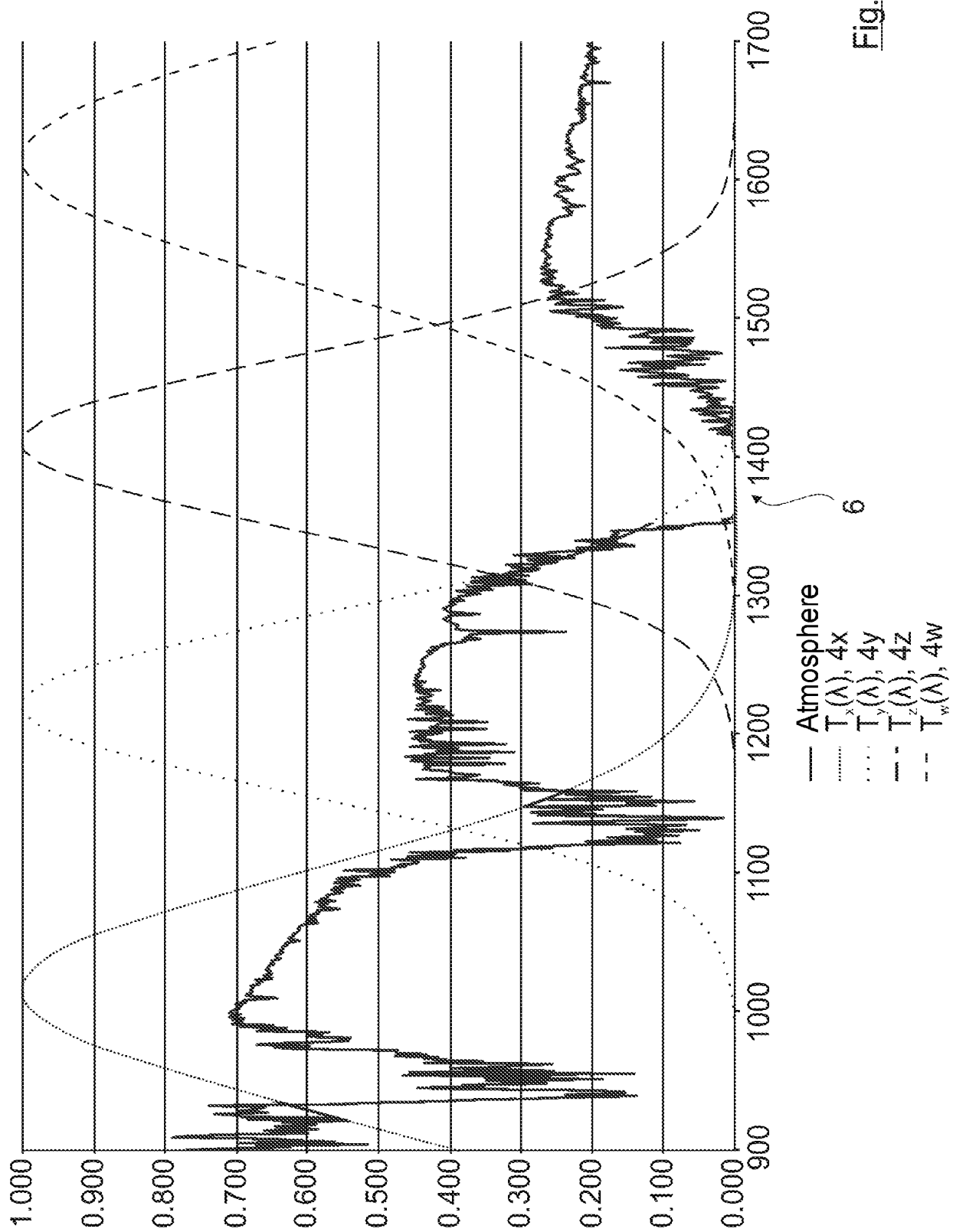
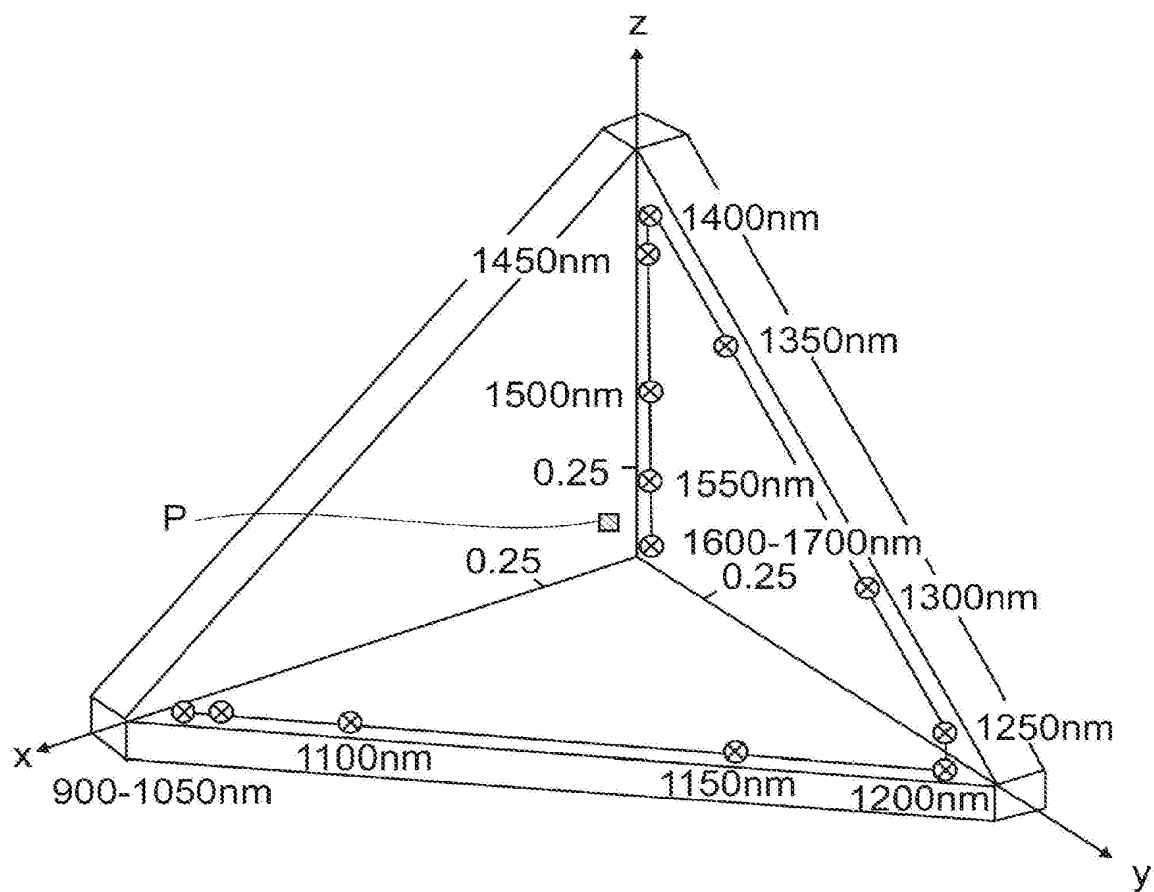
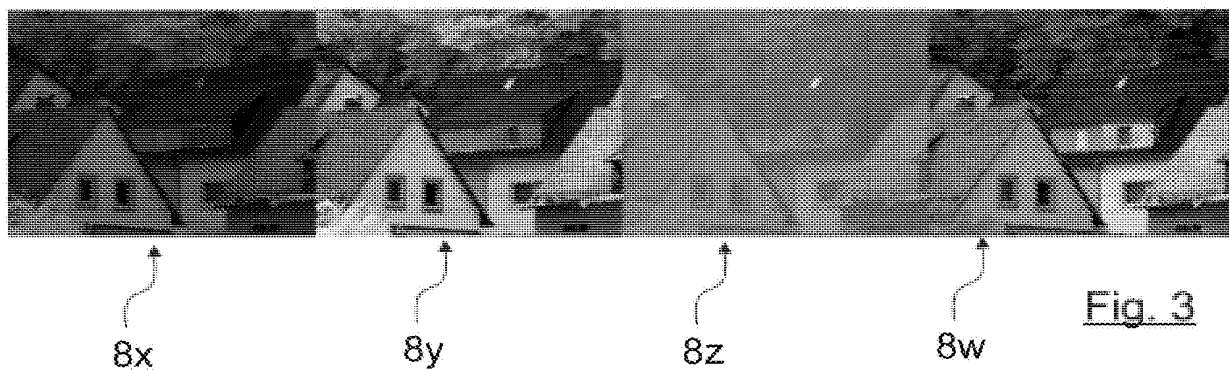


Fig. 2

Fig. 4

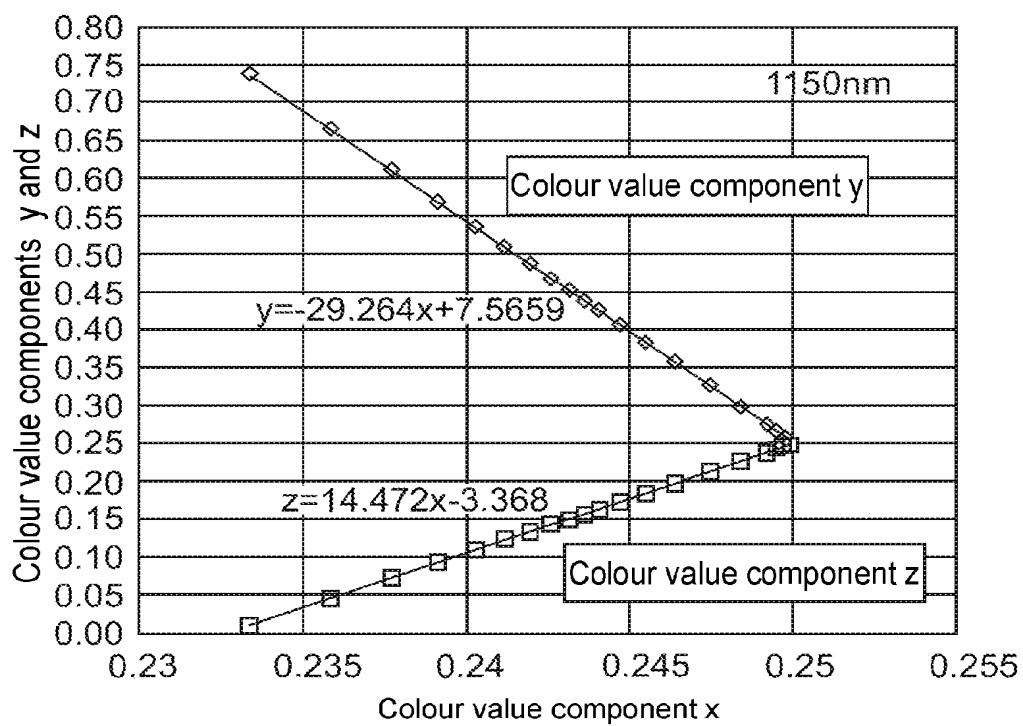
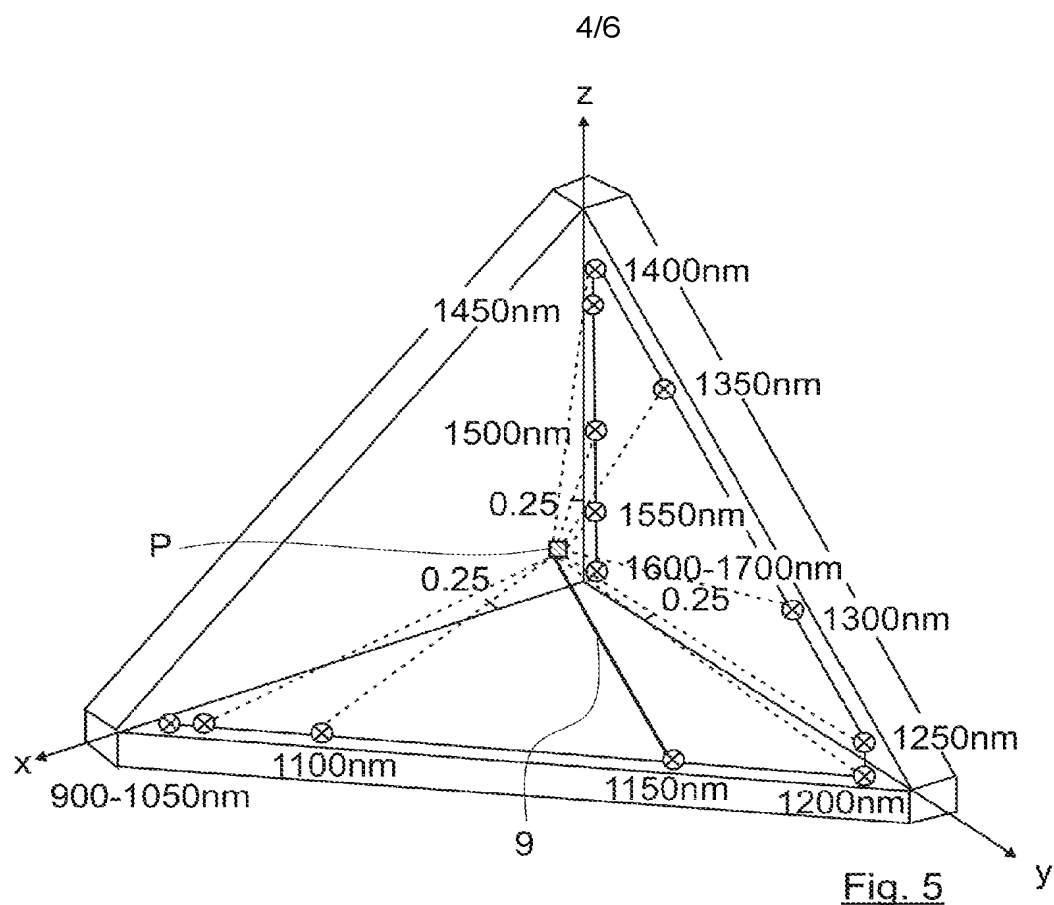


Fig. 6

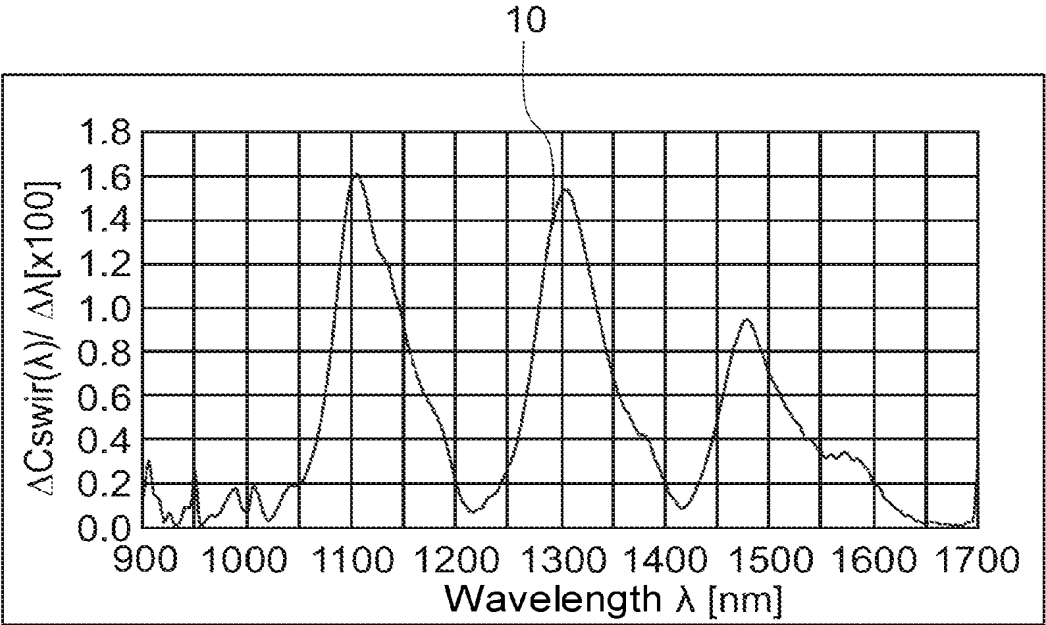


Fig. 7

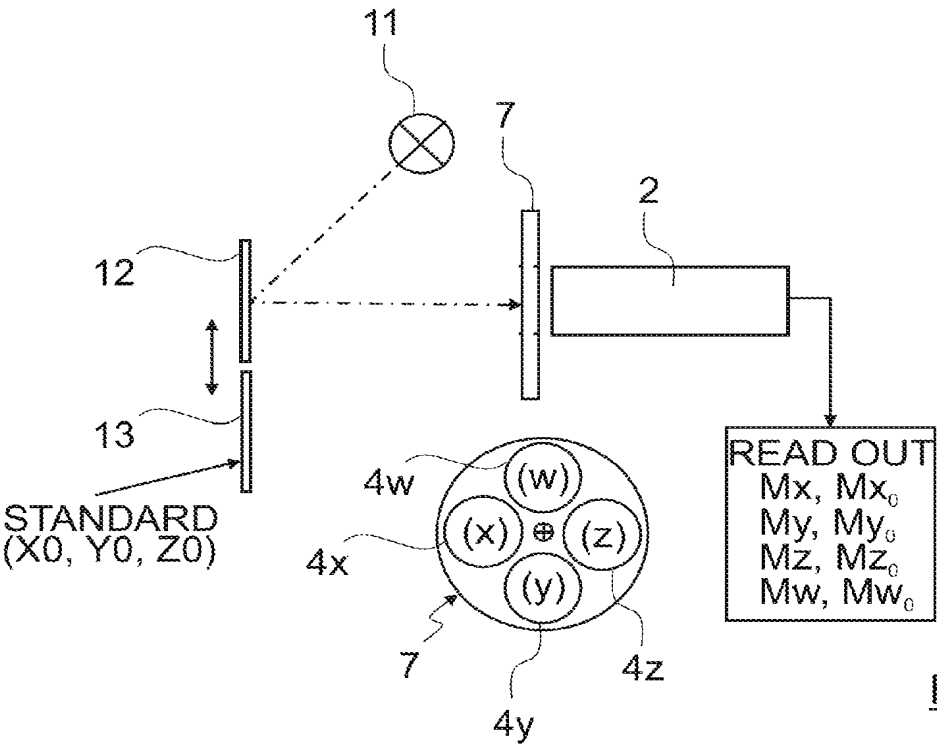


Fig. 8

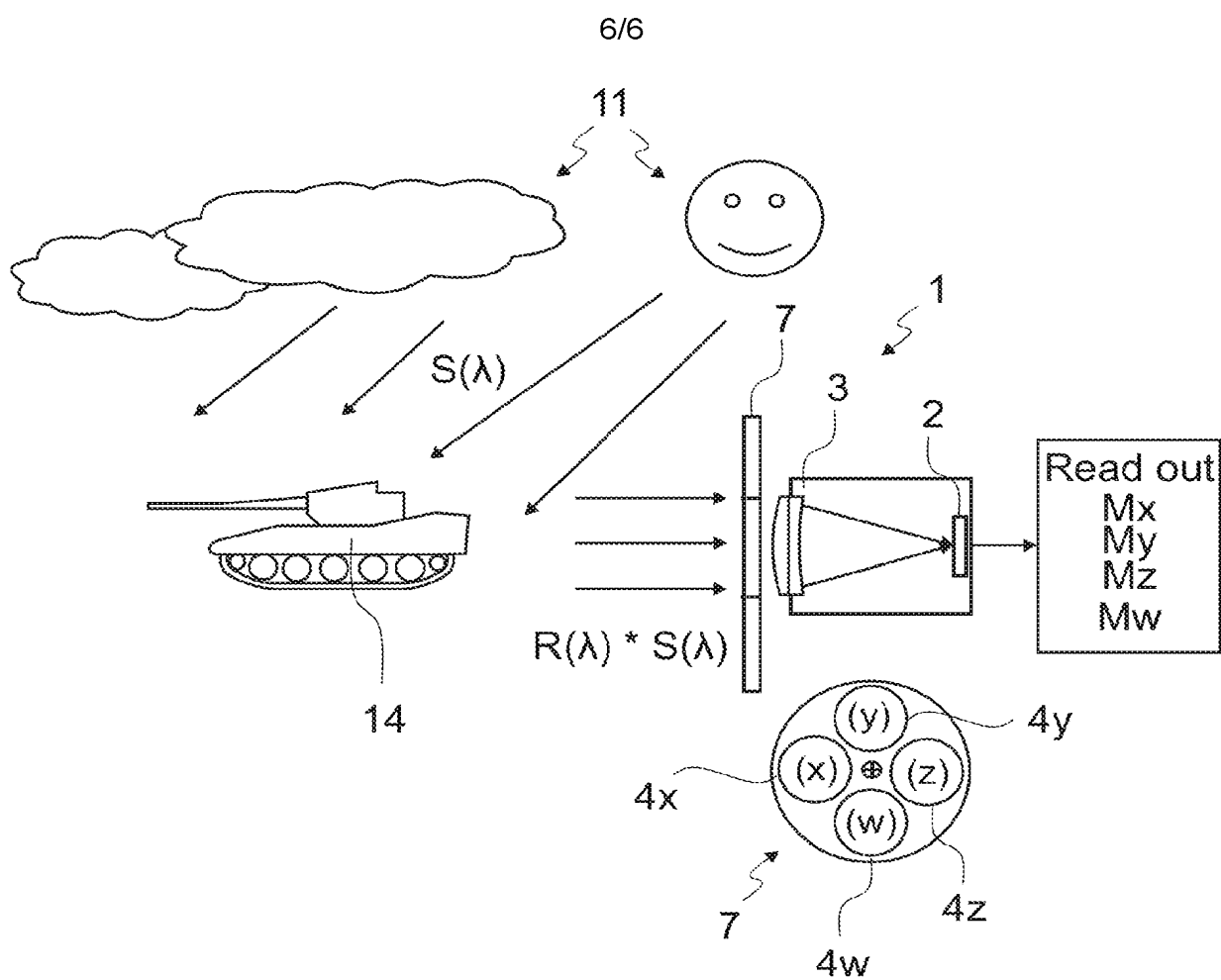


Fig. 9

Description:

Camera system

- 5 The invention relates to camera system, comprising at least one infrared detector device that is sensitive to electromagnetic radiation in the shortwave infrared region from approximately 900 nm to approximately 1700 nm.

Current camera systems having detectors that are sensitive in the shortwave infrared (SWIR/shortwave infrared) region from 900 nm to 1700 nm produce no spectral information items in relation to the recorded pictures or scenes. Even though the spectral range comprises an entire octave in the electromagnetic spectrum in terms of frequency and said spectral region is larger than the visual spectral region, many current applications only use the integrated radiation over the entire spectral region.

15 Representations are usually implemented integrated over the wavelength, usually in black/white or greyscale values. Spectral resolutions and coloured representation in this wavelength region previously only existed in the case of remote sensing using spectrometers or complicated spectral filters.

20 However, the production of spectral information items or the creation of a colour metric in the shortwave infrared region is very advantageous in conjunction with a less complicated and expensive HDTV camera system. Firstly, improved imaging is possible using the produced spectral information items. By way of example, smoke and fog can be penetrated over short distances. Spectral ranges that are particularly
25 impaired by moisture in the atmosphere or by scattering can be not taken into account, or omitted, in the representation. A representation can be implemented both in an RGB space as a so-called false colour representation, or as a greyscale picture.

A second advantage of using shortwave infrared camera systems lies in the option of
30 revealing objects clearly masked for the visual region and the mid-infrared region by using the shortwave infrared. The information about an object to be observed can be significantly increased if the latter is observed or imaged in various spectral regions. The observation of an object in different spectral regions generally allows an

improved analysis of the absorption, reflection, transmission and/or emission characteristics of the object, and so a specific property of the object as such can be identified more easily. By way of example, two objects appearing identical in the visual spectral region may be distinguished from one another in the infrared (IR) spectral region provided they have different temperatures.

Proceeding therefrom, the present invention is based on the object of developing a camera system of the type set forth at the outset, which avoids the disadvantages of the prior art and which, in particular, is able to produce spectral information items relating to a picture recorded in the shortwave infrared.

According to the invention, this object is achieved by Claim 1.

According to the invention, a camera system, in particular a high-resolution camera system, is proposed, comprising:

- at least one infrared detector device, in particular two-dimensional infrared detector device, that is sensitive to electromagnetic radiation in the shortwave infrared range from approximately or exactly 900 nm to approximately or exactly 1700 nm and that has a plurality of sensor elements arranged next to one another in rows and columns for capturing spatial picture elements;
- at least one optical unit that images electromagnetic radiation incident on the camera system onto the at least one infrared detector device;
- at least two different spectral filters that are disposed or disposable upstream of the at least one infrared detector device and that are each light-transmissive in different shortwave infrared spectral regions;
- a control and processing device that is configured to capture a picture of at least approximately the same scene using the at least one infrared detector device with the at least two spectral filters disposed upstream thereof, in such a way that picture signals of the recorded scene are produced in the different shortwave infrared spectral regions of the at least two different spectral filters, wherein each spatial picture element captured by the at least one infrared detector device is provided with spectral information items corresponding to the at least two different upstream

spectral filters.

The invention pursues the goal of exposing the image sensor with at least two different spectral filters (e.g., in sequence by a filter wheel), like in the case of RGB imaging using CCD or CMOS camera sensors, and of producing the spectral information item by way of a dedicated colour metric for the shortwave infrared region. Specifically developed transformations can adopt the representation in RGB space as a false colour representation (spectral coded false colour). Since many objects have a conspicuous spectral behaviour in the region from 900 nm to 1700 nm, an extension to the capabilities can be obtained, especially when revealing these objects. Likewise, the detection of water, for example in the form of humidity or fog, can be improved. Moreover, in the case of infrared spectral bands that are dominated by a water absorption band (e.g., at approximately 1440 nm), the latter can be removed by calculation or can be not taken into account, and so the range can be increased. By defining a colour metric in the shortwave infrared region, the option of a hyperspectral or multispectral resolution and a representation using only one sensor arises. Retrofitting available products is possible with relatively little modification outlay. Moreover, a standardized colour metric allows the comparability of the images. According to the invention, imaging can be implemented at the same time or with a time offset. A corresponding beam splitter arrangement with further infrared detector devices, i.e., a plurality of measurement channels or a type of Bayer filter, are required in the case of simultaneous imaging, like in the case of RGB imaging.

By way of the invention, captured spatial picture elements (pixels) in the shortwave infrared region are advantageously provided with spectral information items corresponding to the upstream spectral filters.

The at least two different spectral filters may comprise:

- at least one first spectral filter that is light-transmissive in a first shortwave infrared spectral region from approximately 900 nm to approximately 1300 nm and preferably is maximally light-transmissive at approximately 1000 nm;

- at least one second spectral filter that is light-transmissive in a second shortwave infrared spectral region from approximately 1000 nm to approximately 1400 nm and preferably is maximally light-transmissive at approximately 1200 nm;
- at least one third spectral filter that is light-transmissive in a third shortwave infrared spectral region from approximately 1200 nm to approximately 1600 nm and preferably is maximally light-transmissive at approximately 1400 nm; and/or
- at least one fourth spectral filter that is light-transmissive in a fourth shortwave infrared spectral region from approximately 1300 nm to approximately 1700 nm and preferably is maximally light-transmissive at approximately 1600 nm.

The shortwave infrared region is completely covered by such a selection of spectral filters. The infrared spectral regions have a sufficient overlap such that the spectral information items are advantageously calculable. The third spectral filter covers a dominant water absorption band at approximately 1440 nm.

Four spectral filters can be present in one configuration of the invention.

It is advantageous if at least one of the different shortwave infrared spectral regions comprises a water absorption band, in particular a dominant water absorption band.

This renders it possible not to take account of a measurement channel that is particularly impaired by scattered light or by humidity, or mist or fog in the atmosphere, when creating the overall picture as, as a rule, only little usable information is present in said measurement channel. Advantageously, the overall resolution can be improved by way of this measure. Consequently, the option of suppressing interference radiation from the water absorption band arises by omitting the corresponding spectral filter; on the other hand, water components in the image can be highlighted accordingly. Consequently, it is likewise possible to detect moisture or to detect water. By way of example, objects camouflaged by dry leaves could be recognized or identified in a forest that otherwise has damp leaves on the trees.

It is advantageous if the different shortwave infrared spectral regions of the at least two different spectral filters partly overlap, in particular by several nanometres, preferably by at least approximately 50%, if they are spectrally adjacent or lie next to one another.

5

As a result of an at least partial overlap of the different shortwave infrared spectral regions, in particular by several nanometres, at least two measurement values can be captured for each wavelength in different measurement channels. As it were, the incident electromagnetic radiation is distributed among a certain number of – at least
10 two – measurement channels. These measurement channels are distinguished by different spectral sensitivities, and the sensitivity curves as a function of the wavelength should be suitably chosen in this case. The wavelength of the respectively incident light is uniquely establishable by calculation, at least by forming a quotient, from the individual measurement values of the different channels. The
15 suitable spectral sensitivity curves can be formed by various spectral filters and/or different infrared detectors. In this respect, reference is made to DE 197 44 565 A1. Different measurement values are obtained in the management channels, and the wavelength can be deduced therefrom. This effect is used in similar fashion in the present invention.

20

The at least two different spectral filters can be interchangeable, in particular pivotable or displaceable, and/or arranged in a filter changer with at least two positions, in particular a filter wheel. By way of example, the spectral filters can be configured as multi-layer dielectric interference filters. Further, beam splitter
25 elements, too, e.g., in the form of reflective filters, or the like can be considered as spectral filters.

The at least one infrared detector device can be an InGaAs (indium-gallium-arsenide) detector or an MCT (mercury-cadmium-telluride) detector.

30

Two-dimensional InGaAs detectors for detection in the shortwave infrared region from 900 nm to 1700 nm can be used. Such infrared detector devices have a plurality

of sensor elements arranged next to one another in lines and columns for capturing individual picture element (pixels) (e.g., with a resolution of 640 x 512 pixels).

The control and processing device can be configured to produce a multispectral picture of the recorded scene by superposing or combining or adding the picture signals of the recorded scene in the different shortwave infrared spectral regions. The picture signals of the recorded scene can be stored in a picture memory and can be displayed or output as a summed picture or the like. By way of example, the measurement values in the various management channels, i.e., the spectral information items of the at least two different upstream spectral filters, are added for each picture element or pixel. The control and processing device or the picture processing unit can be configured to combine the picture contents in the different shortwave infrared spectral regions with one another by calculation. If use is made of a plurality of infrared detector devices and sensors, the picture processing unit can be configured to combine the separate picture contents of at least two of the detectors with one another by calculation in real time. To this end, the picture data are electronically superposed and positioned in real time.

It is likewise advantageous if the picture signals of an infrared spectral region that comprises a water absorption band, in particular a dominant water absorption band, is not taken into account when superposing or combining the picture signals of the recorded scene in the different shortwave infrared spectral regions. This can improve the overall resolution of the image if the scattered light resulting from the water absorption band (e.g., at 1440 nm) is not used in the superposition.

The control and processing device can be configured to produce an RGB colour picture of the recorded scene by superposing or combining the picture signals of the recorded scene in the different shortwave infrared spectral regions, wherein one RGB colour channel is assigned in each case to a different shortwave infrared spectral region.

A so-called false colour picture can be produced by these measures, wherein, for

example, a visually red colour is assigned to the region of 900 nm to 1100 nm, a visually green colour is assigned to the region of 1100 nm to 1300 nm, and a visually blue colour is assigned to the region from 1500 nm to 1700 nm.

- 5 The control and processing device can be configured to determine colour value components for at least two spatial picture elements from the picture signals of the different shortwave infrared spectral regions, and compare these by forming a difference, in particular a difference based on the Euclidean metric. Similarly, a colour metric can be introduced for the shortwave infrared spectral region.

10

Further, the control and processing device can be configured, for the purposes of object identification in the recorded picture, to compare colour value components of objects and/or object surfaces, which were determined in advance and preferably stored, with colour value components determined in the recorded picture by forming a difference, in particular a difference based on the Euclidean metric.

15

To this end, experimental laboratory measurements can be carried out in advance by virtue of spectral camouflaging structures (camouflage material, etc.) or further natural substances (foliage, earth, etc.) being measured. The spectral properties of many surfaces are known and can be determined. As a result, it is possible to uncover synthetic surfaces (uniforms, vehicles), for example. It is also possible to detect changes in the earth, for example, for detecting buried mines. Moreover, it is possible to find natural resources on account of the different surface reflections. The spectral properties or colour value components of the objects can be supplied to a colour metric and they may possibly be recognized again in a recorded image if they lie within tolerance regions of the brightness values of the individual shortwave infrared spectral regions.

20

25

30

It is very advantageous if there is a beam deflection by approximately $\pm \frac{1}{2}$ pixel in the horizontal or vertical direction of the electromagnetic radiation incident on the camera system whenever there is a change of the at least two different spectral filters. As a result of this measure, the resolution of the camera system can be

increased further in the style of micro-scanning. To this end, the filter changer can be provided with appropriate means, for example with angled faces. However, prisms or the like may also be used. In the case of four different spectral filters, the sequence of the beam deflection can be carried out, for instance, as follows: 1st filter change
5 +½ pixel horizontal direction; 2nd filter change +½ pixel vertical direction; 3rd filter change -½ pixel horizontal direction; 4th filter change -½ pixel vertical direction.

Advantageous configurations and developments of the invention emerge from the dependent claims.

10

Exemplary embodiments of the invention, outlined in principle, are specified below on the basis of the drawing. Here, functionally equivalent elements are provided with the same reference signs.

15 In detail:

Figure 1 shows a much-simplified schematic illustration of a camera system according to the invention;

20 Figure 2 shows a schematic diagram with four different transmission curves in the shortwave infrared spectral regions;

Figure 3 shows representations of greyscale value pictures, which are obtained with four different upstream spectral filters;

25

Figure 4 shows a first chromaticity diagram of spectral colours in the shortwave infrared region;

30 Figure 5 shows a second chromaticity diagram of spectral colours in the shortwave infrared region;

Figure 6 shows a representation of colour value components for the same hue

(1150 nm) and different colour saturations in the shortwave infrared region;

Figure 7 shows a representation of a change of colour value components of the pure spectral colours depending on the wavelength;

Figure 8 shows a schematic representation of the essential components of a colorimeter for the shortwave infrared region; and

Figure 9 shows a schematic representation of an imaging process using a camera system according to the invention.

Figure 1 illustrates a camera system 1 according to the invention, comprising:

- at least one infrared detector device 2 that is sensitive to electromagnetic radiation in the shortwave infrared range from approximately 900 nm to approximately 1700 nm and that has a plurality of sensor elements, not illustrated in detail in Figure 1, arranged next to one another in rows and columns for capturing individual spatial picture elements;

- at least one optical unit 3 that images electromagnetic radiation (indicated by a dashed line L) incident on the camera system 1 onto the at least one infrared detector device 2;

- at least two different spectral filters 4x, 4y, 4z, 4w, indicated using dashed lines, that are disposed or disposable upstream of the at least one infrared detector device 2 and that are each light-transmissive in different shortwave infrared spectral regions;

- a control and processing device 5 that is configured to capture a picture of at least approximately the same scene using the at least one infrared detector device 2 with the at least two different spectral filters 4x, 4y, 4z, 4w disposed upstream thereof, in such a way that picture signals of the recorded scene are produced in the different shortwave infrared spectral regions of the at least two different spectral filters 4x, 4y, 4z, 4w, wherein each spatial picture element captured by the at least one infrared detector device 2 is provided with spectral information items corresponding to the at least two different upstream spectral filters 4x, 4y, 4z, 4w.

As is clear from Figure 2, four different spectral filters 4x, 4y, 4z, 4w with associated spectral transmission curves $T_x(\lambda)$, $T_y(\lambda)$, $T_z(\lambda)$ and $T_w(\lambda)$ can be present.

5 The four different spectral filters 4x, 4y, 4z, 4w comprise:

- at least one first spectral filter 4x that is light-transmissive in a first shortwave infrared spectral region from approximately 900 nm to approximately 1300 nm and preferably is maximally light-transmissive at approximately 1000 nm;

10 - at least one second spectral filter 4y that is light-transmissive in a second shortwave infrared spectral region from approximately 1000 nm to approximately 1400 nm and preferably is maximally light-transmissive at approximately 1200 nm;

- at least one third spectral filter 4z that is light-transmissive in a third shortwave infrared spectral region from approximately 1200 nm to approximately 1600 nm and preferably is maximally light-transmissive at approximately 1400 nm; and/or

15 - at least one fourth spectral filter 4w that is light-transmissive in a fourth shortwave infrared spectral region from approximately 1300 nm to approximately 1700 nm and preferably is maximally light-transmissive at approximately 1600 nm.

Moreover, the spectral transmission or absorption of the atmosphere is illustrated in Figure 2 using a solid line. In Figure 2, the wavelength λ is plotted along the

20 horizontal axis and the light-transmissivity or transmittance is plotted on the vertical axis. It is further clear from Figure 2 that a water absorption band 6, in particular a dominant water absorption band, covers at least one of the different shortwave infrared spectral regions, specifically the third shortwave infrared spectral region from approximately 1200 nm to approximately 1600 nm. The different shortwave infrared
25 spectral regions of the at least two different spectral filters 4x, 4y, 4z, 4w partly overlap, in particular by several nanometres, preferably by at least 50%, if they are spectrally adjacent. The spectral filters 4x, 4y, 4w are preferably also selected in such a way that the maximum light-transmissivities thereof lie in the regions of maximum illuminance.

30

The at least two different spectral filters 4x, 4y, 4z, 4w can be interchangeable, in particular pivotable or displaceable, and/or arranged in a filter changer with at least

two positions, in particular a filter wheel 7 (see also Figures 7 and 8). By way of example, if 25 multispectral pictures are produced per second for the representation, 100 spectral pictures have to be recorded per second in the case of four different spectral filters 4x, 4y, 4z, 4w; i.e., 100 filter changes per second are necessary.

5

The at least one infrared detector device 2 can be an InGaAs detector, in particular a two-dimensional InGaAs detector, or an MCT detector.

Figure 3 indicates pictures 8x, 8y, 8z and 8w that were recorded with the spectral filters 4x, 4y, 4z, 4w. It is very clear that the image 8z provides substantially worse image information items as a result of the reduction in the illuminance caused by the dominant water absorption band 6.

The control and processing device 5 can be configured to produce a multispectral picture of the recorded scene by superposing or combining the picture signals of the recorded scene in the different shortwave infrared spectral regions.

The picture signals of an infrared spectral region or spectral filter 4z that comprises a water absorption band 6, in particular a dominant water absorption band, is not taken into account when superposing or combining the picture signals of the recorded scene in the different shortwave infrared spectral regions.

The control and processing device 5 can be configured to produce an RGB colour picture of the recorded scene by superposing or combining the picture signals of the recorded scene in the different shortwave infrared spectral regions, wherein one RGB colour channel is assigned in each case to a different shortwave infrared spectral region. As a result, a so-called false colour picture can be produced.

The control and processing device 5 can be configured to determine colour value components for at least two spatial picture elements from the picture signals of the different shortwave infrared spectral regions, and compare these by forming a difference, in particular a difference based on the Euclidean metric.

Further, the control and processing device 5 can be configured, for the purposes of object identification in the recorded picture, to compare colour value components of objects and/or object surfaces, which were determined in advance and preferably stored, with colour value components determined in the recorded picture by forming a difference, in particular a difference based on the Euclidean metric.

There can be a beam deflection by approximately +/- half a pixel in the horizontal or vertical direction of the electromagnetic radiation (L) incident on the camera system 1 whenever there is a change of the at least two different spectral filters 4x, 4y, 4z, 4w.

The employed shortwave infrared spectral region (SWIR region) between 900 nm and 1700 nm is a wavelength range that is spectrally broader than that of visible light. SWIR cameras known from the prior art produce a greyscale value image using the intensity over the entire spectral band. However, objects may have a completely different spectral behaviour in this region. Plants have a high reflectivity at the lower end of the SWIR region and liquid water has a strong absorption band around 1440 nm, for example.

According to the invention, dividing the SWIR region into a suitable number of spectral measurement channels is proposed in order to extract more detailed information items from a recorded picture. In order to obtain these information items, the proposition follows a concept that is similar to that of the colour vision of the human eye. In a manner analogous to the three types of colour receptors of the eye, four spectral measurement channels are defined for the shortwave infrared. Consequently, each picture element is characterized by four colour values instead of a single greyscale value.

A specific SWIR colour measurement is possible for a comprehensive characterization of an object by way of choosing suitable filters with suitable bandwidth and spectral overlap. Spectral sensitivity, algorithms for calculating SWIR colour values, a distinction of SWIR colour values by NEWD (noise equivalent

wavelength difference) and a spectrally encoded false colour picture representation are proposed.

Principles of SWIR colour measurement are proposed below; these may also be part of the subject matter of the invention.

The result of a radiometric measurement implemented by means of four spectral measurement channels in the shortwave infrared region can be processed in a manner similar to a colour stimulus by the human eye, with the difference that a 4-tuple of values is now present.

The imaging process in the SWIR region is also very similar to the visible region in that a radiation source is required for the purposes of illuminating the scene. Typically, an artificial source such as an incandescent lamp can be used in the laboratory, while natural daylight (from the sun or the sky) is required outside.

Therefore, the SWIR radiation reflected by an object of interest is not determined exclusively by the spectral reflectance $R(\lambda)$ of the object but also by the spectral distribution $S(\lambda)$ of the light source. The spectral radiant flux coming from the object corresponds to the colour stimulus $\varphi(\lambda) = S(\lambda) \cdot R(\lambda)$ in trichromy.

Moreover, the output of a colorimeter depends not only on the spectral transmission curves $T_x(\lambda)$, $T_y(\lambda)$, $T_z(\lambda)$ and $T_w(\lambda)$ of the spectral filters 4x, 4y, 4z, 4w that were selected to separate the spectral measurement channels, but also on the spectral detectivity $D(\lambda)$ of the implemented detector or of the infrared detector device 2. An InGaAs detector is often used in a SWIR colorimeter.

Therefore, a colorimetric measurement leads to the following 4-tuple of colour values, which take account of all the aforementioned effects:

$$X = k_x \cdot \int_{900}^{1700} \varphi(\lambda) \cdot D(\lambda) \cdot T_x(\lambda) d\lambda;$$

$$\begin{aligned}
 Y &= k_y \cdot \int_{900}^{1700} \varphi(\lambda) \cdot D(\lambda) \cdot T_y(\lambda) d\lambda; \\
 Z &= k_z \cdot \int_{900}^{1700} \varphi(\lambda) \cdot D(\lambda) \cdot T_z(\lambda) d\lambda; \\
 W &= k_w \cdot \int_{900}^{1700} \varphi(\lambda) \cdot D(\lambda) \cdot T_w(\lambda) d\lambda.
 \end{aligned} \tag{1}$$

- 5 The integration is implemented over the entire shortwave infrared region. The instrument constants k_i are freely selectable, but may be calculated in such a way that all four colour values are the same for a perfect matte white target. This procedure ensures that the chromaticity coordinates for the colour value components for the colour “white” all equal 0.25.

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The colour value components are defined below in relation to the colour values according to ratios such that $x + y + z + w = 1$ applies:

$$\begin{aligned}
 x &= X / (W+X+Y+Z); \\
 y &= Y / (W+X+Y+Z); \\
 z &= Z / (W+X+Y+Z); \\
 w &= W / (W+X+Y+Z).
 \end{aligned} \tag{2}$$

20 Each of the four colour value components defines the relative component of the four above-defined spectral measurement channels that are required in order to correspond with the SWIR colour of a sample 12 (see Figure 8). Since the sum of the four colour value components equals 1, it is only necessary to specify three thereof, x, y and z; the fourth can then be calculated by subtracting x, y and z from 1.

25 As is clear from Figure 4, the SWIR colour of the sample 12 can be specified by a point in a three-dimensional chromaticity diagram, which differs significantly from the two-dimensional CIE chromaticity diagram from trichromy. The SWIR primary colours are denoted by the points (0, 0, 0), (1, 0, 0), (0, 1, 0) and (0, 0, 1). Consequently, the maximum space is delimited by a corner cube. The location of all spectral colours of

the shortwave infrared spectral region (specified in nanometres nm) is plotted in the three-dimensional chromaticity diagram according to Figure 4.

The surface of the SWIR colour diagram or of the chromaticity diagram is defined by the totality of all rays that extend from a white point P (0.25, 0.25, 0.25) to the spectral colour line along the edge. In Figures 4 and 5, the white point P is indicated by a hatched square. Each point in the chromaticity diagram specifies the SWIR chromaticity (hue and saturation), independently of the luminance. This is advantageous in field applications, in which the colour distinction is important and the illuminance is usually not monitored.

A pure spectral colour has maximum possible saturation. The more white radiation is mixed in, the more the saturation reduces and the chromaticity coordinates change in such a way that the point is displaced along a straight line or linearly to the white point P in the chromaticity diagram (see Figure 6). In Figure 5, a full line 9 is plotted for the spectral colour or wavelength of 1150 nm in exemplary fashion. It extends from the point of the spectral colour 1150 nm at the coordinates (0.23, 0.74, 0.01) directly to the white point P (0.25, 0.25, 0.25).

The difference between two colours A and B can be calculated by means of the Euclidean metric, which is applied to the corresponding points in the diagram:

$$\Delta C_{\text{SWIR}} = \{(x_A - x_B)^2 + (y_A - y_B)^2 + (z_A - z_B)^2\}^{1/2}. \quad (3)$$

Whether two colours A and B can be considered to be different depends on an error range of the colorimeter to be established. Different thresholds are specified in relation to hue and saturation; these also vary with location on the chromaticity diagram. A first estimate for the capability of distinguishing between spectral colours can be derived by calculating the variation of the chromaticity coordinates per unit wavelength $\Delta C_{\text{SWIR}}(\lambda) / \Delta \lambda$ along a chromaticity curve 10 (see Figure 7).

At the tips of the chromaticity curve 10, a small change in wavelength causes a relatively large change in the chromaticity coordinates, and therefore this is detected

more easily than the same wavelength change in one of the troughs of the chromaticity curve 10. In military applications, this has a certain significance for the detection and spectral identification of laser radiation (e.g., a laser target mark).

- 5 Colorimetric measurements using a 4-channel SWIR radiometer are described below.

In the case of a filter colorimeter, a light source 11 alternately illuminates a sample 12 and a white standard or standard target 13 (see Figure 8). The reflected light is spectrally selected by a set of bandpass filters in a filter wheel 7, and then measured by a detector.

In the proposed SWIR colorimetry, the reflected radiation is measured by four spectral filters 4x, 4y, 4z, 4w instead of three filters like the tristimulus colour measurements. Four measurement values (Mx_0 , My_0 , Mz_0 and Mw_0) are produced as output signal for the standard target 13, said measurement signals containing all spectral information items about the light source 11, the spectral filters 4x, 4y, 4z, 4w and the infrared detector device 2 and serving to calibrate the appliance. The second 4-tuple of the values (Mx , My , Mz and Mw) additionally contains the spectral reflectivity of the sample 12. Consequently, the following applies:

$$\begin{aligned}
 Mx_0 &= k \cdot \int_{900}^{1700} S(\lambda) \cdot T_x(\lambda) \cdot D(\lambda) d\lambda; & Mx &= k \cdot \int_{900}^{1700} S(\lambda) \cdot T_x(\lambda) \cdot D(\lambda) \cdot R(\lambda) d\lambda; \\
 My_0 &= k \cdot \int_{900}^{1700} S(\lambda) \cdot T_y(\lambda) \cdot D(\lambda) d\lambda; & My &= k \cdot \int_{900}^{1700} S(\lambda) \cdot T_y(\lambda) \cdot D(\lambda) \cdot R(\lambda) d\lambda; \\
 Mz_0 &= k \cdot \int_{900}^{1700} S(\lambda) \cdot T_z(\lambda) \cdot D(\lambda) d\lambda; & Mz &= k \cdot \int_{900}^{1700} S(\lambda) \cdot T_z(\lambda) \cdot D(\lambda) \cdot R(\lambda) d\lambda; \\
 Mw_0 &= k \cdot \int_{900}^{1700} S(\lambda) \cdot T_w(\lambda) \cdot D(\lambda) d\lambda; & Mw &= k \cdot \int_{900}^{1700} S(\lambda) \cdot T_w(\lambda) \cdot D(\lambda) \cdot R(\lambda) d\lambda.
 \end{aligned} \quad (4)$$

Therefore, the colour values of the sample 12 are accordingly derived by the ratios of the values of sample 12 and standard target 13:

$$X = M_x / M_{x0}; Y = M_y / M_{y0}; Z = M_z / M_{z0}; W = M_w / M_{w0}. \quad (5)$$

The colour value components of the sample 12 emerge from the equation $x + y + z + w = 1$:

$$\begin{aligned} x &= X / (X+Y+Z+W); \\ y &= Y / (X+Y+Z+W); \\ z &= Z / (X+Y+Z+W); \\ w &= W / (X+Y+Z+W). \end{aligned} \quad (6)$$

The result can be plotted on a SWIR colour scale and can be compared to the colours of other samples or references.

The camera system 1 according to the invention, which is equipped with four different spectral filters 4x, 4y, 4z, 4w that are arranged in a filter wheel 7, in particular, can be used to carry out quantitative colorimetric measurements of objects 14 in the scenery (see Figure 9). Here, solar or sky radiation serves as a light source 11. The output signal of the camera system 1 comprises a 4-tuple of values M_x , M_y , M_z and M_w or of values $M_x(px1)$, $M_y(px1)$, $M_z(px1)$ and $M_w(px1)$ for each sensor element or detector element $px1$ (not illustrated in any more detail at the figures), which is measured by means of the spectral filters 4x, 4y, 4z, 4w. Using Equations (5) and (6), the chromaticity coordinates are evaluated in the same way as in the case of SWIR colorimetry, with the difference that data of a factory calibration have to be used as a reference in place of internal reference values.

The calibration process can be carried out using a suitable radiation source and frosted glass as a diffuser. For a camera system 1 to be applied in the field (e.g., for monitoring or reconnaissance), the use of a radiation source emitting a spectral radiant flux near the standard light type D65 appears advantageous since this simulates the typical radiation of northern sky regions. However, the sky radiation in the SWIR spectral region deviates significantly from the specified D65 black body of 6504 K on account of three strong water vapour absorption bands, the strongest of

which lies in the wavelength band from approximately 1350 nm to almost 1500 nm. However, this can be simulated by suitable filters.

Consequently, chromaticity coordinates can be assigned to each picture element or pixel of the scene and the SWIR colour of different objects can be compared quantitatively to decide whether or not two objects are the same. By way of example, it is possible to distinguish between camouflage colours and natural green, or even between camouflage colours with different origins. However, since it is only carried out in one picture, all picture elements clearly have identical light conditions.

Variations of the sky radiation have a very small effect.

List of reference signs:

	1	Camera system
	2	Infrared detector device
5	3	Optical unit
	4x,4y,4z,4w	Spectral filter
	5	Control and processing device
	6	Water absorption band
	7	Filter wheel
10	8x,8y,8z,8w	Pictures
	9	Full line
	10	Chromaticity curve
	11	Light source
	12	Sample
15	13	Standard target
	14	Object
	$T_x(\lambda), T_y(\lambda), T_z(\lambda), T_w(\lambda)$	Spectral transmission curves
	$S(\lambda)$	Spectral distribution
	$R(\lambda)$	Spectral reflectance
20	P	White point
	L	Incident electromagnetic radiation

Patent claims:

1. Camera system (1), comprising:

- at least one infrared detector device (2) that is sensitive to electromagnetic radiation in the shortwave infrared range from approximately 900 nm to approximately 1700 nm and that has a plurality of sensor elements arranged next to one another in rows and columns for capturing individual spatial picture elements;

- at least one optical unit (3) that images electromagnetic radiation (L) incident on the camera system (1) onto the at least one infrared detector device (2);

- at least two different spectral filters (4x, 4y, 4z, 4w) that are disposed or disposable upstream of the at least one infrared detector device (2) and that are each light-transmissive in different shortwave infrared spectral regions;

- a control and processing device (5) that is configured to capture a picture of at least approximately the same scene using the at least one infrared detector device (2) with

the at least two different spectral filters (4x, 4y, 4z, 4w) disposed upstream thereof, in such a way that picture signals of the recorded scene are produced in the different shortwave infrared spectral regions of the at least two different spectral filters (4x, 4y, 4z, 4w), wherein each spatial picture element captured by the at least one infrared detector device (2) is provided with spectral information items corresponding to the at least two different upstream spectral filters (4x, 4y, 4z, 4w).

2. Camera system (1) according to Claim 1, wherein the at least two different spectral filters (4x, 4y, 4z, 4w) comprise:

- at least one first spectral filter (4x) that is light-transmissive in a first shortwave infrared spectral region from approximately 900 nm to approximately 1300 nm and preferably is maximally light-transmissive at approximately 1000 nm;

- at least one second spectral filter (4y) that is light-transmissive in a second shortwave infrared spectral region from approximately 1000 nm to approximately 1400 nm and preferably is maximally light-transmissive at approximately 1200 nm;

- at least one third spectral filter (4z) that is light-transmissive in a third shortwave infrared spectral region from approximately 1200 nm to approximately 1600 nm and preferably is maximally light-transmissive at approximately 1400 nm; and/or

- at least one fourth spectral filter (4w) that is light-transmissive in a fourth shortwave infrared spectral region from approximately 1300 nm to approximately 1700 nm and preferably is maximally light-transmissive at approximately 1600 nm.

5 3. Camera system (1) according to Claim 1 or 2, wherein four different spectral filters (4x, 4y, 4z, 4w) are present.

4. Camera system (1) according to Claim 1, 2 or 3, wherein at least one of the different shortwave infrared spectral regions comprises a water absorption band (6),
10 in particular a dominant water absorption band.

5. Camera system (1) according to any one of Claims 1 to 4, wherein the different shortwave infrared spectral regions of the at least two different spectral filters (4x, 4y, 4z, 4w) partly overlap, in particular by several nanometres, preferably by at least
15 50%, if they are spectrally adjacent.

6. Camera system (1) according to any one of Claims 1 to 5, wherein the at least two different spectral filters (4x, 4y, 4z, 4w) are interchangeable, in particular pivotable or displaceable, and/or arranged in a filter changer with at least two positions, in
20 particular a filter wheel (7).

7. Camera system (1) according to any one of Claims 1 to 6, wherein the at least one infrared detector device (2) is an InGaAs detector or an MCT detector.

25 8. Camera system (1) according to any one of Claims 1 to 7, wherein the control and processing device (5) is configured to produce a multispectral picture of the recorded scene by superposing or combining the picture signals of the recorded scene in the different shortwave infrared spectral regions.

30 9. Camera system (1) according to Claim 8, wherein the picture signals of an infrared spectral region that comprises a water absorption band (6), in particular a dominant water absorption band, is not taken into account when superposing or combining the

picture signals of the recorded scene in the different shortwave infrared spectral regions.

10. Camera system (1) according to any one of Claims 1 to 9, wherein the control and processing device (5) is configured to produce an RGB colour picture of the recorded scene by superposing or combining the picture signals of the recorded scene in the different shortwave infrared spectral regions, wherein one RGB colour channel is assigned in each case to a different shortwave infrared spectral region.

11. Camera system (1) according to any one of Claims 1 to 10, wherein the control and processing device (5) is configured to determine colour value components for at least two spatial picture elements from the picture signals of the different shortwave infrared spectral regions, and compare these by forming a difference, in particular a difference based on the Euclidean metric.

12. Camera system (1) according to Claim 11, wherein the control and processing device (5) is configured, for the purposes of object identification in the recorded picture, to compare colour value components of objects and/or object surfaces, which were determined in advance and preferably stored, with colour value components determined in the recorded picture by forming a difference, in particular a difference based on the Euclidean metric.

13. Camera system (1) according to any one of Claims 6 to 12, wherein there is a beam deflection by approximately $\pm \frac{1}{2}$ pixel in the horizontal or vertical direction of the electromagnetic radiation (L) incident on the camera system (1) whenever there is a change of the at least two different spectral filters (4x, 4y, 4z, 4w).



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Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1-7, 11 & 12	US 2012/0154792 A1 (TREADO ET AL) - See in particular figure 2A and paragraphs [0031] to [0038]
X	1 & 8-10	WO 2018/119209 A1 (UNIV MICHIGAN REGENTS) - See in particular paragraphs [0052], [0075] and [0089]
X	1-5 & 7	US 2016/0077253 A1 (YETZBACHER ET AL) - See in particular figure 1 and paragraphs [0037], [0039] and [0048]
X	1, 3, 6 & 13	CN 105357487 A (MIANYANG SHAOJUN INFORMATION TECHNOLOGY CO LTD) - See in particular figure 2 and associated description
X	1, 4 & 7	EP 2557414 A2 (FIAT RICERCHE) - See in particular figure 1 and paragraphs [0007], [0012] and [0013]
X	1 & 6-8	US 2012/0062740 A1 (TREADO ET AL) - See in particular figure 1B and paragraphs [0031] to [0033], [0042], [0043] & [0064]
X	1 & 6	US 2014/0110585 A1 (JUSTICE JAMES) - See in particular figure 1 and paragraphs [0029] to [0030], [0039]

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

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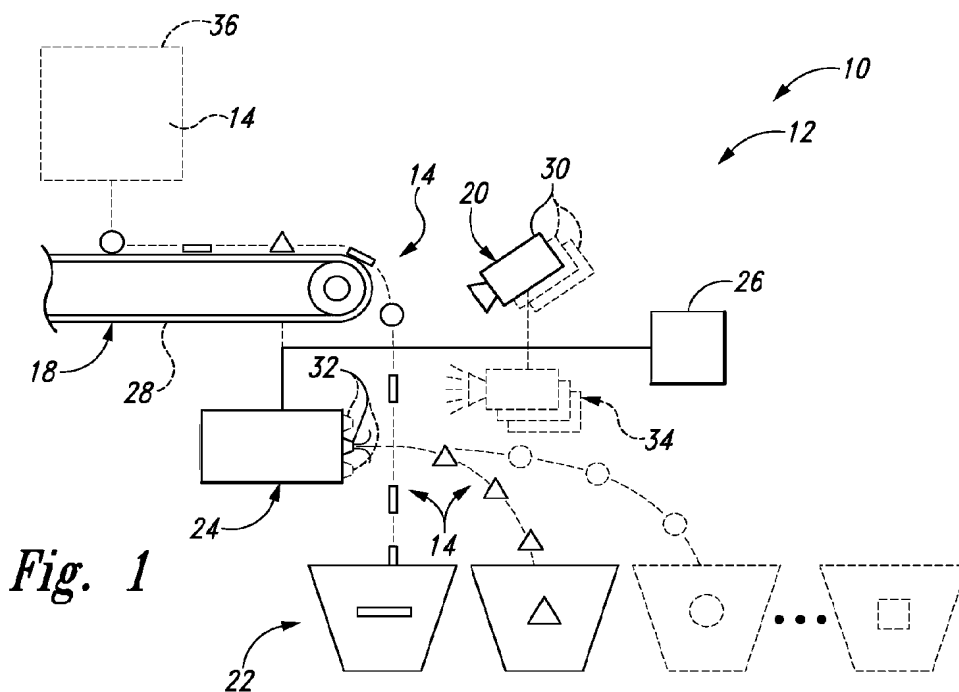
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(54) CHOPPED FIBER COMPOSITE SORTING AND MOLDING SYSTEMS AND METHODS

(57) Chopped fiber composite systems and methods are disclosed. Sorting systems include a conveyor, an imager, a plurality of receptacles, a pneumatic device, and controller. Molding systems include a conveyor, an imager, a mold, a pneumatic device, and a controller. The controller directs the pneumatic device to alter the freefall of chopped fiber composite pieces based on char-

acteristics of the chopped fiber composite pieces as they drop from the conveyor and into a receptacle or a mold. Sorting and molding methods include dropping chopped fiber composite pieces, detecting characteristics of the dropping pieces, and directing the pieces based on the detected characteristics.

**Fig. 1**

Description

FIELD

[0001] The present disclosure relates to chopped fiber composite sorting and molding.

BACKGROUND

[0002] Compression molding with chopped fiber composites is used in a variety of industries to produce a variety of parts. For example, the aerospace, land vehicle, and marine vehicle industries are utilizing composite materials more and more, and compression molding is but one available process for manufacturing parts. In the aerospace industry, for example, compression molding may be used for non-critical parts, that is, parts whose failure are not catastrophic to a larger apparatus as a whole. Historically, compression molding with chopped fiber composites has resulted in a lower than desired quality of part due to differences in properties and/or the presence of defects in the chopped fiber composite pieces being utilized. Accordingly, there is a need for improved chopped fiber composite sorting and molding systems and methods, optionally for use to create critical parts, that is, parts whose failure may be significant to the integrity of a larger apparatus as a whole.

SUMMARY

[0003] Chopped fiber composite systems and methods are disclosed, including systems and methods for sorting chopped fiber composite pieces and systems and methods for molding fiber-reinforced composite structured from chopped fiber composite pieces.

[0004] Systems for sorting chopped fiber composite pieces include a conveyor configured to drop chopped fiber composite pieces, an imager positioned relative to the conveyor and configured to image chopped fiber composite pieces as they drop from the conveyor, a plurality of receptacles positioned relative to the conveyor, a pneumatic device positioned relative to the conveyor and configured to direct pressurized streams of gas at individual chopped fiber composite pieces as they drop from the conveyor, and a controller in communication with the imager and the pneumatic device. The controller is programmed to cause the pneumatic device to direct a specific pressurized stream of gas at a corresponding specific chopped fiber composite piece as it drops from the conveyor based on image data associated with the corresponding specific chopped fiber composite piece and received from the imager. The specific pressurized stream of gas alters the corresponding specific chopped fiber composite piece's freefall path into a predetermined one of the plurality of receptacles based on predetermined criteria determined from the image data associated with the corresponding specific chopped fiber composite piece.

[0005] Systems for molding fiber-reinforced composite structures include a conveyor configured to drop chopped fiber composite pieces, an imager positioned relative to the conveyor and configured to image chopped fiber composite pieces as they drop from the conveyor, a mold positioned relative to the conveyor to receive the chopped fiber composite pieces as they drop from the conveyor, a pneumatic device positioned relative to the conveyor and configured to direct pressurized streams of gas at individual chopped fiber composite pieces as they drop from the conveyor, and a controller in communication with the imager and the pneumatic device. The controller is programmed to cause the pneumatic device to direct a specific pressurized stream of gas at a corresponding specific chopped fiber composite piece as it drops from the conveyor based on image data associated with the corresponding specific chopped fiber composite piece and received from the imager. The specific pressurized stream alters the corresponding specific chopped fiber composite piece's freefall path into a predetermined region of the mold and/or alters the orientation of the corresponding specific chopped fiber composite piece based on predetermined criteria determined from the image data associated with the corresponding specific chopped fiber composite piece.

[0006] Methods for sorting chopped fiber composite pieces include dropping chopped fiber composite pieces, detecting characteristics of individual chopped fiber composite pieces as they drop, and directing individual ones of the chopped fiber composite pieces into a predetermined receptacle based on one or more detected characteristics of respective individual ones of the chopped fiber composite pieces as they drop.

[0007] Methods of molding fiber-reinforced composite structures include dropping chopped fiber composite pieces, detecting characteristics of individual chopped fiber composite pieces as they drop, directing individual ones of the chopped fiber composite pieces into a predetermined region of a mold and/or altering orientations of individual ones of the chopped fiber composite pieces based on one or more detected characteristics of respective individual ones of the chopped fiber composite pieces as they drop, compressing the chopped fiber composite pieces within the mold, and curing the compressed chopped fiber composite pieces to define the fiber-reinforced composite structure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Fig. 1 is a schematic representation of systems for sorting chopped fiber composite pieces.

Fig. 2 is a schematic representation of systems for molding structures from chopped fiber composite pieces.

Fig. 3 is a flowchart schematically representing methods for sorting chopped fiber composite pieces

and methods for molding structures from chopped fiber composite pieces.

DESCRIPTION

[0009] Chopped fiber composite systems and methods are disclosed herein. Generally, in the figures, elements that are likely to be included in a given example are illustrated in solid lines, while elements that are optional to a given example are illustrated in broken lines. However, elements that are illustrated in solid lines are not essential to all examples of the present disclosure, and an element shown in solid lines may be omitted from a particular example without departing from the scope of the present disclosure.

[0010] As used herein, "chopped fiber composite" and "chopped fiber composite pieces" generally refer to a class of composite material used in a compression molding process, in which the composite material is composed of numerous small (e.g., greatest dimension typically in the range of 5-20 mm) pieces, chips, flakes, sheets, and/or other structures having fibers embedded in a polymer. The fibers may be carbon fibers, boron fibers, aramid (e.g., Kevlar®) fibers, glass fibers, and/or other materials, and the polymer may be a thermoset plastic, a thermoplastic, a resin, an epoxy, and/or other materials and may be pre-cured, uncured, or partially cured prior to the compression molding process. A volume of chopped fiber composite pieces are placed in a mold, compressed, and then heated to melt and cure the polymer into the form of the mold, resulting in a fiber-reinforced composite structure, part, or component.

[0011] Figs. 1 and 2 provide schematic representations of illustrative, non-exclusive examples of chopped fiber composite systems 10 according to the present disclosure. Fig. 1 illustrates a system 10 in the form of a system 12 for sorting chopped fiber composite pieces 14, such as to subsequently be used during a compression molding process, and Fig. 2 illustrates a system 16 for molding a fiber-reinforced composite structure from chopped fiber composite pieces 14. It is within the scope of the present disclosure that a system 12 and a system 16 may be distinct from each other, that a system 12 and a system 16 may be combined into a single system 10, and/or that a system 12 shares component parts with a system 16.

[0012] With reference first to Fig. 1, systems 12 for sorting chopped fiber composite pieces 14 generally include a conveyor 18, an imager 20, a plurality of receptacles 22, a pneumatic device 24, and a controller 26.

[0013] Conveyor 18 is configured to drop chopped fiber composite pieces 14 so that they fall under the force of gravity toward the receptacles 22. While the conveyor 18 in Fig. 1 is schematically illustrated in the form of an optional conveyor belt 28, conveyor 18 may be any suitable structure or mechanism that is configured to drop chopped fiber composite pieces toward the receptacles 22. Accordingly, a conveyor 18 additionally or alterna-

tively may include and/or be a hopper or other structure that directly drops chopped fiber composite pieces, as opposed to first translating them as in the instance of a conveyor belt 28.

[0014] Additionally or alternatively, a conveyor 18 may be configured to drop chopped fiber composite pieces 14 at spaced-apart intervals in time and/or space. For example, a conveyor 18 may be configured to sequentially drop single chopped fiber composite pieces one after another. Additionally or alternatively, a conveyor 18 may be configured to drop no more than a maximum number of chopped fiber composite pieces within a certain period of time. As illustrative, non-exclusive examples, a conveyor 18 may be configured to drop no more than 100, no more than 500, no more than 1000, no more than 5000, or no more than 10000 chopped fiber composite pieces per second. Additionally or alternatively, a conveyor may be configured to drop up to or at least 100, 500, or 1000 pounds of chopped fiber composite pieces per hour.

[0015] Additionally or alternatively, a conveyor 18 may be configured to drop up to a minimum number of chopped fiber composite pieces within a certain period of time. As illustrative, non-exclusive examples, a conveyor 18 may be configured to drop up to at least 5, at least 10, at least 100, at least 500, at least 1000, at least 5000, or at least 10000 chopped fiber composite pieces per second. Moreover, a conveyor 18 may be configured to drop up to such a minimum number of chopped fiber composite pieces while having the chopped fiber composite pieces appropriately spaced apart in time and/or space for functionality of the system 10, such as based on capabilities, limitations, properties, positions, and/or characteristics of the receptacles 22 and/or the pneumatic device 24.

[0016] With continued reference to Fig. 1 and system 12, imager 20 is positioned relative to conveyor 18 and is configured to image chopped fiber composite pieces 14 as they drop from the conveyor. As schematically illustrated, an imager 20 may include one or more cameras 30 positioned to image the chopped fiber composite pieces as they drop. In some systems 12, at least two cameras or at least three cameras may be used to image chopped fiber composite pieces from different angles as they drop from the conveyor.

[0017] Any suitable imager and camera may be used and incorporated into a system 12. For example, the one or more cameras may be described as high-speed cameras and may be configured to capture images at a rate of at least 100, 500, 1000, 10000, 17000, or more images per second.

[0018] The receptacles 22 of a system 12 are positioned relative to the conveyor 18 and may take any suitable form or structure, including any suitable size and capacity, such that they are configured to receive and contain chopped fiber composite pieces 14 that drop from the conveyor 18. Moreover, any suitable number of receptacles may be provided and included as part of a sys-

tem 12, such as depending on the desired sorting of chopped fiber composite pieces. Also, as discussed herein, and as schematically illustrated in Fig. 1 with the individual receptacles having schematic illustrations of distinct chopped fiber composite pieces thereon, individual receptacles may be associated with a specific characteristic of chopped fiber composite pieces, including (but not limited to) such illustrative, non-exclusive examples of characteristics as size, thickness, volume, aspect ratio of length to width, shape, color, fiber orientation, fiber number, presence of a defect, fiber pattern, orientation, reflectivity, opacity, light absorbance, geometry, and velocity.

[0019] The pneumatic device 24 of a system 12 is configured to direct pressurized streams, or bursts, of gas (e.g., air) at individual chopped fiber composite pieces 14 as they drop from the conveyor 18 so as to direct them into a specific receptacle 22, as schematically illustrated in Fig. 1. More specifically, the pneumatic device is configured to selectively direct differently configured pressurized streams, or bursts, of gas at individual chopped fiber composite pieces based on one or more characteristics of the individual chopped fiber composite pieces. This is schematically illustrated in Fig. 1 with the direction of differently shaped chopped fiber composite pieces into respective receptacles 22. The schematic shapes of the chopped fiber composite pieces used in the figures are solely for illustration purposes only and do not limit systems 10 to distinguishing between and sorting between the schematic shapes illustrated.

[0020] The differently configured pressurized streams of gas may differ based on one or more of pressure, duration, direction, orientation, position, velocity, and temperature. For example, a higher pressure, longer duration, and/or greater velocity of a stream of gas may direct an individual chopped fiber composite piece into a receptacle that is spaced further away than a lower pressure, shorter duration, and/or lesser velocity of a stream of gas. Similarly, the direction or orientation of the stream of gas may affect to which of the receptacles 22 an individual chopped fiber composite piece is directed. Additionally or alternatively, the vertical position of the stream of gas may affect to which of the receptacles 22 an individual chopped fiber composite piece is directed, such as with a higher placed stream of gas directing a chopped fiber composite piece to a further receptacle than a lower placed stream of gas. Additionally or alternatively, the lateral position of a stream of gas may affect whether an individual chopped fiber composite piece is in a position to be directed, or redirected, by the stream of gas, such as based on the lateral position of the individual chopped fiber composite piece as it is dropped from the conveyor 18.

[0021] As schematically and optionally illustrated in Fig. 1, a pneumatic device 24 may include a plurality of spaced-apart nozzles 32. Each nozzle may be configured to direct a unique pressurized stream of gas, such as with the uniqueness based on one or more of pressure,

duration, direction, orientation, position, velocity, and temperature. In some systems 12, each nozzle 32 may be configured to direct chopped fiber reinforced composite pieces into a single one of the plurality of receptacles. In some systems 12, each nozzle may be configured to direct chopped fiber reinforced composite pieces having a predetermined characteristic. Other configurations of pneumatic devices 24 and nozzles 32 also may be utilized and incorporated into a system 12.

[0022] As also schematically illustrated in Fig. 1, the controller 26 of a system 12 is in communication with the imager 20 and the pneumatic device 24. More specifically, the controller 26 is programmed to cause the pneumatic device 24 to direct a specific pressurized stream of gas at a corresponding specific chopped fiber composite piece 14 as it drops from the conveyor 18 based on image data associated with the corresponding specific chopped fiber composite piece and received from the imager 20. As a result, the specific pressurized stream of gas alters the corresponding specific chopped fiber composite piece's freefall path into a predetermined one of the plurality of receptacles based on predetermined criteria determined from the image data associated with the corresponding specific chopped fiber composite piece. In other words, as implemented by the controller 26, a system 12 is configured to detect one or more characteristics associated with an individual chopped fiber composite piece as it is dropped by the conveyor, and based on such detected characteristics, direct the individual chopped fiber composite piece into a specific one of the receptacles 22 by instructing the pneumatic device 24 to direct an appropriate pressurized stream of gas at the individual chopped fiber composite piece. Additionally, the controller may instruct the pneumatic device to not direct any stream of gas at a specific chopped fiber composite piece, such as when the specific chopped fiber composite piece is intended to drop directly into a receptacle directly beneath where the chopped fiber composite piece is dropping from the conveyor.

[0023] The predetermined criteria on which the controller bases instructions to the pneumatic device may include one or more of the illustrative, non-exclusive characteristics of chopped fiber composite pieces discussed herein.

[0024] A controller 26 may be any suitable device or devices that are configured to perform the functions of the controller discussed herein. For example, the controller may include one or more of an electronic controller, a dedicated controller, a special-purpose controller, a personal computer, a special-purpose computer, a wireless device for communication with other devices, a display device, a logic device, a memory device, and/or a memory device having computer readable media suitable for storing computer-executable instructions for implementing aspects of systems and/or methods according to the present disclosure.

[0025] As optionally and schematically illustrated in Fig. 1, some systems 12 also may include one or more

light sources 34 positioned relative to the conveyor and that are configured to illuminate the chopped fiber composite pieces 14 as they drop from the conveyor and are imaged by the imager 20. For example, such illumination of the chopped fiber composite pieces may facilitate the imaging by the imager 20 and the detection of specific characteristics of the chopped composite pieces as they drop from the conveyor. As illustrative, non-exclusive examples, the light sources may be configured to emit light in one or more of, and optionally substantially only in one of, the ultraviolet, deep ultraviolet, visible, infrared, and far infrared spectrums. As used herein, the ultraviolet spectrum includes light having wavelengths generally in the range of 10-400 μm , the deep ultraviolet spectrum includes light having wavelengths generally in the range of 10-200 μm , the visible spectrum includes light having wavelengths generally in the range of 380-760 nm, the infrared spectrum includes light having wavelengths generally in the range of 750 nm-1 mm, and the far infrared spectrum includes light having wavelengths generally in the range of 10 μm -1mm.

[0026] As also optionally and schematically illustrated in Fig. 1, a system 12 may be described as including a source 36 of the chopped fiber composite pieces 14. The source 36, when present, is positioned relative to the conveyor 18 and configured to distribute the chopped fiber composite pieces 14 on, in, and/or otherwise to the conveyor for subsequent dropping by the conveyor. The source 36 may include off-the-shelf chopped fiber composite pieces, such as provided by a supplier of such material, and with the off-the-shelf chopped fiber composite pieces optionally including desired characteristics, such as being dependent on an ultimate fiber-reinforced composite structure to be molded by a system 16. Additionally or alternatively, the source 36 may include specifically manufactured chopped fiber composite pieces, such as according to criteria specified by an operator of a system 10 and corresponding to desired characteristics of an ultimate fiber-reinforced composite structure to be molded by a system 16. Additionally or alternatively, the source 36 may include scraps of fiber-reinforced composite structures that are the result of manufacturing operations that are distinct from a system 10. For example, in the aerospace industry, many component parts of aircraft are now being constructed of fiber-reinforced composite materials, and various such component parts are constructed by various different manufacturing methods, including methods other than compression molding. In some such other manufacturing methods, fiber-reinforced composite material and parts are trimmed, resulting in what historically has been waste. Additionally, following a quality inspection of a fiber-reinforced composite part, the entire part may not be suitable for intended purpose and historically may have been scrapped as waste. Such former waste may be utilized as or turned into chopped fiber composite pieces 14 for use with systems 10 according to the present disclosure. As illustrative, non-exclusive examples, such scraps may be operated

on by a grinder, a chipper, a cutter, or other suitable device to create chopped fiber composite pieces 14 for use with systems 10. Moreover, the resulting created chopped fiber composite pieces may have varying characteristics, such as corresponding to those enumerated herein, and therefore may benefit from being sorted by a system 12. Additionally, the source 36 may include a generally uniform distribution of different characteristics. Alternatively, in other systems 12, the source 36 may include a generally non-uniform distribution of different characteristics.

[0027] Turning now to Fig. 2, systems 16 for molding a fiber-reinforced composite structure from chopped composite pieces 14 generally include a conveyor 18, an imager 20, a mold 40, a pneumatic device 24, and a controller 26. Elements of systems 16 that serve a similar, or at least a substantially similar, purpose as elements of systems 12 are identified with like reference numerals and therefore may not be discussed in detail herein with reference to Fig. 2 and systems 16. As mentioned, a system 16 may be completely distinct from a system 12, may share component parts with a system 12, and/or may be combined to form a single system 10. For example, the imager of a system 16 may also be the imager of system 12, may be distinct from but the same type and/or configuration of the imager of a system 12, or may be a completely different imager than the imager of a system 12.

[0028] The mold 40 of a system 16 is positioned relative to the conveyor 18 to receive the chopped fiber composite pieces 14 as they drop from the conveyor. The mold may correspond to any desired fiber-reinforced composite structure to be formed by a compression molding process, including (but not limited to) aerospace components, land vehicle components, marine vehicle components, spacecraft components, etc. Additionally or alternatively, the fiber-reinforced composite structure may be a non-critical (or secondary) component, that is, a component whose failure is not catastrophic to the greater vehicle or other apparatus. Additionally or alternatively, the fiber-reinforced composite structure may be a critical (or primary) component.

[0029] Additionally or alternatively, the mold 40 may correspond to a fiber-reinforced composite structure that is configured to be complex, such as that includes non-uniform contours, tight corners, different thicknesses, etc., such as that may not lend itself to being manufactured via a process in which layers, or plies, of fiber-reinforced composite material are layered on a tool, mandrel, or other form. Additionally or alternatively, the mold 40 may be described as having or defining multiple regions 42 of the mold. Such regions may have different characteristics, such as corresponding to different thicknesses, different contours or radii, etc.

[0030] The pneumatic device 24 of a system 16, like the pneumatic device of a system 12, is configured to direct pressurized streams, or bursts, of gas at individual chopped fiber composite pieces 14 as they drop from the conveyor 18. However, rather than directing an individual

chopped fiber reinforced composite piece into a specific receptacle, instead, the pneumatic device of a system 16 alters the freefall paths of individual chopped fiber composite pieces, such as to direct them into predetermined regions of the mold 40 and/or to alter their orientation into a desired orientation as they fall into a predetermined region of the mold. More specifically, the pneumatic device is configured to selectively direct differently configured pressurized streams, or bursts, of gas at individual chopped fiber composite pieces based on one or more characteristics of the individual chopped fiber composite pieces, such as, and including, the characteristics of chopped fiber composite pieces discussed herein in connection with systems 12. This is schematically illustrated in Fig. 2 with differently shaped chopped fiber composite pieces 14 being directed into three different regions 42 of the mold, and also with the rectangular shaped chopped fiber composite pieces being rotated from a vertical orientation to a horizontal orientation. These examples are provided solely as examples and in a very schematic manner without limiting the present disclosure to specific shapes of chopped fiber composite pieces, number of regions of a mold, etc.

[0031] The differently configured pressurized streams of gas may differ based on one or more of pressure, duration, direction, orientation, position, velocity, and temperature. For example, a higher pressure, longer duration, and/or greater velocity of a stream of gas may direct an individual chopped fiber composite piece into a region 42 of the mold 40 that is spaced further away than a lower pressure, shorter duration, and/or lesser velocity of a stream of gas. Additionally or alternatively, the direction or orientation of the stream of gas may affect a change in orientation of a chopped fiber composite piece as it drops from the conveyor and into the mold. Additionally or alternatively, the lateral position of a stream of gas may affect whether an individual chopped fiber composite piece is in a position to be directed, or redirected, by the stream of gas, such as based on the lateral position of the individual chopped fiber composite piece as it is dropped from the conveyor 18 and into the mold 40.

[0032] As schematically and optionally illustrated in Fig. 2, a pneumatic device 24 may include a plurality of spaced-apart nozzles 32. Each nozzle may be configured to direct a unique pressurized stream of gas, such as with the uniqueness based on one or more of pressure, duration, direction, orientation, position, velocity, and temperature. In some systems 16, each nozzle 32 may be configured to direct chopped fiber reinforced composite pieces into a single region of a mold. In some systems 16, each nozzle may be configured to direct chopped fiber reinforced composite pieces having a predetermined characteristic. Other configurations of pneumatic devices 24 and nozzles 32 also may be utilized and incorporated into a system 16.

[0033] In some systems 16, the pneumatic device 24 additionally or alternatively may be configured to direct heated streams of gas, and in some systems, streams

of gas at a temperature that alters a physical characteristic of a chopped fiber composite piece that is impacted by the stream of gas. For example, a temperature of a stream of gas may be selected to partially cure, melt, or make tacky a chopped fiber composite piece as it is dropped into the mold. As an illustrative, non-exclusive example, heating a chopped fiber composite piece as it drops may ensure that it sticks to previously dropped chopped fiber composite pieces and/or to the mold in an intended location within the mold. Alternatively, in some systems 16, the pneumatic device may direct heated streams of gas at all chopped fiber composite pieces being dropped from the conveyor, such as to ensure a desired state of tackiness or stickiness as they drop into the mold.

[0034] The controller 26 of a system 16 is in communication with the imager 20 and the pneumatic device 24. More specifically, the controller 26 is programmed to cause the pneumatic device to direct a specific pressurized stream of gas at a corresponding specific chopped fiber composite piece 14 as it drops from the conveyor 18 based on image data associated with the corresponding specific chopped fiber composite piece and received from the imager 20. As a result, the specific pressurized stream of gas is configured to alter the corresponding specific chopped fiber composite piece's freefall path into a predetermined region of the mold and/or alters the orientation of the corresponding specific chopped fiber composite piece based on predetermined criteria determined from the image data associated with the corresponding specific chopped fiber composite piece. In other words, as implemented by the controller 26, a system 16 is configured to detect one or more characteristics associated with an individual chopped fiber composite piece as it is dropped by the conveyor 18, and based on such detected characteristics, direct the individual chopped fiber composite piece into a specific region 42 of the mold 40 and/or to alter the orientation of the individual chopped fiber composite piece by instructing the pneumatic device 24 to direct an appropriate pressurized stream of gas at the individual chopped fiber composite piece. Additionally, the controller may instruct the pneumatic device to not direct any stream of gas at a specific chopped fiber composite piece, such as when the specific chopped fiber composite piece is intended to drop directly into a region of the mold directly beneath where the chopped fiber composite piece is dropping from the conveyor.

[0035] The predetermined criteria on which the controller bases instructions to the pneumatic device may include one or more of the illustrative, non-exclusive characteristics of chopped fiber composite pieces discussed herein. As in systems 12, a controller of a system 16 may be any suitable device or devices that are configured to perform the functions of the controller discussed herein.

[0036] In some systems 16, the controller 26 may be programmed to cause the pneumatic device to uniformly, randomly, and/or pseudo-randomly distribute the

chopped fiber composite pieces 14 into the mold according to characteristics of the chopped fiber composite pieces determined from the image data. In other words, systems 16 may be configured to ensure a specific distribution of differently configured chopped fiber composite pieces within the mold prior to compression and curing of the fiber-reinforced composite structure being molded.

[0037] Additionally or alternatively, in some systems 16, the controller 26 may be programmed to cause the pneumatic device 24 to heat a specific pressurized stream of gas that is directed at a specific chopped fiber composite piece 14 dropping from the conveyor 18. For example, the controller may detect or otherwise determine the state or cure, tackiness, or stickiness of a chopped fiber composite piece and determine that it should be heated to ensure that it sticks to previously dropped chopped fiber composite pieces and/or to the mold in an intended location within the mold.

[0038] As with systems 12, systems 16 also may include one or more optional light sources 34 positioned relative to the conveyor 18 and that are configured to illuminate the chopped fiber composite pieces 14 as they drop from the conveyor and are imaged by the imager 20, as schematically and optionally illustrated in Fig. 2.

[0039] As also optionally and schematically illustrated in Fig. 2, a system 16 may include a source 44 of chopped fiber composite pieces 14. The source 44, when present, is positioned relative to the conveyor and configured to distribute the chopped fiber composite pieces on and/or in the conveyor for subsequent dropping from the conveyor. As schematically indicated, the source 44 may include one or more of the receptacles 22 of a system 12.

[0040] Fig. 3 schematically provides a flowchart that represents illustrative, non-exclusive examples of methods 100 according to the present disclosure, including methods 102 for sorting chopped fiber composite pieces and methods 104 for molding a fiber-reinforced composite structure. In Fig. 3, steps shared by methods 102 and 104 and/or steps that are similar between methods 102 and methods 104 are illustrated in solid boxes. Steps that are exclusive to methods 104 are illustrated in dashed boxes. The methods and steps illustrated in Fig. 3 are not limiting and other methods and steps are within the scope of the present disclosure, including methods having greater than or fewer than the number of steps illustrated, as understood from the discussions herein.

[0041] Beginning first with methods 102, a method 102 for sorting chopped fiber composite pieces includes dropping 106 chopped fiber composite pieces, detecting 108 characteristics of individual chopped fiber composite pieces as they drop, and directing 110 individual ones of the chopped fiber composite pieces into a predetermined receptacle based on one or more detected characteristics of respective individual ones of the chopped fiber composite pieces as they drop. Steps 106, 108, and 110 are schematically illustrated in individual loops, schematically representing that the steps may be continuous and ongoing during a method 102 and not necessarily se-

quential in order.

[0042] The characteristics on which the directing 110 is based may include one or more of size, thickness, volume, aspect ratio of length to width, shape, color, fiber orientation, fiber number, presence of a defect, fiber pattern, orientation, reflectivity, opacity, light absorbance, geometry, and velocity.

[0043] In some methods 102, the detecting 108 may include imaging individual chopped fiber composite pieces as they drop. In some such methods, the imaging may include imaging with one or more cameras, optionally with at least two cameras positioned to image chopped fiber composite pieces from different angles as they drop from the conveyor, and optionally with at least three cameras positioned to image chopped fiber composite pieces from different angles as they drop from the conveyor. Additionally or alternatively, the imaging may include imaging at a high rate, optionally at a rate of at least 100, 500, 1000, 10000, 17000, or more images per second.

[0044] In some methods 102, the detecting also may include illuminating the chopped fiber composite pieces as they drop from the conveyor. For example, the illuminating may include illuminating with light in one or more of, and optionally substantially only in one of, the ultraviolet, deep ultraviolet, visible, infrared, and far infrared spectrums.

[0045] In some methods 102, the directing 110 may include directing differently configured pressurized streams of gas at corresponding individual chopped fiber composite pieces as they drop. For example, the differently configured pressurized streams of gas may correspond to the one or more detected characteristics of respective individual ones of the chopped fiber composite pieces. Additionally, the differently configured pressurized streams of gas may differ based on one or more of pressure, duration, direction, velocity, and temperature.

[0046] In some methods 102, the chopped fiber composite pieces may include off-the-shelf and/or specifically manufactured chopped fiber composite pieces. Additionally or alternatively, the chopped fiber composite pieces may include scraps of fiber-reinforced composite structures resultant from manufacturing operations that are distinct from sorting methods 102 and/or molding methods 104. In some methods 102, the chopped fiber composite pieces may include a generally uniform distribution of different characteristics. In other methods 102, the chopped fiber composite pieces may include a generally non-uniform distribution of different characteristics.

[0047] Next, a method 104 for molding a fiber-reinforced composite structure includes dropping 106 chopped fiber composite pieces, detecting 108 characteristics of individual chopped fiber composite pieces as they drop, directing 110 individual ones of the chopped fiber composite pieces into a predetermined region of a mold and/or altering orientations of individual ones of the chopped fiber composite pieces based on one or more detected characteristics of respective individual ones of the chopped fiber composite pieces as they drop, com-

pressing 112 the chopped fiber composite pieces within the mold, and curing 114 the compressed chopped fiber composite pieces to define the fiber-reinforced composite structure.

[0048] In some methods 104, the directing 110 may include uniformly, randomly, and/or pseudo-randomly distributing the chopped fiber composite pieces into the mold according to characteristics of the chopped fiber composite pieces. In other words, a method 104 may ensure a specific distribution of differently configured chopped fiber composite pieces within the mold prior to compression and curing of the fiber-reinforced composite structure being molded.

[0049] In some methods 104, the method may further include and/or directing 110 may include heating individual ones or all of the chopped fiber composite pieces as they drop and are directed into the mold. For example, an individual chopped fiber composite piece may be heated based on one or more detected characteristics of the individual chopped fiber composite piece, such as whether a state or cure, tackiness, or stickiness of the individual chopped fiber composite piece. In some methods 104, the heating may be from a pressurized stream of gas.

[0050] As in methods 102, in some methods 104, the chopped fiber composite pieces may include off-the-shelf and/or specifically manufactured chopped fiber composite pieces. Additionally or alternatively, the chopped fiber composite pieces may include scraps of fiber-reinforced composite structures resultant from manufacturing operations distinct from the method. In some methods 104, the chopped fiber composite pieces may include a generally uniform distribution of different characteristics. In other methods 104, the chopped fiber composite pieces include a generally non-uniform distribution of different characteristics. Additionally or alternatively, the source of chopped fiber composite pieces used in a method 104 may come from or be the result of a sorting method 102.

[0051] Illustrative, non-exclusive examples of inventive subject matter according to the present disclosure are described in the following enumerated paragraphs:

A. A chopped fiber composite system, comprising:

- a conveyor configured to drop chopped fiber composite pieces;
- an imager positioned relative to the conveyor and configured to image chopped fiber composite pieces as they drop from the conveyor;
- a plurality of receptacles positioned relative to the conveyor;
- a pneumatic device positioned relative to the conveyor and configured to direct pressurized streams of gas at individual chopped fiber composite pieces as they drop from the conveyor; and
- a controller in communication with the imager and the pneumatic device, wherein the controller is programmed to cause the pneumatic de-

vice to direct a specific pressurized stream of gas at a corresponding specific chopped fiber composite piece as it drops from the conveyor based on image data associated with the corresponding specific chopped fiber composite piece and received from the imager, and wherein the specific pressurized stream of gas is configured to alter the corresponding specific chopped fiber composite piece's freefall path into a predetermined one of the plurality of receptacles based on predetermined criteria determined from the image data associated with the corresponding specific chopped fiber composite piece.

A1. The system of paragraph A, wherein the predetermined criteria includes one or more of a size of the individual chopped fiber composite piece, a thickness of the individual chopped fiber composite piece, a volume of the individual chopped fiber composite piece, a shape of the individual chopped fiber composite piece, an aspect ratio of length to width of the individual chopped fiber composite piece, color of the individual chopped fiber composite piece, fiber orientation within the individual chopped fiber composite piece, presence of a defect in the individual chopped fiber composite piece, a fiber pattern within the individual chopped fiber composite piece, number of fibers within the chopped fiber composite piece, an orientation of the individual chopped fiber composite piece, a reflectivity of the individual chopped fiber composite piece, an opacity of the individual chopped fiber composite piece, a light absorbance of the individual chopped fiber composite piece, a geometry of the individual chopped fiber composite piece, and a velocity of the individual chopped fiber composite piece.

A2. The system of any of paragraphs A-A1, wherein the imager includes one or more cameras, optionally at least two cameras positioned to image chopped fiber composite pieces from different angles as they drop from the conveyor, and optionally at least three cameras positioned to image chopped fiber composite pieces from different angles as they drop from the conveyor.

A2.1. The system of paragraph A2, wherein the one or more cameras are configured to capture images at a high rate, optionally at a rate of at least 100, 500, 1000, 10000, or 17000 images per second.

A3. The system of any of paragraphs A-A2.1, wherein the plurality of receptacles includes individual receptacles associated with at least one criterion of the predetermined criteria for receiving chopped fiber composite pieces with the respective at least one criterion.

A4. The system of any of paragraphs A-A3, wherein the pneumatic device is configured to selectively direct differently configured pressurized streams of

gas at respective corresponding individual chopped fiber composite pieces, wherein the differently configured pressurized streams of gas differ based on one or more of pressure, duration, direction, orientation, position, and velocity.

A4.1. The system of paragraph A4, wherein the pneumatic device includes a plurality of nozzles.

A4.1.1. The system of paragraph A4.1, wherein each nozzle is configured to direct a unique pressurized stream of gas.

A4.1.2. The system of any of paragraphs A4.1-A4.1.1, wherein each nozzle is configured to direct chopped fiber reinforced composite pieces into a single one of the plurality of receptacles.

A4.1.3. The system of any of paragraphs A4.1-A4.1.2, wherein each nozzle is configured to direct chopped fiber reinforced composite pieces having a predetermined characteristic, wherein the predetermined characteristic corresponds to one or more of the predetermined criteria.

A5. The system of any of paragraphs A-A4.1.3, further comprising:

a light source positioned relative to the conveyor and configured to illuminate the chopped fiber composite pieces as they drop from the conveyor.

A5.1. The system of paragraph A5, wherein the light source is configured to emit light in one or more of, and optionally substantially only in one of, the ultraviolet, deep ultraviolet, visible, infrared, and far infrared spectrums.

A6. The system of any of paragraphs A-A5.1, wherein the controller includes one or more of an electronic controller, a dedicated controller, a special-purpose controller, a personal computer, a special-purpose computer, a wireless device for communication with other devices, a display device, a logic device, a memory device, and/or a memory device having computer readable media suitable for storing computer-executable instructions for implementing aspects of systems and/or methods according to the present disclosure.

A7. The system of any of paragraphs A-A6, further comprising:

a source of chopped fiber composite pieces positioned relative to the conveyor and configured to distribute the chopped fiber composite pieces on and/or in the conveyor for subsequent dropping by the conveyor.

A7.1. The system of paragraph A7, wherein the source of chopped fiber composite pieces includes off-the-shelf and/or specifically manufactured chopped fiber composite pieces.

A7.2. The system of any of paragraphs A7-A7.1,

wherein the source of chopped fiber composite pieces includes scraps of fiber-reinforced composite structures resultant from manufacturing operations distinct from the system.

A7.3. The system of any of paragraphs A7-A7.2, wherein the source of chopped fiber composite pieces includes a generally uniform distribution of different characteristics, wherein the different characteristics correspond to one or more of the predetermined criteria.

A7.4. The system of any of paragraphs A7-A7.2, wherein the source of chopped fiber composite pieces includes a generally non-uniform distribution of different characteristics, wherein the different characteristics correspond to one or more of the predetermined criteria.

B. A chopped fiber composite system, comprising:

a conveyor configured to drop chopped fiber composite pieces;

an imager positioned relative to the conveyor and configured to image chopped fiber composite pieces as they drop from the conveyor;

a mold positioned relative to the conveyor to receive the chopped fiber composite pieces as they drop from the conveyor;

a pneumatic device positioned relative to the conveyor and configured to direct pressurized streams of gas at individual chopped fiber composite pieces as they drop from the conveyor; and

a controller in communication with the imager and the pneumatic device, wherein the controller is programmed to cause the pneumatic device to direct a specific pressurized stream of gas at a corresponding specific chopped fiber composite piece as it drops from the conveyor based on image data associated with the corresponding specific chopped fiber composite piece and received from the imager, and wherein the specific pressurized stream of gas is configured to alter the corresponding specific chopped fiber composite piece's freefall path into a predetermined region of the mold and/or alters the orientation of the corresponding specific chopped fiber composite piece based on predetermined criteria determined from the image data associated with the corresponding specific chopped fiber composite piece.

B1. The system of paragraph B, wherein the predetermined criteria includes one or more of a size of the individual chopped fiber composite piece, a thickness of the individual chopped fiber composite piece, a volume of the individual chopped fiber composite piece, a shape of the individual chopped fiber composite piece, an aspect ratio of length to width of the individual chopped fiber composite piece, color of

the individual chopped fiber composite piece, fiber orientation within the individual chopped fiber composite piece, presence of a defect in the individual chopped fiber composite piece, a fiber pattern within the individual chopped fiber composite piece, number of fibers within the chopped fiber composite piece, an orientation of the individual chopped fiber composite piece, a reflectivity of the individual chopped fiber composite piece, an opacity of the individual chopped fiber composite piece, a light absorbance of the individual chopped fiber composite piece, a geometry of the individual chopped fiber composite piece, a velocity of the individual chopped fiber composite piece, and a state of cure of the individual chopped fiber composite piece.

B2. The system of any of paragraphs B-B1, wherein the imager includes one or more cameras, optionally at least two cameras positioned to image chopped fiber composite pieces from different angles as they drop from the conveyor, and optionally at least three cameras positioned to image chopped fiber composite pieces from different angles as they drop from the conveyor.

B2.1. The system of paragraph B2, wherein the one or more cameras are configured to capture images at a high rate, optionally at a rate of at least 100, 500, 1000, 10000, or 17000 images per second.

B3. The system of any of paragraphs B-B2.1, wherein the mold is configured to form an aerospace component, optionally a non-critical (or secondary) aerospace component, and optionally a critical (or primary) aerospace component.

B4. The system of any of paragraphs B-B3, wherein the pneumatic device is configured to selectively direct differently configured pressurized streams of gas at respective corresponding individual chopped fiber composite pieces, wherein the differently configured pressurized streams of gas differ based on one or more of pressure, duration, direction, orientation, position, velocity, and temperature.

B4.1. The system of paragraph B4, wherein the pneumatic device includes a plurality of nozzles.

B4.1.1. The system of paragraph B4.1, wherein each nozzle is configured to direct a unique pressurized stream of gas.

B4.1.2. The system of any of paragraphs B4.1-B4.1.1, wherein each nozzle is configured to direct chopped fiber reinforced composite pieces into a single predetermined region of the mold.

B4.1.3. The system of any of paragraphs B4.1-B4.1.2, wherein each nozzle is configured to direct chopped fiber reinforced composite pieces having a predetermined characteristic, wherein the predetermined characteristic corresponds to one or more of the predetermined criteria.

B5. The system of any of paragraphs B-B4.1.3, wherein the pneumatic device is configured to direct heated pressurized streams of gas at individual

chopped fiber composite pieces as they drop from the conveyor.

B6. The system of any of paragraphs B-B5, further comprising:

a light source configured to illuminate the chopped fiber composite pieces as they drop from the conveyor.

B6.1. The system of paragraph B6, wherein the light source is configured to emit light in one or more of, and optionally substantially only in one of, the ultraviolet, deep ultraviolet, visible, infrared, and far infrared spectrums.

B7. The system of any of paragraphs B-B6.1, wherein the controller includes one or more of an electronic controller, a dedicated controller, a special-purpose controller, a personal computer, a special-purpose computer, a wireless device for communication with other devices, a display device, a logic device, a memory device, and/or a memory device having computer readable media suitable for storing computer-executable instructions for implementing aspects of systems and/or methods according to the present disclosure.

B8. The system of any of paragraphs B-B7, wherein the controller is programmed to cause the pneumatic device to uniformly, randomly, and/or pseudo-randomly distribute the chopped fiber composite pieces into the mold according to characteristics of the chopped fiber composite pieces determined from the image data, wherein the characteristics correspond to the predetermined criteria.

B9. The system of any of paragraphs B-B8, wherein the controller is programmed to cause the pneumatic device to heat the specific pressurized stream of gas based on the predetermined criteria.

B10. The system of any of paragraphs B-B9, further comprising:

a source of chopped fiber composite pieces positioned relative to the conveyor and configured to distribute the chopped fiber composite pieces on and/or in the conveyor for subsequent dropping from the conveyor.

B10.1. The system of paragraph B10, wherein the source of chopped fiber composite pieces includes one or more of the plurality of receptacles of the system of any of paragraphs A-A7.4.

B11. The system of any of paragraphs B-B10.1, wherein the system shares component parts with the system of any of paragraphs A-A7.4.

B12. The system of any of paragraphs B-B10.1, further comprising the system of any of paragraphs A-A7.4.

C. The system of any of paragraphs A-B12, wherein the system is configured to perform the method of

any of paragraphs E-G.

D. The use of the system of any of paragraphs A-C, optionally to form a fiber-reinforced composite structure, optionally an aerospace structure.

E. A method for sorting chopped fiber composite pieces, the method comprising:

dropping chopped fiber composite pieces;
detecting characteristics of individual chopped fiber composite pieces as they drop; and
directing individual ones of the chopped fiber composite pieces into a predetermined receptacle based on one or more detected characteristics of respective individual ones of the chopped fiber composite pieces as they drop.

E1. The method of paragraph E, wherein the characteristics include one or more of a size of the individual chopped fiber composite piece, a thickness of the individual chopped fiber composite piece, a volume of the individual chopped fiber composite piece, a shape of the individual chopped fiber composite piece, an aspect ratio of length to width of the individual chopped fiber composite piece, color of the individual chopped fiber composite piece, fiber orientation within the individual chopped fiber composite piece, presence of a defect in the individual chopped fiber composite piece, a fiber pattern within the individual chopped fiber composite piece, number of fibers within the chopped fiber composite piece, an orientation of the individual chopped fiber composite piece, a reflectivity of the individual chopped fiber composite piece, an opacity of the individual chopped fiber composite piece, a light absorbance of the individual chopped fiber composite piece, a geometry of the individual chopped fiber composite piece, and a velocity of the individual chopped fiber composite piece.

E2. The method of any of paragraphs E-E1, wherein the detecting includes imaging individual chopped fiber composite pieces as they drop.

E2.1. The method of paragraph E2, wherein the imaging includes imaging with one or more cameras, optionally at least two cameras positioned to image chopped fiber composite pieces from different angles as they drop from the conveyor, and optionally at least three cameras positioned to image chopped fiber composite pieces from different angles as they drop from the conveyor.

E2.2. The method of any of paragraphs E-E2.1, wherein the imaging includes imaging at a high rate, optionally at a rate of at least 100, 500, 1000, 10000, or 17000 images per second.

E3. The method of any of paragraphs E-E2.2, wherein the detecting includes illuminating the chopped fiber composite pieces as they drop from the conveyor.

E3.1. The method of paragraph E3, wherein the il-

luminating includes illuminating with light in one or more of, and optionally substantially only in one of, the ultraviolet, deep ultraviolet, visible, infrared, and far infrared spectrums.

E4. The method of any of paragraphs E-E3.1, wherein the directing includes directing differently configured pressurized streams of gas at corresponding individual chopped fiber composite pieces as they drop.

E4.1. The method of paragraph E4, wherein the differently configured pressurized streams of gas correspond to the one or more detected characteristics of respective individual ones of the chopped fiber composite pieces.

E4.2. The method of any of paragraphs E4-E4.1, wherein the differently configured pressurized streams of gas differ based on one or more of pressure, duration, direction, and velocity.

E5. The method of any of paragraphs E-E4.2, wherein the chopped fiber composite pieces include off-the-shelf and/or specifically manufactured chopped fiber composite pieces.

E6. The method of any of paragraphs E-E5, wherein the chopped fiber composite pieces include scraps of fiber-reinforced composite structures resultant from manufacturing operations distinct from the method.

E7. The method of any of paragraphs E-E6, wherein the chopped fiber composite pieces include a generally uniform distribution of different characteristics.

E8. The method of any of paragraphs E-E6, wherein the chopped fiber composite pieces include a generally non-uniform distribution of different characteristics.

F. A method for molding a fiber-reinforced composite structure, the method comprising:

dropping chopped fiber composite pieces;
detecting characteristics of individual chopped fiber composite pieces as they drop;
directing individual ones of the chopped fiber composite pieces into a predetermined region of a mold and/or altering orientations of individual ones of the chopped fiber composite pieces based on one or more detected characteristics of respective individual ones of the chopped fiber composite pieces as they drop;
compressing the chopped fiber composite pieces within the mold; and
curing the compressed chopped fiber composite pieces to define the fiber-reinforced composite structure.

F1. The method of paragraph F, wherein the characteristics include one or more of a size of the individual chopped fiber composite piece, a thickness of the individual chopped fiber composite piece, a volume of the individual chopped fiber composite

piece, a shape of the individual chopped fiber composite piece, an aspect ratio of length to width of the individual chopped fiber composite piece, color of the individual chopped fiber composite piece, fiber orientation within the individual chopped fiber composite piece, presence of a defect in the individual chopped fiber composite piece, a fiber pattern within the individual chopped fiber composite piece, number of fibers within the chopped fiber composite piece, an orientation of the individual chopped fiber composite piece, a reflectivity of the individual chopped fiber composite piece, an opacity of the individual chopped fiber composite piece, a light absorbance of the individual chopped fiber composite piece, a geometry of the individual chopped fiber composite piece, and a velocity of the individual chopped fiber composite piece.

F2. The method of any of paragraphs F-F1, wherein the detecting includes imaging individual chopped fiber composite pieces as they drop.

F2.1. The method of paragraph F2, wherein the imaging includes imaging with one or more cameras, optionally at least two cameras positioned to image chopped fiber composite pieces from different angles as they drop from the conveyor, and optionally at least three cameras positioned to image chopped fiber composite pieces from different angles as they drop from the conveyor.

F2.2. The method of any of paragraphs F-F2.1, wherein the imaging includes imaging at a high rate, optionally at a rate of at least 100, 500, 1000, 10000, or 17000 images per second.

F3. The method of any of paragraphs F-F2.2, wherein the detecting includes illuminating the chopped fiber composite pieces as they drop from the conveyor.

F3.1. The method of paragraph F3, wherein the illuminating includes illuminating with light in one or more of, and optionally substantially only in one of, the ultraviolet, deep ultraviolet, visible, infrared, and far infrared spectrums.

F4. The method of any of paragraphs F-F3.1, wherein the directing includes directing differently configured pressurized streams of gas at corresponding individual chopped fiber composite pieces as they drop.

F4.1. The method of paragraph F4, wherein the differently configured pressurized streams of gas correspond to the one or more detected characteristics of respective individual ones of the chopped fiber composite pieces.

F4.2. The method of any of paragraphs F-F4.1, wherein the differently configured pressurized streams of gas differ based on one or more of pressure, duration, direction, and velocity.

F5. The method of any of paragraphs F-F4.2, wherein the directing includes uniformly, randomly, and/or pseudo-randomly distributing the chopped fiber

composite pieces into the mold according to characteristics of the chopped fiber composite pieces.

F6. The method of any of paragraphs F-F5, further comprising:

heating individual ones of the chopped fiber composite pieces concurrently with the directing.

F7. The method of any of paragraphs F-F6, wherein the chopped fiber composite pieces include off-the-shelf and/or specifically manufactured chopped fiber composite pieces.

F8. The method of any of paragraphs F-F7, wherein the chopped fiber composite pieces include scraps of fiber-reinforced composite structures resultant from manufacturing operations distinct from the method.

F9. The method of any of paragraphs F-F8, wherein the chopped fiber composite pieces include a generally uniform distribution of different characteristics.

F10. The method of any of paragraphs F-F8, wherein the chopped fiber composite pieces include a generally non-uniform distribution of different characteristics.

F11. The method of any of paragraphs F-F10, wherein the fiber-reinforced composite structure is an aerospace component, optionally a non-critical (or secondary) aerospace component, and optionally a critical (or primary) aerospace component.

F12. The method of any of paragraphs F-F11, further comprising the method of any of paragraphs E-E8.

G. The method of any of paragraphs E-F12, performed by the system of any of paragraphs A-B12.

[0052] As used herein, the terms "selective" and "selectively," when modifying an action, movement, configuration, or other activity of one or more components or characteristics of an apparatus, mean that the specific action, movement, configuration, or other activity is a direct or indirect result of user manipulation of an aspect of, or one or more components of, the apparatus.

[0053] As used herein, the terms "adapted" and "configured" mean that the element, component, or other subject matter is designed and/or intended to perform a given function. Thus, the use of the terms "adapted" and "configured" should not be construed to mean that a given element, component, or other subject matter is simply "capable of" performing a given function but that the element, component, and/or other subject matter is specifically selected, created, implemented, utilized, programmed, and/or designed for the purpose of performing the function. It is also within the scope of the present disclosure that elements, components, and/or other recited subject matter that is recited as being adapted to perform a particular function may additionally or alternatively be described as being configured to perform that function, and vice versa. Similarly, subject matter that is

recited as being configured to perform a particular function may additionally or alternatively be described as being operative to perform that function.

[0054] The various disclosed elements of apparatuses and steps of methods disclosed herein are not required to all apparatuses and methods according to the present disclosure, and the present disclosure includes all novel and non-obvious combinations and subcombinations of the various elements and steps disclosed herein. Moreover, one or more of the various elements and steps disclosed herein may define independent inventive subject matter that is separate and apart from the whole of a disclosed apparatus or method. Accordingly, such inventive subject matter is not required to be associated with the specific apparatuses and methods that are expressly disclosed herein, and such inventive subject matter may find utility in apparatuses and/or methods that are not expressly disclosed herein.

Claims

1. A method for sorting chopped fiber composite pieces (14), the method comprising:

dropping (106) chopped fiber composite pieces;
detecting (108) characteristics of individual chopped fiber composite pieces as they drop;
and
directing (110) individual ones of the chopped fiber composite pieces into a predetermined receptacle (22) based on one or more detected characteristics of respective individual ones of the chopped fiber composite pieces as they drop.

2. A method for molding a fiber-reinforced composite structure, the method comprising:

dropping (106) chopped fiber composite pieces (14);
detecting (108) characteristics of individual chopped fiber composite pieces as they drop;
directing (110) individual ones of the chopped fiber composite pieces into a predetermined region of a mold (40) and/or altering orientations of individual ones of the chopped fiber composite pieces based on one or more detected characteristics of respective individual ones of the chopped fiber composite pieces as they drop;
compressing (112) the chopped fiber composite pieces within the mold; and
curing (114) the compressed chopped fiber composite pieces to define the fiber-reinforced composite structure.

3. The method of claim 1 or claim 2, wherein the characteristics include one or more of a size of the indi-

vidual chopped fiber composite piece, a thickness of the individual chopped fiber composite piece (14), a volume of the individual chopped fiber composite piece, a shape of the individual chopped fiber composite piece, an aspect ratio of length to width of the individual chopped fiber composite piece, color of the individual chopped fiber composite piece, fiber orientation within the individual chopped fiber composite piece, presence of a defect in the individual chopped fiber composite piece, a fiber pattern within the individual chopped fiber composite piece, number of fibers within the chopped fiber composite piece, an orientation of the individual chopped fiber composite piece, a reflectivity of the individual chopped fiber composite piece, an opacity of the individual chopped fiber composite piece, a light absorbance of the individual chopped fiber composite piece, a geometry of the individual chopped fiber composite piece, and a velocity of the individual chopped fiber composite piece.

4. The method of any preceding claim, wherein the detecting (108) includes imaging individual chopped fiber composite pieces (14) as they drop, wherein the imaging includes imaging with at least two cameras (30) positioned to image chopped fiber composite pieces from different angles as they drop, and wherein the imaging includes imaging at a rate of at least 100 images per second.
5. The method of any preceding claim, wherein the directing includes directing (110) differently configured pressurized streams of gas at corresponding individual chopped fiber composite pieces (14) as they drop.
6. The method of claim 5, wherein the differently configured pressurized streams of gas correspond to the one or more detected characteristics of respective individual ones of the chopped fiber composite pieces (14).
7. The method of claim 5 or claim 6, wherein the differently configured pressurized streams of gas differ based on one or more of pressure, duration, direction, and velocity.
8. The method of any preceding claim, wherein the chopped fiber composite pieces include off-the-shelf chopped fiber composite pieces.
9. The method of any preceding claim, wherein the chopped fiber composite pieces include scraps of fiber-reinforced composite structures resultant from manufacturing operations distinct from the method.
10. The method of any of preceding claim, wherein the chopped fiber composite pieces include a generally

uniform distribution of different characteristics.

11. The method of any of preceding claim, wherein the chopped fiber composite pieces include a generally non-uniform distribution of different characteristics. 5
12. The method of claim 2, or any one of claims 3 to 11 when dependent on claim 2, wherein the fiber-reinforced composite structure is an aerospace component. 10
13. A method for molding a fiber-reinforced composite structure, the method comprising:

performing the method for sorting chopped fiber composite pieces according to claim 1, or any claim dependent on claim 1, wherein the step of performing results in a source of chopped fiber composite pieces; followed by
performing the method for molding a fiber-reinforced composite structure according to claim 2, or any claim dependent on claim 2, wherein

the step of dropping chopped fiber composite pieces comprises dropping them from the source. 15
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14. A chopped fiber composite system (10), comprising:

a conveyor (18) configured to drop chopped fiber composite pieces (14);
an imager (20) positioned relative to the conveyor and configured to image chopped fiber composite pieces as they drop from the conveyor;
one of:

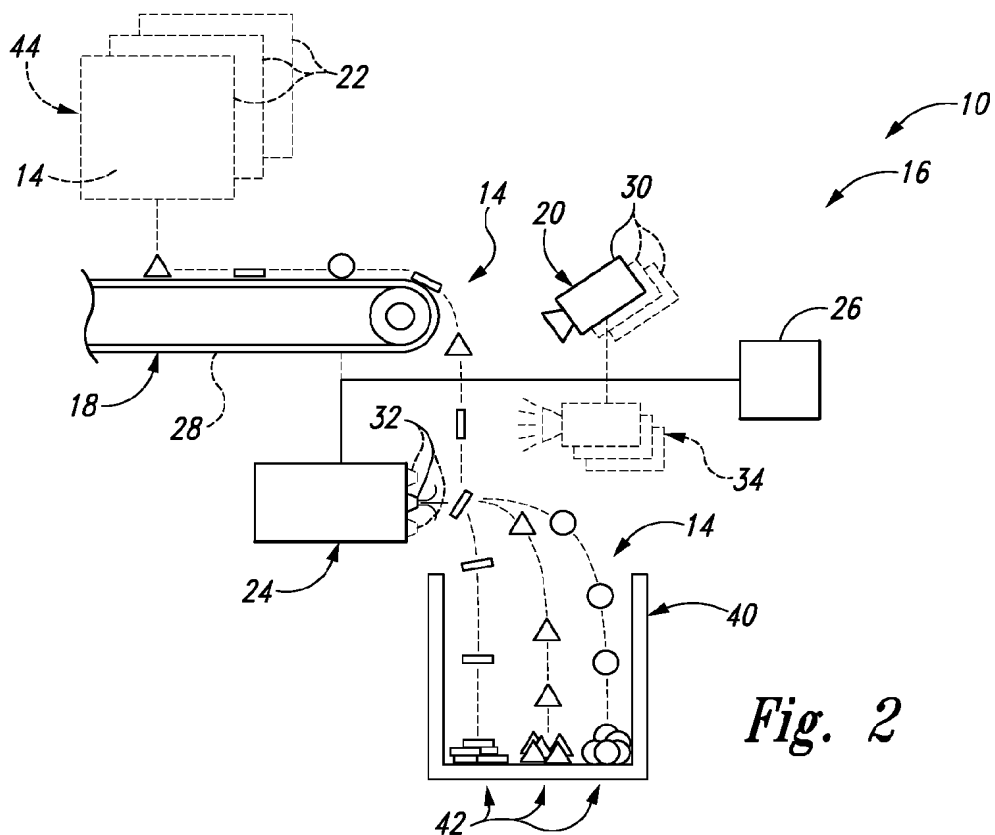
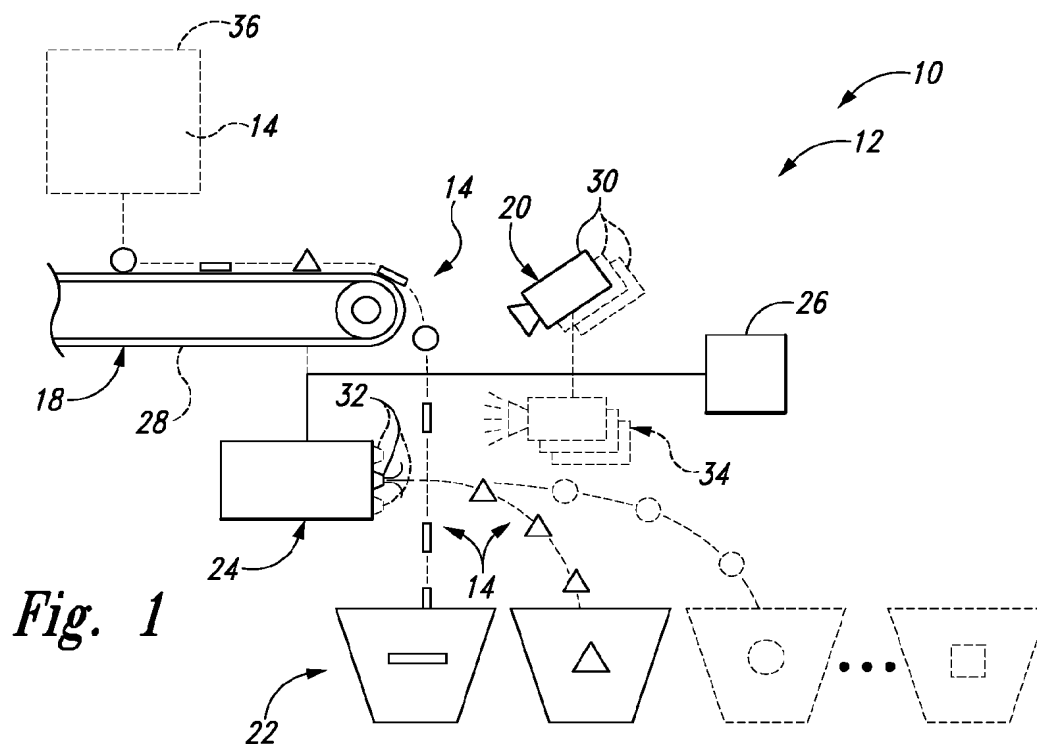
a plurality of receptacles (22) positioned relative to the conveyor; or
a mold (40) positioned relative to the conveyor to receive the chopped fiber composite pieces as they drop from the conveyor; 30
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a pneumatic device (24) positioned relative to the conveyor and configured to direct pressurized streams of gas at individual chopped fiber composite pieces as they drop from the conveyor; and
a controller (26) in communication with the imager and the pneumatic device, wherein the controller is programmed to cause the pneumatic device to direct a specific pressurized stream of gas at a corresponding specific chopped fiber composite piece as it drops from the conveyor based on image data associated with the corresponding specific chopped fiber composite piece and received from the imager, and wherein one of: 45
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the specific pressurized stream of gas is configured to alter the corresponding specific chopped fiber composite piece's free-fall path into a predetermined one of the plurality of receptacles based on predetermined criteria determined from the image data associated with the corresponding specific chopped fiber composite piece; or the specific pressurized stream of gas is configured to alter the corresponding specific chopped fiber composite piece's free-fall path into a predetermined region of the mold and/or alters the orientation of the corresponding specific chopped fiber composite piece based on predetermined criteria determined from the image data associated with the corresponding specific chopped fiber composite piece.

15. The system of claim 14, further comprising:

a source (36) of chopped fiber composite pieces (14) positioned relative to the conveyor (18) and configured to distribute the chopped fiber composite pieces on and/or in the conveyor for subsequent dropping from the conveyor, wherein the source of chopped fiber composite pieces includes scraps of fiber-reinforced composite structures resultant from manufacturing operations distinct from the system.



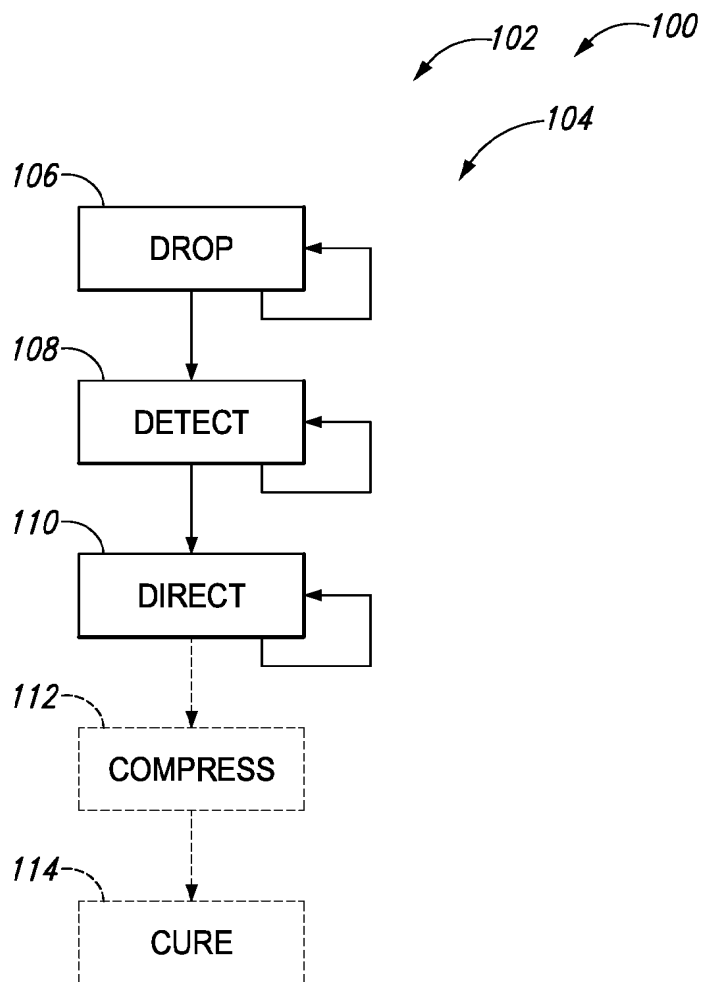


Fig. 3



EUROPEAN SEARCH REPORT

 Application Number
 EP 15 18 3439

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 27 January 2016	Examiner Wich, Roland
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82



ELECTRONIC PAYMENT RECEIPT

APPLICATION #
17/505,866

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SHJ943-US

Title of Invention

SELECTOR MACHINE

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 7769

FILED BY Avi Jencmen

PATENT CENTER # 61791613

AUTHORIZED BY -

CUSTOMER # 150161

FILING DATE 10/20/2021

CORRESPONDENCE
ADDRESS -

FIRST NAMED
INVENTOR Andrea UZZO

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E20233M349469900

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PATENT CENTER # 61791613

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CUSTOMER # 150161

FIRST NAMED INVENTOR
Andrea UZZO

CORRESPONDENCE ADDRESS -

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Documents

TOTAL DOCUMENTS: 9

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
SHJ943-US_IDS_Form.pdf	4	Information Disclosure Statement (IDS) Form (SB08)	598 KB
Thesis_Gasbarrone.pdf	306	Non Patent Literature	15642 KB
Thesis_Gasbarrone_EN Abstract.pdf	1	Non Patent Literature	41 KB
Shot - SEA CHROME 3.pdf	1	Non Patent Literature	311 KB
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Shot - SEA CHROME 1.pdf	1	Non Patent Literature	1027 KB

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New International Application Filed with the USPTO as a Receiving Office

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RODRIGUEZ, JOSEPH C

ART UNIT

PAPER NUMBER

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DATE MAILED: 01/27/2023

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TITLE OF INVENTION: SELECTOR MACHINE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$480	\$0.00	\$0.00	\$480	04/27/2023

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 40% the amount of undiscounted fees, and micro entity fees are 20% the amount of undiscounted fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

150161 7590 01/27/2023
Avi Avraham Jencmen
17 Yizhak Rabin St
Modiin, 7174906
ISRAEL

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/505,866	10/20/2021	Andrea UZZO	SHJ943-US	7769

TITLE OF INVENTION: SELECTOR MACHINE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	\$480	\$0.00	\$0.00	\$480	04/27/2023

EXAMINER	ART UNIT	CLASS-SUBCLASS
RODRIGUEZ, JOSEPH C	3653	209-587000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/AIA/122 or PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/AIA/47 or PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

1 _____

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/505,866	10/20/2021	Andrea UZZO	SHJ943-US	7769
150161	7590	01/27/2023	EXAMINER	
Avi Avraham Jencmen 17 Yizhak Rabin St Modiin, 7174906 ISRAEL			RODRIGUEZ, JOSEPH C	
			ART UNIT	PAPER NUMBER
			3653	

DATE MAILED: 01/27/2023

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 17/505,866	Applicant(s) UZZO, Andrea	
	Examiner JOSEPH C RODRIGUEZ	Art Unit 3653	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Amendment, 1/11/2023.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-15. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☒ All b) ☐ Some* c) ☐ None of the:

1. ☒ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892) 2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____. 3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____. 4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.	5. ☐ Examiner's Amendment/Comment 6. ☒ Examiner's Statement of Reasons for Allowance 7. ☐ Other _____.
--	--

/JOSEPH C RODRIGUEZ/
Primary Examiner, Art Unit 3653

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Reasons for Allowance

The following is an examiner's statement of reasons for allowance:

Applicant's amendments and arguments (1/11/2023) overcome the cited prior art of record. In particular, the amended features of composing a false color synthesis of said at least one product using three measurement signals acquired at three successive time intervals render the invention novel and non-obvious over the prior art. Indeed, although the prior art or record teaches constructing a synthetic image from multi-spectral inputs, the prior art does not teach the claimed spectral bands and the different time intervals as noted by Applicant.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any references not explicitly discussed but made of record during the prosecution of the instant application are considered helpful in understanding and establishing the state of the prior art and are thus relevant to the prosecution of the instant application.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOSEPH C RODRIGUEZ whose telephone number is **571-272-3692** (M-F,

9 am – 6 pm, PST). The Supervisory Examiner is MICHAEL MCCULLOUGH, 571-272-7805.

The **Official** fax phone number for the organization where this application or proceeding is assigned is **571-273-8300**.

Alternatively, to contact the examiner, send an E-mail communication to **Joseph.Rodriguez@uspto.gov**. Such E-mail communication should be in accordance with provisions of the MPEP (see e.g., 502.03 & 713.04; see also Patent Internet Usage Policy Article 5). E-mail communication must begin with a statement authorizing the E-mail communication and acknowledging that such communication is not secure and may be made of record. Please note that **any communications with regards to the merits of an application will be made of record**. A suggested format for such authorization is as follows: "Recognizing that Internet communications are not secure, I hereby authorize the USPTO to communicate with me concerning any subject matter of this application by electronic mail. I understand that a copy of these communications will be made of record in the application file".

Information regarding the status of an application may also be obtained from the Patent Application Information Retrieval (PAIR) system.

Status information for published applications may be obtained from either Private PMR or Public PAIR. Status information for unpublished applications is available through Private PMR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>

Should you have questions on access to the Private PMR system, contact the Electronic Business Center (EBC) at **866-217-9197** (Toll Free).

/JOSEPH C RODRIGUEZ/
Primary Examiner, Art Unit 3655

Jcr

January 25, 2023

<i>Search Notes</i> 	Application/Control No. 17/505,866	Applicant(s)/Patent Under Reexamination UZZO, Andrea
	Examiner JOSEPH C RODRIGUEZ	Art Unit 3653

CPC - Searched*		
Symbol	Date	Examiner
B07C 1/02; 5/3425		
Searched Above	10/06/2022	JCR
Updated Above	01/18/2023	JCR

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

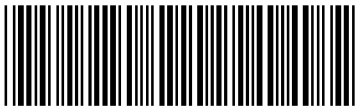
US Classification - Searched*			
Class	Subclass	Date	Examiner
209	577, 581	10/06/2022	JCR

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Text Search (See IFW for stragies & limitations)	10/06/2022	JCR
Updated Above	01/18/2023	JCR

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	Same as Above	01/18/2023	JCR

/JOSEPH C RODRIGUEZ/ Primary Examiner, Art Unit 3653	
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Issue Classification 	Application/Control No. 17/505,866	Applicant(s)/Patent Under Reexamination UZZO, Andrea
	Examiner JOSEPH C RODRIGUEZ	Art Unit 3653

CPC					
Symbol				Type	Version
B07C	/	5	/	3425	F 2013-01-01

CPC Combination Sets				
Symbol	Type	Set	Ranking	Version
/				

NONE (Assistant Examiner) (Date)		Total Claims Allowed: 15	
/JOSEPH C RODRIGUEZ/ Primary Examiner, Art Unit 3653 (Primary Examiner) (Date)		18 January 2023 O.G. Print Claim(s)	2 O.G. Print Figure

Issue Classification 	Application/Control No. 17/505,866	Applicant(s)/Patent Under Reexamination UZZO, Andrea	
	Examiner JOSEPH C RODRIGUEZ	Art Unit 3653	

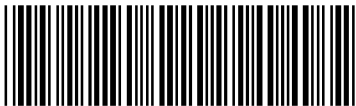
INTERNATIONAL CLASSIFICATION			
CLAIMED			
B07C	/	5	/ 342

NON-CLAIMED			
/		/	

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	15	
/JOSEPH C RODRIGUEZ/ Primary Examiner, Art Unit 3653	18 January 2023	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

<i>Issue Classification</i> 	Application/Control No. 17/505,866	Applicant(s)/Patent Under Reexamination UZZO, Andrea
	Examiner JOSEPH C RODRIGUEZ	Art Unit 3653

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47
--

CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 15	
/JOSEPH C RODRIGUEZ/ Primary Examiner, Art Unit 3653 (Primary Examiner) _____ (Date) 18 January 2023		O.G. Print Claim(s) 1	O.G. Print Figure 2

Bibliographic Data

Application No: 17/505,866

Foreign Priority claimed: ☒ Yes ☐ No

35 USC 119 (a-d) conditions met: ☒ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged: /JOSEPH C RODRIGUEZ/

Examiner's Signature

Initials

Title: SELECTOR MACHINE

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/20/2021	209	3653	SHJ943-US
RULE			

APPLICANTS

3U VISION SRL, Imola (BO), ITALY

INVENTORS

Andrea UZZO, Imola (BO), ITALY

CONTINUING DATA

FOREIGN APPLICATIONS

ITALY IT202020000005884 10/21/2020

IF REQUIRED, FOREIGN LICENSE GRANTED**

10/28/2021

** SMALL ENTITY **

STATE OR COUNTRY

ITALY

ADDRESS

Avi Avraham Jencmen

17 Yizhak Rabin St

Modiin, 7174906

ISRAEL

FILING FEE RECEIVED

\$830

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	25	"505866".ap.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 11:47 AM
L2	7	(joseph near3 rodriguez) AND optical near3 (sort\$3 separat\$3 classify\$3) SAME (IR infrared)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 11:54 AM
L3	6964	B07C1/02.cpc. b07c5/3425.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:20 PM
L4	53	L3 AND (IR infrared) near3 (three multiple plurality)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2022/10/06 12:20 PM

L5	30	(Artificial Intelligence) More like doc: US-10034490-B2 Text: (US-20170079315-A1 OR AU-2015252972-A1 OR AU-2015252972-B2 OR EP-3139771-B1 OR EP-3139771-A1 OR WO-2015168495-A1 OR CA-2947286-A1 OR CA-2947286-C OR US- 20150314335-A1 OR US-9364866-B2 OR US-9862004-B1 OR US-20160207048-A1 OR CA-2971629-C OR BR-112016025217-A2 OR US-677789-A OR US-8227012-B2 OR US-20120288599-A1 OR EP-3139771-A4 OR US-20080233253-A1 OR US-20140037826- A1).did.	CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:21 PM
L6	45	(Artificial Intelligence) More like doc: DE-202021105737-U1 Text: (DE-202022103915-U1 OR US-20220118484- A1 OR DE- 102010024784-A1 OR DE-102010024784-B4 OR WO-02085547-A2 OR DE-19708457-C1 OR WO-9835764-A1 OR EP-1048363-A2 OR EP-1005398-B1 OR CH-684742-A5 OR DE- 102019132931-A1 OR DE-19736567-C1 OR EP-0475121-A2 OR DE-1919002-A1 OR DE-2901970-B1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:22 PM

L7	992	DE-102020117074-A1 OR DE-19646753-A1 OR TW-I758367-B OR DE-2015123-C OR DE- 1532268-C).did. 209/577,581.ccls.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:32 PM
L8	67	(L7 L4) AND (IR infrared) near3 (three multiple plurality)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:33 PM
L9	3	(uzzo near3 andrea).inv.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:35 PM
L10	1922	209/577,581,587.ccls.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2022/10/06 12:36 PM

L11	68	(L10 L4) AND (IR infrared) near3 (three multiple plurality)	CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:36 PM
L12	37	(Artificial Intelligence) More like doc: US-3373869-A Text: (US-4136778-A OR US-6646218-B1 OR EP-1173292-A4 OR WO-0058035-A1 OR EP-1173292-A1 OR DE-2836025-A1 OR EP-0719598-A2 OR US-3206603-A OR EP-0719598-B1 OR BR-102012030533-A2 OR US-20130141115-A1 OR US-3675769-A OR JP-2013152216-A OR US-4262806-A OR CA-1113177-A OR WO-9746328-A1 OR US-6303925-B1 OR FR-2651322-A1 OR DE-2201964-A1 OR US-4528680-A).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:38 PM
L13	45	("3910701" "3939983" "4095696" "4146135" "4204950" "4281933").pn. OR ("4558786").urpn. AND	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/06 12:43 PM

L14	96	(PGPB USPT USOC).dbnm. ("3854586" "4057352" "4186836" "4203522" "4225242" "4308959" "4558786" "4609108" "4735323" "5158181" "5239176" "5241171" "5286980" "5314072" "5462176" "5464981" "5479065" "5487472" "5779058" "5791497" "5794788" "5841546" "5864210" "5873470" "5903341" "5954206" "6005346" "6013887" "6078018" "6410872").pn. OR ("6646218").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/06 12:44 PM
L15	41	(Artificial Intelligence) More like doc: WO-2021134110-A1 Text: (AU-2020418569-A1 OR WO-2020253994-A1 OR US-20220044392-A1 OR EP-3928081-A1 OR AU-2017222946-B2 OR CA-2727903-C OR CN-102066013-A OR CA-2727903-A1 OR WO-2019201786-A1 OR EA-018818-B1 OR US-20110002536-A1 OR BR-112014031102-B1 OR CN-111929410-A OR EP-1053463-A1 OR US-6100526-A OR CA-2319524-C OR JP-2003526079-A OR RU-2195644-C2 OR KR-102359036-B1 OR US-10839503-B2).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:46 PM
L16	13	(L10 L4) AND (emitter light source infrared IR) SAME ((interval time\$3 sequential) near3 (activat\$3 turn?on))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE,	OR	ON	ON	2022/10/06 12:51 PM

L17	42	(Artificial Intelligence) More like doc: US-20080308471-A1 Text: (EP-1776578-B1 OR WO-2006015965-A1 OR EP-1776578-A1 OR AT-7890-U1 OR US- 7639352-B2 OR US- 20070182956-A1 OR NO-20070647-L OR DE-3614400-C1 OR KR-100755224-B1 OR US-20150219570-A1 OR EP-1164536-B1 OR WO-2014013421-A1 OR US-9347892-B2 OR KR-20150119398-A OR WO-2009027987-A1 OR JP-6037125-B2 OR KR-102103048-B1 OR EP-2671651-A1 OR CN-1288156-A OR EP- 2671651-B1).did.	SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:53 PM
L18	23	(false near3 color) SAME (chromatic near3 channel)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:54 PM
L19	3	(false near3 color) SAME (chromatic near3 channel) AND (synthesis near3 image)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK,	OR	ON	ON	2022/10/06 12:54 PM

L20	32	((false synthesis) near3 (image color)) SAME (chromatic near3 channel)	TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 02:02 PM
L21	11	((false synthesis) near3 (image color)) SAME (chromatic near3 channel) AND (sort\$3 classify\$3 grad\$3)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 02:03 PM
L22	0	L20 AND L10	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 02:04 PM
L23	2	L20 AND (209/\$.ccls. b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2022/10/06 02:04 PM

L24	11968	((false synthesis) near3 (image color)) SAME (chromatic channel)	EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 02:07 PM
L25	18	L24 AND (209/\$.ccls. b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 02:07 PM
L26	45	(Artificial Intelligence) More like doc: DE-202021105737-U1 Text: (DE-202022103915-U1 OR US-20220118484- A1 OR DE- 102010024784-A1 OR DE-102010024784-B4 OR WO-02085547-A2 OR DE-19708457-C1 OR WO-9835764-A1 OR EP-1048363-A2 OR EP-1005398-B1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO;	OR	ON	ON	2022/10/06 02:08 PM

L27	29	CH-684742-A5 OR DE-102019132931-A1 OR DE-19736567-C1 OR EP-0475121-A2 OR DE-1919002-A1 OR DE-2901970-B1 OR DE-102020117074-A1 OR DE-19646753-A1 OR TW-I758367-B OR DE-2015123-C OR DE-1532268-C).did. (Artificial Intelligence) More like doc: WO-2018077866-A1 Text: (EP-3529593-A1 OR US-10598602-B2 OR AU-2017349176-B2 OR US-20190317023-A1 OR CA-3041403-A1 OR AU-2017349176-A1 OR CA-3041403-C OR US-10942128-B2 OR US-20200173931-A1 OR AU-2019236717-B2 OR AU-2019236717-A1 OR CN-112525856-A OR CN-109863388-B OR RU-2702803-C1 OR CN-109863388-A OR BE-1014423-A6 OR HU-E027987-T2 OR BR-112019008144-A2 OR CA-2709263-C OR EP-2234736-A2).did.	JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 02:17 PM
L28	45	("3910701" "3939983" "4095696" "4146135" "4204950" "4281933").pn. OR ("4558786").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/06 02:57 PM
L29	16	convert\$3 near3 (infrared IR) SAME ((false synthesis) near3 (image color))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/06 03:03 PM
L30	18	("3356439" "3571649" "3877797" "4045125" "4247177" "4529269" "4542959" "4740070" "4783361" "4878748" "4911546" "4952046" "4961640").pn. OR ("5157426").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/06 03:07 PM

L31	4	((false synthesis) near3 (image color)) AND L10	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 03:07 PM
L32	12526	((false synthesis) near3 (image color)) AND (g01n b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 03:09 PM
L33	533	((false synthesis) near3 (image color)) SAME (infrared) AND (g01n b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 03:09 PM
L34	0	((false synthesis) near3 (image color)) SAME ((infrared) AND (RGB chromatic) near3 (channel space) AND (g01n b07c))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL,	OR	ON	ON	2022/10/06 03:09 PM

L35	0	((false synthesis) near3 (image color)) SAME ((infrared) AND (RGB chromatic) AND (g01n b07c))	NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 03:09 PM
L36	0	((false synthesis) near3 (image color)) SAME ((infrared) AND (RGB chromatic) AND (g01n AND b07c))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 03:10 PM
L37	1	((false synthesis) near3 (image color)) SAME ((infrared) AND (RGB chromatic) AND (g01n AND b07c) L33)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 03:10 PM
L38	533	((false synthesis) near3 (image color)) SAME	(US-PGPUB; USPAT; USOCR; FIT (AP, AT,	OR	ON	ON	2022/10/06 03:11 PM

L39	35	(infrared) AND (g01n b07c)L33 "4,515,165"	AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 03:13 PM
L40	348	"4515165"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 03:13 PM
L41	21	((US-20220118484-A1 OR US-20110002536- A1 OR US- 20080308471-A1 OR US-20110317914-A1 OR US-20100110238- A1 OR US- 20150062346-A1).did. AND PGPB.dbnm.) OR ((US-10034490-B2 OR US-9463493-B1 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 06:28 PM

		US-4558786-A OR US-6646218-B1 OR US-6100488-A OR US-10883943-B2 OR US-5157426-A OR US-5782770-A).did. AND USPT.dbnm.) OR ((WO-02085547-A2 OR WO-0058035-A1).did. AND DWPI.dbnm.) OR ((US-3373869-A OR US-3206603-A).did. AND USOC.dbnm.) OR ((WO-2021134110-A1 OR WO-2018077866-A1 OR EP-0873795-A2).did. AND FTDB.dbnm.)	SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L42	1	L41 AND (optical near3 transduc\$3)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 06:29 PM
L43	8	L10 AND (optical near3 transduc\$3)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 06:29 PM
L44	0	L10 AND (optical near3 transduc\$3) SAME ingaas	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS,	OR	ON	ON	2022/10/06 06:30 PM

L45	74	(optical near3 transduc\$3) SAME ingaas	IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 06:30 PM
L46	1	L45 AND (209/\$.ccls. b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 06:30 PM
L47	74	L45	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 06:31 PM

L48	39	L45	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/06 06:31 PM
L49	1	L46 AND infrared	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/06 06:32 PM
L50	3	(optical near3 transduc\$3) SAME (ingaas AND row)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 06:32 PM
L51	97	(optical near3 transduc\$3) SAME (ingaas (indium near3 gallium))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 06:33 PM
L52	48	(optical near3 transduc\$3) SAME (ingaas (indium near3 gallium))	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/06 06:34 PM
L53	48	(optical near3 transduc\$3) SAME (ingaas (indium near3 gallium))L52	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/06 06:34 PM
L54	1	(transduc\$3) SAME (ingaas (indium near3 gallium)) AND (209/\$.cccls. b07c)	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/06 07:13 PM
L55	116	(ingaas (indium near3 gallium)) AND (209/\$.cccls. b07c)	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/06 07:13 PM
L56	1	(ingaas (indium near3 gallium)) SAME transduc\$3 AND (209/\$.cccls. b07c)	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/06 07:22 PM

L57	23	((US-20220118484-A1 OR US-20110002536-A1 OR US-20080308471-A1 OR US-20110317914-A1 OR US-20100110238-A1 OR US-20150062346-A1 OR US-20170059406-A1).did. AND PGPB.dbnm.) OR ((US-10034490-B2 OR US-9463493-B1 OR US-4558786-A OR US-6646218-B1 OR US-6100488-A OR US-10883943-B2 OR US-5157426-A OR US-5782770-A OR US-11120540-B2).did. AND USPT.dbnm.) OR ((WO-02085547-A2 OR WO-0058035-A1).did. AND DWPI.dbnm.) OR ((US-3373869-A OR US-3206603-A).did. AND USOC.dbnm.) OR ((WO-2021134110-A1 OR WO-2018077866-A1 OR EP-0873795-A2).did. AND FTDB.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 07:23 PM
L58	2	L57 AND bandpass near3 filter	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 07:23 PM
L59	2	L58	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL,	OR	ON	ON	2022/10/06 08:04 PM

L60	2	(ingaas (indium near3 gallium)) SAME transduc\$3 AND L57	NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT)	OR	ON	ON	2022/10/06 08:08 PM
L61	9	((US-20110002536-A1 OR US-20080308471-A1 OR US-20100110238-A1 OR US-20110317914-A1 OR US-20170059406-A1).did. AND PGPB.dbnm.) OR ((US-5157426-A OR US-6646218-B1 OR US-11120540-B2 OR US-4558786-A).did. AND USPT.dbnm.)	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/06 08:18 PM
L62	0	((false synthesis) near3 (image color)) SAME ((infrared) AND (RGB chromatic) AND (g01nb07c))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:10 PM
L63	60	((false synthesis) near3 (image color)) SAME ((infrared) AND (RGB chromatic)) AND (g01nb07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:10 PM
L64	34	((false synthesis) near3	(US-PGPUB; USPAT;	OR	ON	ON	2023/01/18

		(image color)) SAME ((infrared) AND (RGB chromatic) AND tim\$3) AND (g01n b07c)	USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				01:10 PM
L65	231	((false synthesis) near3 (image color)) SAME ((different interval) near3 tim\$3) AND (g01n b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:11 PM
L66	41	(Artificial Intelligence) More like doc: US-20220118484-A1 Text: (DE-202021105737-U1 OR DE-202022103915- U1 OR ES-1294896-U OR TR-2022011351-U5 OR US-20080121571- A1 OR EP-4079418-A1 OR US-20220373472- A1 OR EP-4074424-A1 OR BR-112012011848- B1 OR ES-2822334-T3 OR US-9156065-B2 OR EP-2646174-B1 OR CA-3111125-A1 OR US-20140284255-A1 OR US-20150219570- A1 OR EP-2874761-A1 OR WO-2014013421- A1 OR US-9347892-B2 OR AT-7890-U1 OR EP-1776578-A1).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:11 PM
L67	360	((false synthesis) near3 (image color)) SAME	(US-PGPUB; USPAT; USOCR; FIT (AP, AT,	OR	ON	ON	2023/01/18 01:18 PM

L68	8053	((different interval period) near3 tim\$3) AND (g01n b07c)	AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:20 PM
L69	2	((false synthesis) near3 (image color)) SAME ((different interval period) near3 tim\$3) AND L68	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:20 PM
L70	37	((false synthesis) near3 (image color)) SAME ((different interval period) near3 tim\$3 AND (infrared IR)) AND (g01n b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE,	OR	ON	ON	2023/01/18 01:26 PM

L71	25	"505866".ap.	SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L72	7	(joseph near3 rodriguez) AND optical near3 (sort\$3 separat\$3 classify\$3) SAME (IR infrared)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L73	7250	B07C1/02.cpc. b07c5/3425.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L74	60	L3 AND (IR infrared) near3 (three multiple plurality)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2023/01/18 01:32 PM

L75	28	(Artificial Intelligence) More like doc: US-10034490-B2 Text: (US-20170079315-A1 OR AU-2015252972-A1 OR AU-2015252972-B2 OR EP-3139771-B1 OR WO-2015168495-A1 OR EP-3139771-A1 OR CA-2947286-A1 OR CA-2947286-C OR US- 20150314335-A1 OR US-9364866-B2 OR US-20160207048-A1 OR US-9968937-B2 OR BR-112016025217-A2 OR US-677789-A OR US-8227012-B2 OR EP-3139771-A4 OR CA-2315859-C OR US- 6398036-B1 OR US- 5699724-A OR US- 5733592-A).did.	CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L76	55	(Artificial Intelligence) More like doc: DE-202021105737-U1 Text: (DE-202022103915-U1 OR US-20220118484- A1 OR DE- 102010024784-A1 OR DE-102010024784-B4 OR CN-114729901-A OR WO-02085547-A2 OR EP-4074424-A1 OR EP-4079418-A1 OR US-20220373472-A1 OR WO-9835764-A1 OR JP-2021085846-A OR EP-1048363-A2 OR BR-112012011848-B1 OR EP-1005398-B1 OR CH-684742-A5 OR ES- 2822334-T3 OR RU-	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM

L77	992	2737607-C1 OR WO-2006015965-A1 OR EP-1776578-A1 OR DE-102019132931-A1).did. 209/577,581.ccls.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L78	74	(L7 L4) AND (IR infrared) near3 (three multiple plurality)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L79	5	(uzzo near3 andrea).inv.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L80	1922	209/577,581,587.ccls.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2023/01/18 01:32 PM

L81	75	(L10 L4) AND (IR infrared) near3 (three multiple plurality)	CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L82	33	(Artificial Intelligence) More like doc: US-3373869-A Text: (US-6646218-B1 OR EP-1173292-A4 OR WO-0058035-A1 OR EP-1173292-A1 OR DE-2836025-A1 OR EP-0719598-A2 OR US-5779058-A OR EP-0719598-B1 OR BR-102012030533-A2 OR DE-3015468-C2 OR US-20130141115-A1 OR DD-150158-A5 OR JP-2013152216-A OR US-4262806-A OR EP-0902732-A1 OR CA-1113177-A OR US-6303925-B1 OR DE-3015468-A1 OR FR-2651322-A1 OR US-3216568-A).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L83	46	("3910701" "3939983" "4095696" "4146135" "4204950" "4281933").pn. OR ("4558786").urpn. AND	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/01/18 01:32 PM

L84	96	(PGPB USPT USOC).dbnm. ("3854586" "4057352" "4186836" "4203522" "4225242" "4308959" "4558786" "4609108" "4735323" "5158181" "5239176" "5241171" "5286980" "5314072" "5462176" "5464981" "5479065" "5487472" "5779058" "5791497" "5794788" "5841546" "5864210" "5873470" "5903341" "5954206" "6005346" "6013887" "6078018" "6410872").pn. OR ("6646218").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/01/18 01:32 PM
L85	36	(Artificial Intelligence) More like doc: WO-2021134110-A1 Text: (AU-2020418569-A1 OR EP-4081783-A1 OR US-20220412884-A1 OR WO-2023272338- A1 OR WO- 2020253994-A1 OR US-20220044392-A1 OR EP-3928081-A1 OR US-8227719-B2 OR EP-2296831-A1 OR WO-2009155706-A1 OR CA-2727903-C OR CN-102066013-A OR CA-2727903-A1 OR US-20110094946-A1 OR WO-2019201786- A1 OR EA-018818-B1 OR EP-4091425-A1 OR US-20110002536-A1 OR BR-112014031102- B1 OR US- 20220375115-A1).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L86	13	(L10 L4) AND (emitter light source infrared IR) SAME ((interval time\$3 sequential) near3 (activat\$3 turn?on))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL,	OR	ON	ON	2023/01/18 01:32 PM

L87	42	(Artificial Intelligence) More like doc: US-20080308471-A1 Text: (EP-1776578-B1 OR WO-2006015965-A1 OR EP-1776578-A1 OR AT-7890-U1 OR US- 7639352-B2 OR US- 20070182956-A1 OR NO-20070647-L OR DE-3614400-C1 OR KR-100755224-B1 OR US-20150219570-A1 OR EP-1164536-B1 OR WO-2014013421-A1 OR US-9347892-B2 OR WO-2009027987-A1 OR JP-2014157119-A OR JP-6037125-B2 OR KR-102103048-B1 OR EP-2671651-A1 OR CN-1288156-A OR EP- 2671651-B1).did.	PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L88	23	(false near3 color) SAME (chromatic near3 channel)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L89	3	(false near3 color) SAME (chromatic near3 channel) AND (synthesis near3 image)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO,	OR	ON	ON	2023/01/18 01:32 PM

L90	32	((false synthesis) near3 (image color)) SAME (chromatic near3 channel)	RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L91	11	((false synthesis) near3 (image color)) SAME (chromatic near3 channel) AND (sort\$3 classify\$3 grad\$3)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L92	0	L20 AND L10	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L93	2	L20 AND (209/\$.ccls. b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2023/01/18 01:32 PM

L94	12431	((false synthesis) near3 (image color)) SAME (chromatic channel)	CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L95	18	L24 AND (209/\$.ccls. b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L96	55	(Artificial Intelligence) More like doc: <u>DE-202021105737-U1</u> Text: (DE-202022103915-U1 OR US-20220118484- A1 OR DE- 102010024784-A1 OR DE-102010024784-B4 OR CN-114729901-A OR WO-02085547-A2 OR EP-4074424-A1 OR EP-4079418-A1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA,	OR	ON	ON	2023/01/18 01:32 PM

L97	28	US-20220373472-A1 OR WO-9835764-A1 OR JP-2021085846-A OR EP-1048363-A2 OR BR-112012011848-B1 OR EP-1005398-B1 OR CH-684742-A5 OR ES- 2822334-T3 OR RU- 2737607-C1 OR WO- 2006015965-A1 OR EP-1776578-A1 OR DE-102019132931- A1).did. (Artificial Intelligence) More like doc: WO-2018077866-A1 Text: (EP-3529593-A1 OR US-10598602-B2 OR AU-2017349176-B2 OR US-20190317023-A1 OR CA-3041403-A1 OR AU-2017349176-A1 OR CA-3041403-C OR US- 10942128-B2 OR US- 20200173931-A1 OR AU-2019236717-B2 OR AU-2019236717-A1 OR CN-112525856-A OR CN-109863388-B OR RU-2702803-C1 OR CN-109863388-A OR BE-1014423-A6 OR BR-112019008144-A2 OR WO-0231473-A1 OR EP-1332353-A1 OR US-6864970-B1).did.	VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L98	46	("3910701" "3939983" "4095696" "4146135" "4204950" "4281933").pn. OR ("4558786").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/01/18 01:32 PM
L99	16	convert\$3 near3 (infrared IR) SAME ((false synthesis) near3 (image color))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/01/18 01:32 PM
L100	18	("3356439" "3571649" "3877797" "4045125" "4247177" "4529269" "4542959" "4740070" "4783361" "4878748" "4911546" "4952046" "4961640").pn. OR ("5157426").urpn. AND	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2023/01/18 01:32 PM

		(PGPB USPT USOC).dbnm.					
L101	4	((false synthesis) near3 (image color)) AND L10	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L102	12935	((false synthesis) near3 (image color)) AND (g01n b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L103	551	((false synthesis) near3 (image color)) SAME (infrared) AND (g01n b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L104	0	((false synthesis) near3 (image color)) SAME ((infrared) AND (RGB chromatic) near3 (channel space) AND (g01n b07c))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	OR	ON	ON	2023/01/18 01:32 PM

L105	0	((false synthesis) near3 (image color)) SAME ((infrared) AND (RGB chromatic) AND (g01n b07c))	HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L106	0	((false synthesis) near3 (image color)) SAME ((infrared) AND (RGB chromatic) AND (g01n AND b07c))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L107	1	((false synthesis) near3 (image color)) SAME ((infrared) AND (RGB chromatic) AND (g01n AND b07c) L33)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT;	OR	ON	ON	2023/01/18 01:32 PM

L108	551	((false synthesis) near3 (image color)) SAME (infrared) AND (g01n b07c)L33	IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L109	35	"4,515,165"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L110	350	"4515165"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L111	21	((US-20220118484-A1 OR US-20110002536-A1 OR US-20080308471-A1 OR US-20110317914-A1 OR US-20100110238-A1 OR US-20150062346-A1).did.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV,	OR	ON	ON	2023/01/18 01:32 PM

		AND PGPB.dbnm.) OR ((US-10034490-B2 OR US-9463493-B1 OR US-4558786-A OR US- 6646218-B1 OR US- 6100488-A OR US- 10883943-B2 OR US- 5157426-A OR US- 5782770-A).did. AND USPT.dbnm.) OR ((WO-02085547-A2 OR WO-0058035-A1).did. AND DWPI.dbnm.) OR ((US-3373869-A OR US-3206603-A).did. AND USOC.dbnm.) OR ((WO-2021134110-A1 OR WO-2018077866- A1 OR EP-0873795- A2).did. AND FTDB.dbnm.)	MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L112	1	L41 AND (optical near3 transduc\$3)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L113	8	L10 AND (optical near3 transduc\$3)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L114	0	L10 AND (optical near3 transduc\$3) SAME ingaas	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2023/01/18 01:32 PM

L115	74	(optical near3 transduc\$3) SAME ingaas	CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L116	1	L45 AND (209/\$.ccls. b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L117	74	L45	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM

L118	39	L45	WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT)	OR	ON	ON	2023/01/18 01:32 PM
L119	1	L46 AND infrared	(US-PGPUB; USPAT)	OR	ON	ON	2023/01/18 01:32 PM
L120	3	(optical near3 transduc\$3) SAME (ingaas AND row)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L121	98	(optical near3 transduc\$3) SAME (ingaas (indium near3 gallium))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L122	48	(optical near3 transduc\$3) SAME (ingaas (indium near3 gallium))	(US-PGPUB; USPAT)	OR	ON	ON	2023/01/18 01:32 PM
L123	48	(optical near3 transduc\$3) SAME (ingaas (indium near3 gallium))L52	(US-PGPUB; USPAT)	OR	ON	ON	2023/01/18 01:32 PM
L124	1	(transduc\$3) SAME (ingaas (indium near3 gallium)) AND (209/\$.ccls. b07c)	(US-PGPUB; USPAT)	OR	ON	ON	2023/01/18 01:32 PM
L125	117	(ingaas (indium near3 gallium)) AND (209/\$.ccls. b07c)	(US-PGPUB; USPAT)	OR	ON	ON	2023/01/18 01:32 PM
L126	1	(ingaas (indium near3	(US-PGPUB; USPAT)	OR	ON	ON	2023/01/18

L127	23	gallium)) SAME transduc\$3 AND (209/\$.cccls. b07c) ((US-20220118484-A1 OR US-20110002536-A1 OR US-20080308471-A1 OR US-20110317914-A1 OR US-20100110238-A1 OR US-20150062346-A1 OR US-20170059406-A1).did. AND PGPB.dbnm.) OR ((US-10034490-B2 OR US-9463493-B1 OR US-4558786-A OR US-6646218-B1 OR US-6100488-A OR US-10883943-B2 OR US-5157426-A OR US-5782770-A OR US-11120540-B2).did. AND USPT.dbnm.) OR ((WO-02085547-A2 OR WO-0058035-A1).did. AND DWPI.dbnm.) OR ((US-3373869-A OR US-3206603-A).did. AND USOC.dbnm.) OR ((WO-2021134110-A1 OR WO-2018077866-A1 OR EP-0873795-A2).did. AND FTDB.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	01:32 PM 2023/01/18 01:32 PM
L128	2	L57 AND bandpass near3 filter	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L129	2	L58	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB,	OR	ON	ON	2023/01/18 01:32 PM

			HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L130	2	(ingaas (indium near3 gallium)) SAME transduc\$3 AND L57	(US-PGPUB; USPAT)	OR	ON	ON	2023/01/18 01:32 PM
L131	9	((US-20110002536-A1 OR US-20080308471-A1 OR US-20100110238-A1 OR US-20110317914-A1 OR US-20170059406-A1).did. AND PGPB.dbnm.) OR ((US-5157426-A OR US-6646218-B1 OR US-11120540-B2 OR US-4558786-A).did. AND USPT.dbnm.)	(US-PGPUB; USPAT)	OR	ON	ON	2023/01/18 01:32 PM
L132	0	((false synthesis) near3 (image color)) SAME ((infrared) AND (RGB chromatic) AND (g01nb07c))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L133	60	((false synthesis) near3 (image color)) SAME ((infrared) AND (RGB chromatic)) AND (g01nb07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT;	OR	ON	ON	2023/01/18 01:32 PM

L134	34	((false synthesis) near3 (image color)) SAME ((infrared) AND (RGB chromatic) AND tim\$3) AND (g01n b07c)	IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L135	231	((false synthesis) near3 (image color)) SAME ((different interval) near3 tim\$3) AND (g01n b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L136	41	(Artificial Intelligence) More like doc: <u>US-20220118484-A1</u> Text: (DE-202021105737-U1 OR DE-202022103915-U1 OR ES-1294896-U OR TR-2022011351-U5 OR US-20080121571-A1 OR EP-4079418-A1 OR US-20220373472-A1 OR EP-4074424-A1 OR BR-112012011848-B1 OR ES-2822334-T3 OR US-9156065-B2 OR EP-2646174-B1 OR CA-3111125-A1 OR US-20140284255-A1 OR US-20150219570-A1 OR EP-2874761-A1 OR WO-2014013421-A1 OR US-9347892-B2 OR AT-7890-U1 OR EP-1776578-A1).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM

L137	360	((false synthesis) near3 (image color)) SAME ((different interval period) near3 tim\$3) AND (g01n b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L138	8053	L3 L7	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L139	2	((false synthesis) near3 (image color)) SAME ((different interval period) near3 tim\$3) AND L68	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2023/01/18 01:32 PM
L140	37	((false synthesis) near3 (image color)) SAME ((different interval period) near3 tim\$3 AND (infrared IR)) AND (g01n b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL,	OR	ON	ON	2023/01/18 01:32 PM

			NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
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PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.



ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
17/505,866

RECEIPT DATE / TIME
01/11/2023 05:40:02 AM ET

ATTORNEY DOCKET #
SHJ943-US

Title of Invention

SELECTOR MACHINE

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
 under 35 USC 111(a)

PATENT # -

CONFIRMATION # 7769

FILED BY Avi Jencmen

PATENT CENTER # 61418197

FILING DATE 10/20/2021

CUSTOMER # 150161

FIRST NAMED
INVENTOR Andrea UZZO

CORRESPONDENCE
ADDRESS -

AUTHORIZED BY -

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
SHJ943-US_Response_Office_Action.pdf	11	Amendment/Request for Reconsideration-After Non-Final Rejection	69 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
SHJ943-US_Response_Office_Action.pdf	0D703F973FB837D9DB948DE141144F90B8AB3E35862F981B24307D868BA3159C7345B45D1511E94EB253874D064BAEAF47FE8684E05D2FDB07D54E79AEAEF71B

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s):	Andrea UZZO	Examiner:	RODRIGUEZ, JOSEPH C
Serial No.:	17/505,866	Group Art Unit:	3653
Filed:	20-10-2021	Confirmation No.	7769
Title:	SELECTOR MACHINE		

Mail Stop Amendments
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

RESPONSE UNDER 37 C.F.R. §1.111

Dear Sir/Ma'am:

In response to the Non-Final Office Action dated October 13, 2022, applicant hereby submits the following remarks. Reconsideration of the application is respectfully requested.

Kindly amend the above-identified application as follows:

Listing of the claims begin on page **2** of this paper.

Remarks/Arguments begin on page **6** of this paper.

LISTING OF THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

What is claimed is:

1. (Currently Amended) A selector machine, comprising:

- a conveyance system ~~(2)~~, which is arranged for advancing, along an advancement path ~~(A)~~, at least one bulk product comprising multiple solid elements to be selected;
- an optical detection system ~~(3)~~ comprising:
 - an emitter device ~~(4)~~ arranged for emitting, towards said advancement path ~~(A)~~, electromagnetic radiations ~~(40)~~ adapted to hit said at least one product;
 - an optical sensor ~~(5)~~ directed towards said advancement path ~~(A)~~ and arranged for receiving reflected radiations ~~(RF)~~ coming from said at least one product irradiated by said electromagnetic radiations ~~(40)~~, and for transducing said reflected radiations ~~(RF)~~ into corresponding measurement signals;
 - an electronic control unit ~~(6)~~ operatively connected to said optical sensor ~~(5)~~ in order to receive said measurement signals, and arranged for emitting control signals;
- an expulsion device ~~(7)~~ connected to said optical detection system ~~(3)~~ in order to receive said control signals, which are adapted to drive said expulsion device ~~(7)~~ to eliminate, from said advancement path ~~(A)~~, specific solid elements of said at least one product;

wherein:

- said emitter device ~~(4)~~ comprises at least three IR sources ~~(8)~~, each of which is arranged for emitting electromagnetic radiations ~~(40)~~ in a corresponding separate spectral band ~~(80)~~ in the infrared spectrum;
- said electronic control unit ~~(6)~~ is operatively connected to said emitter device ~~(4)~~ and is arranged for alternately turning on said IR sources ~~(8)~~ one after the other, in corresponding

and separate time intervals (~~T_{ON}~~);

- said optical sensor (~~5~~) is arranged for detecting, in each said time interval (~~T_{ON}~~), corresponding said reflected radiations (~~RF~~) coming from said at least one product irradiated by the corresponding said IR source (~~8~~), and to generate corresponding said measurement signals;
- said electronic control unit (~~6~~) comprises a processing module (~~9~~), which is provided with at least three chromatic channels (~~10~~) of a RGB color space and is arranged for associating the measurement signals corresponding to each said IR source (~~8~~) with a corresponding chromatic channel of said chromatic channels (~~10~~) ~~in order to compose~~ and for composing a false color synthesis image of said at least one product by means of three said measurement signals acquired every three successive said time intervals; said electronic control unit (~~6~~) being configured to generate said control signals as a function of said synthesis image.

2. (Currently Amended) The selector machine of claim 1, wherein the spectral band (~~80~~) of the electromagnetic radiations (~~40~~) emitted by each said IR source (~~8~~) is contained within the short wave infrared spectrum.

3. (Currently Amended) The selector machine of claim 1, wherein the wavelengths of said spectral band (~~80~~) are substantially comprised between 900 nm and 2200 nm.

4. (Currently Amended) The selector machine of claim 1, wherein said optical sensor (~~5~~) comprises at least one row of optical transducers (~~5'~~) extended along an extension direction (~~X~~) substantially transverse to said advancement path (~~A~~).

5. (Currently Amended) The selector machine of claim 4, wherein said optical transducers ~~(5')~~ are InGaAs solid state transducers.

6. (Currently Amended) The selector machine of claim 1, wherein each said IR source ~~(8)~~ comprises at least one LED ~~(8')~~.

7. (Currently Amended) The selector machine of claim 6, wherein each said IR source ~~(8)~~ comprises at least one row of LEDs ~~(8')~~; wherein said at least one row of LEDs ~~(8')~~ is extended along an extension direction ~~(Y)~~ substantially transverse to said advancement direction ~~(A)~~.

8. (Currently Amended) The selector machine of claim 4, wherein each said IR source ~~(8)~~ comprises multiple rows of LED ~~(8')~~;
wherein said rows of LED ~~(8')~~ are placed with said extension directions ~~(Y)~~ substantially parallel to the extension direction ~~(X)~~ of said rows of optical transducers ~~(5')~~.

9. (Currently Amended) The selector machine of claim 1, wherein said optical sensor ~~(5)~~ has an acquisition frequency substantially comprised between 15 and 25 kHz.

10. (Currently Amended) The selector machine of claim 1, wherein said electronic control unit ~~(6)~~ is arranged for sending, to said IR sources ~~(8)~~, trigger signals ~~(60, 60')~~ synchronized with said processing module ~~(9)~~.

11. (Currently Amended) The selector machine of claim 1, further comprising a bandpass filter ~~(11)~~ provided with at least three narrow spectral bands ~~(110)~~, each of which extended

for a subset of wavelengths of the spectral band ~~(80)~~ of a corresponding said IR source ~~(8)~~; said bandpass filter ~~(11)~~ being positioned in a manner such to intercept said electromagnetic radiations ~~(40)~~ emitted by said IR sources ~~(8)~~ or said reflected radiations ~~(RF)~~ coming from said at least one product.

12. (Currently Amended) The selector machine of claim 11, wherein said bandpass filter ~~(11)~~ is positioned between said advancement path ~~(A)~~ and said optical sensor ~~(5)~~ in order to intercept the reflected radiations ~~(RF)~~ coming from said at least one product.

13. (Currently Amended) The selector machine of claim 11, wherein said bandpass filter ~~(11)~~ is positioned between said advancement path ~~(A)~~ and said optical sensor ~~(5)~~ in order to intercept the reflected radiations ~~(RF)~~ coming from said at least one product; wherein said bandpass filter ~~(11)~~ is mounted on said optical sensor ~~(5)~~.

14. (Currently Amended) The selector machine of claim 11, wherein each said narrow spectral band ~~(110)~~ of said bandpass filter ~~(11)~~ has a bandwidth ~~(111)~~ substantially comprised between 15 and 35 nm.

15. (Currently Amended) The selector machine of claim 11, wherein the narrow spectral bands ~~(110)~~ of said bandpass filter ~~(11)~~ are not overlapped on each other.

REMARKS

The present response is intended to be fully responsive to all points of objection raised by the Examiner and is believed to place the application in condition for allowance.

I. Status of Claims

Claims 1-15 are pending.

Claim 1 has been amended in order to add the following limitations:

“for composing a false color synthesis image of said at least one product] by means of three said measurement signals acquired every three successive said time intervals”.

This amendment is supported, for example, by the specification on page 11 lines 7-8 and on page 12 lines 22-23.

Claims 1-15 have been further amended by deleting the reference signs in order to be in line with US practice.

II. Claim Rejections under 35 USC § 103

Claims 1-3, 6, 7 and 9-10 are rejected under 35 U.S.C. 103 as being unpatentable over Lane (US 4,558,786) in view of Kronberg (US 5,157,026).

The Applicant respectfully believes that the amended claim 1 overcomes the Examiner's rejections for the following reasons:

In summary, the subject matter of claim 1 is a selector machine arranged for turning on, cyclically, three different IR sources 8 one after the other, in three separate time intervals T_{ON} , and for detecting three corresponding measurement signals of the light reflected by the products. For each group of measurement signals (detected in three successive time intervals), the processing module 9 of the machine generate a false color synthesis image of the product, for driving the expulsion device 7.

Specifically, the electronic control unit 6 of the machine turns on, in a first time interval $T_{ON}(1)$, a first of the three IR sources 8 (with the other IR sources 8 inactive), and the reflected radiations RF coming from the product is acquired by the optical sensor 5 to generate a measurement signal. This measurement signal, is mapped (by means of the processing module 9) on a first of the three chromatic channels 10 (e.g., the red R in the RGB color space). In a successive second time interval $T_{ON}(2)$, a second of the IR sources 8 is turned on (with the other ones turned off), so that the optical sensor 5 generates a second measurement signal which is associated with a second of the chromatic channels 10 (e.g., the green G). In a successive third time interval $T_{ON}(3)$, a third of the IR sources 8 is turned on (with the other ones turned off), so that the optical sensor 5 generates a third measurement signal that is mapped with a third of the chromatic channels 10 (e.g., the blue B). Such sequential activation of the IR sources is cyclically repeated.

Thus, the false color synthesis image is processed every three successive time intervals T_{ON} , since this image is generated by means of three measurement signals acquired in time intervals T_{ON} in sequence.

This claimed arrangement allows an easy and efficient way to generate a false color synthesis image to select the products.

No prior art of record teaches or suggests to generate a false color synthesis image by processing *“three said measurement signals acquired every three successive said time intervals”*.

In detail, Lane discloses an electro-optical sorter comprising a control system which produces a series of pulses for driving four groups of LEDs 14, 19, 21, 22 to generate a sequence of illumination pulses. Specifically, each group of LEDs emits light at a corresponding wavelength, i.e.: a first infrared wavelength IR1 (800 nm), a second infrared wavelength IR2 (990 nm), a red wavelength (660 nm), and a green wavelength (550 nm).

The sorter of Lane also comprises a detector 18 which detects the light reflected by the products to be selected when each group of LEDs is turned on.

The measurements of first infrared wavelength IR1 are compared with a threshold by a threshold comparator to determine if an object is present (see col. 3, lines 10-17). Also, the measurements of the two infrared wavelengths IR1 and IR2 are compared (by an organic/inorganic comparator) to determine if the object is organic or inorganic (see col. 3, lines 18-22). Further, the measurements of the two visible light wavelengths (red and green) are compared (by a color comparator) to determine if the object is ripe or unripe (see col. 3, lines 22-25).

Therefore, Lane merely teaches to compare the values of two different infrared wavelengths IR1 and IR2 and, thus, does not give any prompt to use this information to generate a false color synthesis image.

In particular, Lane does not disclose at least that:

“said electronic control unit (6) comprises a processing module (9), which is provided with at least three chromatic channels (10) of a RGB color space and is arranged for associating the measurement signals corresponding to each said IR source (8) with a corresponding chromatic channel of said chromatic channels (10), and for composing a false color synthesis image of said at least one product by means of three said measurement signals acquired every three successive said time intervals; said electronic control unit (6) being configured to generate said control signals as a function of said synthesis image”.

Kronberg discloses a false color viewing device made by a pair of goggles having lenses provided with specific filters to select the wavelengths of interest.

In the “Discussion of the Background”, Kronberg briefly talks about the “false color” technique, and in particular about the “near-infrared false color”, wherein each channels map a primary color adjacent to its own, i.e. “near-infrared” is mapped as red, “red” is mapped as green, “green” is mapped as blue, and the blue wavelengths are not used.

In particular, on column 2 lines 1-10, Kronberg discloses two methods for producing near-infrared false images.

In a first method, a specialized color video camera acquires infrared, red and green signals and sends them to red, green and blue channels, respectively, of a monitor. Thus, a multi-spectral camera is used, which detects simultaneously all the bands of the electromagnetic spectrum, and is provided with a series of filters each selecting a corresponding wavelength (e.g., IR, red, or green) to be processed.

In a second method, a photographic process uses an infrared sensitive film to obtain an infrared photograph, which is then combined with other visible photographs in the same film.

The second method disclosed in Kronberg is a photographic process that requires the use of photographic films to obtain the photos, so that it can't be in any way adopted in the selector of Lane which needs an electronic processing of digital data to work.

The first method disclosed in Kronberg uses a multi-spectral camera which detects simultaneously (in the same time interval) all the spectral bands, and uses optical filter to select the desired wavelength.

Therefore, differently from the claimed solution, this first method of Kronberg does not teach to *“composing a false color synthesis image [...] by means of three said measurement signals acquired every three successive said time intervals”*, because, on the contrary, the multi-spectral camera used in Kronberg acquires at the same time the measurement signals of all the spectral bands (and then determines the spectral bandwidth of interest by means of optical filters).

Furthermore, as discussed above, Lane teaches merely to compare the values of the different IR signals and does not give any prompt to use them to generate a false color image.

Therefore, if the skilled person wanted to adopt the “false color” technique in the sorter of Lane, he/she at most would apply the multispectral camera of Kronberg which acquires simultaneously the measurement signals of all the spectral bands.

Thus, the so modified sorter would not comprise the claimed features concerning *“a processing module (9) [...] arranged for composing a false color synthesis image of said at least one product by means of three said measurement signals acquired every three successive said time intervals”*.

The applicant would like to point out that this claimed configuration is not a mere variation of common design parameters, because it can't be derived by simply changing the number of emitter and/or the respective light frequencies, but it is necessary to arrange a specific configuration wherein the measurement signals of every three successive time intervals are associated to the corresponding three chromatic channels to generate a false color synthesis image.

No prior art of record teaches or suggest to arrange this configuration, so that it can't be derive by the skilled person by means of predictable variations of known machines.

For the abovementioned reasons, the Applicant respectfully submits that amended claim 1 is patentable over the prior art of record.

As claims 2-15 depend directly on claim 1, and since claim 1 is novel and non-obvious over the cited references, claims 2-15, by virtue of their dependency, are also novel and non-obvious over these cited references.

In the above discussion of the allowability of the claims, and particularly but not exclusively in the above discussion of the allowability of the dependent claims based on the allowability of the respective base claims, discussion of other arguments for allowability of the claims has been omitted in the interest of brevity and clarity. Should a further Official Action issue rejecting one or more claims, Applicants reserves the right to present further arguments.

It is respectfully submitted that the claims are in condition for allowance. Prompt notice of allowance is respectfully and earnestly solicited.

Should the Examiner wish to call the undersigned, it is kindly requested that the Examiner calls between 8:00-13:00 EST (15:00-20:00 Israel time).

Respectfully Submitted,
/AVI AVRAHAM JENCMEN/

AVI AVRAHAM JENCMEN
Agent for the Applicant
Reg. No. 76,188

Dated: January 11, 2023

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 17/505,866	Filing Date 10/20/2021	☐ To be Mailed
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ENTITY: ☐ LARGE ☒ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE (\$)	FEE (\$)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 = *		x \$50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 = *		x \$240 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)	RATE (\$)	ADDITIONAL FEE (\$)	
AMENDMENT	01/11/2023	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA			
	Total (37 CFR 1.16(i))	* 15	Minus	** 20	= 0	x \$40 =	0	
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0	x \$192 =	0	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
						TOTAL ADD'L FEE	0	
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA			
	Total (37 CFR 1.16(i))	*	Minus	**	=	x \$0 =		
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x \$0 =		
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
						TOTAL ADD'L FEE		
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.						SLIE		
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".						/TONGELINA C TUBBS/		
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".								
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
17/505,866	10/20/2021	Andrea UZZO	SHJ943-US	7769
150161	7590	10/13/2022	EXAMINER	
Avi Avraham Jencmen 17 Yizhak Rabin St Modiin, 7174906 ISRAEL			RODRIGUEZ, JOSEPH C	
			ART UNIT	PAPER NUMBER
			3653	
			NOTIFICATION DATE	DELIVERY MODE
			10/13/2022	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102 of this title, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 6, 7 and 9-10 are rejected under 35 U.S.C. 103 as being unpatentable over Lane (US 4,558,786) in view of Kronberg (US 5,157,426) and legal precedent.

Lane (fig. 1-6) teaches a selector machine comprising:

(re: certain elements of claim 1) a conveyance system (near 23), which is arranged for advancing, along an advancement path (fig. 1),

at least one bulk product comprising multiple solid elements to be selected (col. 11, ln. 10-35);

an optical detection system (3) comprising:

an emitter device (near 14) arranged for emitting, towards said advancement path, electromagnetic radiations adapted to hit said at least one product (col. 5);

an optical sensor (near 17, 18) directed towards said advancement path and arranged for receiving reflected radiations coming from said at least one product irradiated by said electromagnetic radiations, and for transducing said reflected radiations into corresponding measurement signals (col. 5, ln. 45+);

an electronic control unit operatively connected to said optical sensor in order to receive said measurement signals, and arranged for emitting control signals (fig. 1-3 showing various control circuitry; col. 3 teaching various how various control circuitry elements are employed to make logic determinations to control sorting);

an expulsion device (near 33, 44, 37) connected to said optical detection system in order to receive said control signals, which are adapted to drive said expulsion device to eliminate, from said advancement path, specific solid elements of said at least one product (fig. 1; col. 11, ln. 1-10);

wherein: said emitter device comprises at least two IR sources, each of which is arranged for emitting electromagnetic radiations in a corresponding separate spectral band in the infrared spectrum (col. 5-6);

said electronic control unit is operatively connected to said emitter device and is arranged for alternately turning on said IR sources one after the other, in corresponding and separate time intervals (Id.);

said optical sensor is arranged for detecting, in each said time interval, corresponding said reflected radiations coming from said at least one product irradiated by the corresponding said IR source, and to generate corresponding said measurement signals (Id.);

(re: claim 2) wherein the spectral band of the electromagnetic radiations emitted by each said IR source is contained within the short wave infrared spectrum (col. 5-6);

(re: claim 3) wherein the wavelengths of said spectral band are substantially comprised between 900 nm and 2200 nm (col. 4 and col. 8 teaching that *additional* test frequencies in the deep infrared range down to 2000 nm may be used);

(re: claim 6) wherein each said IR source (8) comprises at least one LED (8');

(re: claim 7) wherein each said IR source comprises at least one row of LEDs;

wherein said at least one row of LEDs is extended along an extension direction (Y) substantially transverse to said advancement direction (fig. 4 and col. 6 teaching rows of LEDs);

(re: certain elements of claim 8) wherein each said IR source comprises multiple rows of LED;

wherein said rows of LED are placed with said extension directions substantially parallel to the extension direction of said rows of optical transducers (Id.);

(re: claim 10) wherein said electronic control unit is arranged for sending, to said IR sources, trigger signals synchronized with said processing module (col. 3 teaching various how various control circuitry elements are employed to make logic determinations to control sorting).

Lane as set forth above teaches all that is claimed except for expressly teaching

(re: certain elements of claim 1) said emitter device comprises at least three IR sources;

said electronic control unit comprises a processing module, which is provided with at

least three chromatic channels of a RGB color space and is arranged for

associating the measurement signals corresponding to each said IR source with

a corresponding chromatic channel of said chromatic channels in order to

compose a false color synthesis image of said at least one product;

said electronic control unit being configured to generate said control signals as a

function of said synthesis image;

(re: claim 9) wherein said optical sensor has an acquisition frequency substantially

comprised between 15 and 25 kHz.

Here, it is noted that Lane already teaches that the system can be configured to sort different

objects by adding more emitting devices at different frequencies (col. 5, ln. 45+ and col.

11, ln. 10-35 teaching that system may be adapted to use test frequencies in the deep infrared range down to 2000 nm).

Kronberg further teaches that it is well-known in the optical analysis arts to use a false color

synthesis image to assist in distinguishing objects being analyzed in the IR ranges (col.

1, ln. 30+ teaching mapping of multiple IR values into RGB color space).

Further, the claimed features relating to the specific number of emitters and respective frequencies can be regarded as common design parameters/operating variables controlled by the design incentives and/or economic considerations involved in this type of subject matter. This is especially applicable in the optical sorting arts as the type of material to be sorted controls variations in the specific device. Moreover, legal precedent teaches that variations in these type of common design parameters/variables are obvious and that said parameters can be recognized as result-effective variables whose optimization would be known to one with ordinary skill in the art. See MPEP 2144.04.IV (teaching that changes in size, proportion or shape of known elements are obvious); 2144.04.V.D. and VI (teaching that the mere rearrangement or duplication of known elements, or making known elements adjustable, is not a patentable advance); 2144.05 I.II (ample motivation to optimize or modify result-effective variables based on “design need(s)” or “market demand”).

It would thus be obvious to one with ordinary skill in the art to modify the base reference with these prior art teachings to arrive at the claimed invention. The rationale for this obviousness determination can be found in the prior art itself as cited above and in legal precedent as described above. Further, the prior art discussed and cited demonstrates the level of sophistication of one with ordinary skill in the art and that these modifications are predictable variations that would be within this skill level. Therefore, it would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to modify the invention of Lane for the reasons set forth above.

Claims 4, 5, 8 and 11-15 are rejected under 35 U.S.C. 103 as being unpatentable over Lane, Kronberg and legal precedent (“Lane et al.”) as applied to the claims above, and further in

view of Thomasson et al. ("Thomasson")(US 2011/0002536) and Pelletier et al. ("Pelletier")(US 2017/0059406).

Lane et al. as set forth above teach all that is claimed except for expressly teaching

(re: claim 4) wherein said optical sensor comprises at least one row of optical transducers extended along an extension direction substantially transverse to said advancement path;

(re: claim 5) wherein said optical transducers are InGaAs solid state transducers;

(re: claim 11) comprising a bandpass filter provided with at least three narrow spectral bands, each of which extended for a subset of wavelengths of the spectral band of a corresponding said IR source;

said bandpass filter being positioned in a manner such to intercept said electromagnetic radiations emitted by said IR sources or said reflected radiations (RF) coming from said at least one product;

(re: claim 12) wherein said bandpass filter is positioned between said advancement path and said optical sensor in order to intercept the reflected radiations (RF) coming from said at least one product.

(re: claim 13) wherein said bandpass filter is positioned between said advancement path (A) and said optical sensor in order to intercept the reflected radiations (RF) coming from said at least one product; wherein said bandpass filter is mounted on said optical sensor;

(re: claim 14) wherein each said narrow spectral band of said bandpass filter has a bandwidth substantially comprised between 15 and 35 nm;

(re: claim 15) wherein the narrow spectral bands of said bandpass filter are not overlapped on each other.

Pelletier, however, teaches that it is well-known in the optical analysis arts to use an InGaSa optical transducer (fig. 1; para. 28-31).

Thomasson further teaches that it is well-known to bandpass filters in the claimed IR ranges
(para. 40)

Further, the claimed features relating to the type of optical sensors, spectral bands or positioning of the bandpass filters can be regarded as common design parameters/variables controlled by the design incentives and/or economic considerations involved in this type of subject matter. This is especially applicable in the sorting arts as the type of material to be sorted and the desired degree of sortation controls variations in the specific device dimensions, features and/or sorting steps. Moreover, legal precedent teaches that variations in these type of common design parameters/variables are obvious and that said parameters can be recognized as result-effective variables whose optimization would be known to one with ordinary skill in the art. See MPEP 2144.04.V.D. and VI (teaching that the mere rearrangement or duplication of known elements, or making known elements adjustable, is not a patentable advance); 2144.05 I.II (ample motivation to optimize or modify result-effective variables based on “design need(s)” or “market demand”).

It would thus be obvious to one with ordinary skill in the art to modify the combination of references with these prior art teachings to arrive at the claimed invention as these modifications are already well-known and commonly implanted in the separating arts.

The rationale for this obviousness determination can be found in legal precedent as described above and from an analysis of the prior art teachings that demonstrates that the modification to arrive at the claimed invention would merely involve the substitution/addition of well-known elements with no change in their respective functions. Moreover, the use of prior art elements according to their known functions is a predictable variation that would yield predictable results (e.g., benefit produced by known function), and thus cannot be regarded as a non-obvious modification when the modification is already commonly implemented in the relevant prior art. See also MPEP 2143.I (teaching that simple substitution of one known element for another to

obtain predictable results is known to one with ordinary skill in the art); 2144.06, 2144.07 (teaching as obvious the use of art recognized equivalences).

Further, the prior art discussed and cited demonstrates the level of sophistication of one with ordinary skill in the art and that these modifications are predictable variations that would be within this skill level. Therefore, it would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to modify the invention of Lane et al. for the reasons set forth above.

Conclusion

Any references not explicitly discussed above but made of record are regarded as helpful in establishing the state of the prior art and are thus considered relevant to the prosecution of the instant application.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOSEPH C RODRIGUEZ whose telephone number is 571-272-3692 (M-F, 9 am – 6 pm, PST). The Supervisory Examiner is MICHAEL MCCULLOUGH, 571-272-7805. The Official fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Alternatively, to contact the examiner, send an E-mail communication to **Joseph.Rodriguez@uspto.gov**. Such E-mail communication should be in accordance with provisions of the MPEP (see e.g., 502.03 & 713.04; see also Patent Internet Usage Policy Article 5). E-mail communication must begin with a statement authorizing the E-mail communication and acknowledging that such communication is not secure and may be made of record. Please note that **any communications with regards to the merits of an application will be made of record**. A suggested format for such authorization is as follows: "Recognizing that Internet communications are not secure, I hereby authorize the USPTO to communicate

Art Unit: 3653

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/JOSEPH C RODRIGUEZ/
Primary Examiner, Art Unit 3655

Jcr

October 6, 2022

<i>Notice of References Cited</i>	Application/Control No. 17/505,866		Applicant(s)/Patent Under Reexamination UZZO, Andrea	
	Examiner JOSEPH C RODRIGUEZ		Art Unit 3653	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-6646218-B1	11-2003	Campbell; Duncan	B07C5/367	209/582
*	B	US-20110002536-A1	01-2011	Thomasson; J. Alex	G06V20/693	382/165
*	C	US-20080308471-A1	12-2008	Huber; Reinhold	B07C5/366	209/577
*	D	US-20110317914-A1	12-2011	Omer; Ido	H04N1/409	382/167
*	E	US-20100110238-A1	05-2010	Kang; Moon-gi	H04N5/3572	348/E9.037
*	F	US-5157426-A	10-1992	Kronberg; James W.	G02C7/104	351/159.6
*	G	US-20170059406-A1	03-2017	Pelletier; Michael T.	G01J3/36	1/1
*	H	US-11120540-B2	09-2021	Mairhofer; Stefan	H04N5/2256	1/1
*	I	US-4558786-A	12-1985	Lane; Marvin M.	B07C5/342	209/558
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
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	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

<i>Search Notes</i> 	Application/Control No. 17/505,866	Applicant(s)/Patent Under Reexamination UZZO, Andrea
	Examiner JOSEPH C RODRIGUEZ	Art Unit 3653

CPC - Searched*		
Symbol	Date	Examiner
B07C 1/02; 5/3425		
Searched Above	10/06/2022	JCR

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
209	577, 581	10/06/2022	JCR

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Text Search (See IFW for stragies & limitations)	10/06/2022	JCR

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/JOSEPH C RODRIGUEZ/ Primary Examiner, Art Unit 3653	
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PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	25	"505866".ap.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 11:47 AM
L2	7	(joseph near3 rodriguez) AND optical near3 (sort\$3 separat\$3 classify\$3) SAME (IR infrared)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 11:54 AM
L3	6964	B07C1/02.cpc. b07c5/3425.cpc.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:20 PM
L4	53	L3 AND (IR infrared) near3 (three multiple plurality)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2022/10/06 12:20 PM

L5	30	(Artificial Intelligence) More like doc: US-10034490-B2 Text: (US-20170079315-A1 OR AU-2015252972-A1 OR AU-2015252972-B2 OR EP-3139771-B1 OR EP-3139771-A1 OR WO-2015168495-A1 OR CA-2947286-A1 OR CA-2947286-C OR US- 20150314335-A1 OR US-9364866-B2 OR US-9862004-B1 OR US-20160207048-A1 OR CA-2971629-C OR BR-112016025217-A2 OR US-677789-A OR US-8227012-B2 OR US-20120288599-A1 OR EP-3139771-A4 OR US-20080233253-A1 OR US-20140037826- A1).did.	CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:21 PM
L6	45	(Artificial Intelligence) More like doc: DE-202021105737-U1 Text: (DE-202022103915-U1 OR US-20220118484- A1 OR DE- 102010024784-A1 OR DE-102010024784-B4 OR WO-02085547-A2 OR DE-19708457-C1 OR WO-9835764-A1 OR EP-1048363-A2 OR EP-1005398-B1 OR CH-684742-A5 OR DE- 102019132931-A1 OR DE-19736567-C1 OR EP-0475121-A2 OR DE-1919002-A1 OR DE-2901970-B1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:22 PM

L7	992	DE-102020117074-A1 OR DE-19646753-A1 OR TW-I758367-B OR DE-2015123-C OR DE- 1532268-C).did. 209/577,581.ccls.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:32 PM
L8	67	(L7 L4) AND (IR infrared) near3 (three multiple plurality)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:33 PM
L9	3	(uzzo near3 andrea).inv.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:35 PM
L10	1922	209/577,581,587.ccls.	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU,	OR	ON	ON	2022/10/06 12:36 PM

L11	68	(L10 L4) AND (IR infrared) near3 (three multiple plurality)	CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:36 PM
L12	37	(Artificial Intelligence) More like doc: US-3373869-A Text: (US-4136778-A OR US-6646218-B1 OR EP-1173292-A4 OR WO-0058035-A1 OR EP-1173292-A1 OR DE-2836025-A1 OR EP-0719598-A2 OR US-3206603-A OR EP-0719598-B1 OR BR-102012030533-A2 OR US-20130141115-A1 OR US-3675769-A OR JP-2013152216-A OR US-4262806-A OR CA-1113177-A OR WO-9746328-A1 OR US-6303925-B1 OR FR-2651322-A1 OR DE-2201964-A1 OR US-4528680-A).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:38 PM
L13	45	("3910701" "3939983" "4095696" "4146135" "4204950" "4281933").pn. OR ("4558786").urpn. AND	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/06 12:43 PM

L14	96	(PGPB USPT USOC).dbnm. ("3854586" "4057352" "4186836" "4203522" "4225242" "4308959" "4558786" "4609108" "4735323" "5158181" "5239176" "5241171" "5286980" "5314072" "5462176" "5464981" "5479065" "5487472" "5779058" "5791497" "5794788" "5841546" "5864210" "5873470" "5903341" "5954206" "6005346" "6013887" "6078018" "6410872").pn. OR ("6646218").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/06 12:44 PM
L15	41	(Artificial Intelligence) More like doc: WO-2021134110-A1 Text: (AU-2020418569-A1 OR WO-2020253994- A1 OR US- 20220044392-A1 OR EP-3928081-A1 OR AU-2017222946-B2 OR CA-2727903-C OR CN- 102066013-A OR CA- 2727903-A1 OR WO- 2019201786-A1 OR EA-018818-B1 OR US- 20110002536-A1 OR BR-112014031102-B1 OR CN-111929410-A OR EP-1053463-A1 OR US-6100526-A OR CA- 2319524-C OR JP- 2003526079-A OR RU- 2195644-C2 OR KR- 102359036-B1 OR US- 10839503-B2).did.	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:46 PM
L16	13	(L10 L4) AND (emitter light source infrared IR) SAME ((interval time\$3 sequential) near3 (activat\$3 turn?on))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE,	OR	ON	ON	2022/10/06 12:51 PM

L17	42	(Artificial Intelligence) More like doc: US-20080308471-A1 Text: (EP-1776578-B1 OR WO-2006015965-A1 OR EP-1776578-A1 OR AT-7890-U1 OR US- 7639352-B2 OR US- 20070182956-A1 OR NO-20070647-L OR DE-3614400-C1 OR KR-100755224-B1 OR US-20150219570-A1 OR EP-1164536-B1 OR WO-2014013421-A1 OR US-9347892-B2 OR KR-20150119398-A OR WO-2009027987-A1 OR JP-6037125-B2 OR KR-102103048-B1 OR EP-2671651-A1 OR CN-1288156-A OR EP- 2671651-B1).did.	SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:53 PM
L18	23	(false near3 color) SAME (chromatic near3 channel)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 12:54 PM
L19	3	(false near3 color) SAME (chromatic near3 channel) AND (synthesis near3 image)	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK,	OR	ON	ON	2022/10/06 12:54 PM

L20	32	((false synthesis) near3 (image color)) SAME (chromatic near3 channel)	TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 02:02 PM
L21	11	((false synthesis) near3 (image color)) SAME (chromatic near3 channel) AND (sort\$3 classify\$3 grad\$3)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 02:03 PM
L22	0	L20 AND L10	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 02:04 PM
L23	2	L20 AND (209/\$.ccls. b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA,	OR	ON	ON	2022/10/06 02:04 PM

L24	11968	((false synthesis) near3 (image color)) SAME (chromatic channel)	EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 02:07 PM
L25	18	L24 AND (209/\$.ccls. b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 02:07 PM
L26	45	(Artificial Intelligence) More like doc: DE-202021105737-U1 Text: (DE-202022103915-U1 OR US-20220118484- A1 OR DE- 102010024784-A1 OR DE-102010024784-B4 OR WO-02085547-A2 OR DE-19708457-C1 OR WO-9835764-A1 OR EP-1048363-A2 OR EP-1005398-B1 OR	(US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO;	OR	ON	ON	2022/10/06 02:08 PM

L27	29	CH-684742-A5 OR DE-102019132931-A1 OR DE-19736567-C1 OR EP-0475121-A2 OR DE-1919002-A1 OR DE-2901970-B1 OR DE-102020117074-A1 OR DE-19646753-A1 OR TW-I758367-B OR DE-2015123-C OR DE-1532268-C).did. (Artificial Intelligence) More like doc: WO-2018077866-A1 Text: (EP-3529593-A1 OR US-10598602-B2 OR AU-2017349176-B2 OR US-20190317023-A1 OR CA-3041403-A1 OR AU-2017349176-A1 OR CA-3041403-C OR US-10942128-B2 OR US-20200173931-A1 OR AU-2019236717-B2 OR AU-2019236717-A1 OR CN-112525856-A OR CN-109863388-B OR RU-2702803-C1 OR CN-109863388-A OR BE-1014423-A6 OR HU-E027987-T2 OR BR-112019008144-A2 OR CA-2709263-C OR EP-2234736-A2).did.	JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AU, AP, AT, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, OA, RU, SU, WO, MC, MD, MY, NL, NO, NZ, PH, PL, PT, RO, RS, SE, SG, SI, SK, TH, TN, TR, TW, UA, VN); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 02:17 PM
L28	45	("3910701" "3939983" "4095696" "4146135" "4204950" "4281933").pn. OR ("4558786").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/06 02:57 PM
L29	16	convert\$3 near3 (infrared IR) SAME ((false synthesis) near3 (image color))	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/06 03:03 PM
L30	18	("3356439" "3571649" "3877797" "4045125" "4247177" "4529269" "4542959" "4740070" "4783361" "4878748" "4911546" "4952046" "4961640").pn. OR ("5157426").urpn. AND (PGPB USPT USOC).dbnm.	(US-PGPUB; USPAT; USOCR)	OR	ON	ON	2022/10/06 03:07 PM

L31	4	((false synthesis) near3 (image color)) AND L10	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 03:07 PM
L32	12526	((false synthesis) near3 (image color)) AND (g01n b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 03:09 PM
L33	533	((false synthesis) near3 (image color)) SAME (infrared) AND (g01n b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 03:09 PM
L34	0	((false synthesis) near3 (image color)) SAME ((infrared) AND (RGB chromatic) near3 (channel space) AND (g01n b07c))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL,	OR	ON	ON	2022/10/06 03:09 PM

L35	0	((false synthesis) near3 (image color)) SAME ((infrared) AND (RGB chromatic) AND (g01n b07c))	NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 03:09 PM
L36	0	((false synthesis) near3 (image color)) SAME ((infrared) AND (RGB chromatic) AND (g01n AND b07c))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 03:10 PM
L37	1	((false synthesis) near3 (image color)) SAME ((infrared) AND (RGB chromatic) AND (g01n AND b07c) L33)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 03:10 PM
L38	533	((false synthesis) near3 (image color)) SAME	(US-PGPUB; USPAT; USOCR; FIT (AP, AT,	OR	ON	ON	2022/10/06 03:11 PM

L39	35	(infrared) AND (g01nb07c)L33 "4,515,165"	AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 03:13 PM
L40	348	"4515165"	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 03:13 PM
L41	21	((US-20220118484-A1 OR US-20110002536-A1 OR US-20080308471-A1 OR US-20110317914-A1 OR US-20100110238-A1 OR US-20150062346-A1).did. AND PGPB.dbnm.) OR ((US-10034490-B2 OR US-9463493-B1 OR	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE,	OR	ON	ON	2022/10/06 06:28 PM

		US-4558786-A OR US-6646218-B1 OR US-6100488-A OR US-10883943-B2 OR US-5157426-A OR US-5782770-A).did. AND USPT.dbnm.) OR ((WO-02085547-A2 OR WO-0058035-A1).did. AND DWPI.dbnm.) OR ((US-3373869-A OR US-3206603-A).did. AND USOC.dbnm.) OR ((WO-2021134110-A1 OR WO-2018077866-A1 OR EP-0873795-A2).did. AND FTDB.dbnm.)	SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L42	1	L41 AND (optical near3 transduc\$3)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 06:29 PM
L43	8	L10 AND (optical near3 transduc\$3)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 06:29 PM
L44	0	L10 AND (optical near3 transduc\$3) SAME ingaas	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS,	OR	ON	ON	2022/10/06 06:30 PM

L45	74	(optical near3 transduc\$3) SAME ingaas	IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB) (US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 06:30 PM
L46	1	L45 AND (209/\$.ccls. b07c)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 06:30 PM
L47	74	L45	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 06:31 PM

L48	39	L45	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/06 06:31 PM
L49	1	L46 AND infrared	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/06 06:32 PM
L50	3	(optical near3 transduc\$3) SAME (ingaas AND row)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 06:32 PM
L51	97	(optical near3 transduc\$3) SAME (ingaas (indium near3 gallium))	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 06:33 PM
L52	48	(optical near3 transduc\$3) SAME (ingaas (indium near3 gallium))	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/06 06:34 PM
L53	48	(optical near3 transduc\$3) SAME (ingaas (indium near3 gallium))L52	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/06 06:34 PM
L54	1	(transduc\$3) SAME (ingaas (indium near3 gallium)) AND (209/\$.ccls. b07c)	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/06 07:13 PM
L55	116	(ingaas (indium near3 gallium)) AND (209/\$.ccls. b07c)	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/06 07:13 PM
L56	1	(ingaas (indium near3 gallium)) SAME transduc\$3 AND (209/\$.ccls. b07c)	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/06 07:22 PM

L57	23	((US-20220118484-A1 OR US-20110002536-A1 OR US-20080308471-A1 OR US-20110317914-A1 OR US-20100110238-A1 OR US-20150062346-A1 OR US-20170059406-A1).did. AND PGPB.dbnm.) OR ((US-10034490-B2 OR US-9463493-B1 OR US-4558786-A OR US-6646218-B1 OR US-6100488-A OR US-10883943-B2 OR US-5157426-A OR US-5782770-A OR US-11120540-B2).did. AND USPT.dbnm.) OR ((WO-02085547-A2 OR WO-0058035-A1).did. AND DWPI.dbnm.) OR ((US-3373869-A OR US-3206603-A).did. AND USOC.dbnm.) OR ((WO-2021134110-A1 OR WO-2018077866-A1 OR EP-0873795-A2).did. AND FTDB.dbnm.)	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 07:23 PM
L58	2	L57 AND bandpass near3 filter	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL, NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)	OR	ON	ON	2022/10/06 07:23 PM
L59	2	L58	(US-PGPUB; USPAT; USOCR; FIT (AP, AT, AU, BE, BG, BR, BY, CA, CH, CN, CS, CU, CZ, DD, DE, DK, EA, EE, EP, ES, FI, FR, GB, HR, HU, ID, IE, IL, IS, IT, JP, KR, LT, LU, LV, MA, MC, MD, MY, NL,	OR	ON	ON	2022/10/06 08:04 PM

			NO, NZ, OA, PH, PL, PT, RO, RS, RU, SE, SG, SI, SK, SU, TH, TN, TR, TW, UA, VN, WO); FPRS; EPO; JPO; DERWENT; IBM_TDB)				
L60	2	(ingaas (indium near3 gallium)) SAME transduc\$3 AND L57	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/06 08:08 PM
L61	9	((US-20110002536-A1 OR US-20080308471-A1 OR US-20100110238-A1 OR US-20110317914-A1 OR US-20170059406-A1).did. AND PGPB.dbnm.) OR ((US-5157426-A OR US-6646218-B1 OR US-11120540-B2 OR US-4558786-A).did. AND USPT.dbnm.)	(US-PGPUB; USPAT)	OR	ON	ON	2022/10/06 08:18 PM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Doc Code: ECOMM.AUTH/ECOMM.WTDW

Doc Description: Internet Communications Authorization/Internet Communications Authorization Withdrawal

PTO/SB/439 (11-15)

**AUTHORIZATION FOR INTERNET
COMMUNICATIONS IN A PATENT
APPLICATION OR REQUEST TO
WITHDRAW AUTHORIZATION FOR
INTERNET COMMUNICATIONS**

Application No.	17/505,866
Filing Date	10-20-2021
First Named Inventor	UZZO, Andrea
Art Unit	3653
Examiner Name	Joseph C Rodriguez
Practitioner Docket No.	SHJ943-US

To: Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I. To authorize permission for Internet Communications.

☒ Recognizing that Internet communications are not secure, I hereby authorize the USPTO to communicate with the undersigned and practitioners in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via video conferencing, instant messaging, or electronic mail. I understand that a copy of these communications will be made of record in the application file. (MPEP 502.03)

II. To withdraw authorization for Internet Communications.

☐ The authorization given on _____, to the USPTO to communicate with the undersigned and any practitioner in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via Internet communications such as video conferencing, instant messaging, or electronic mail is hereby withdrawn. I understand that the withdrawal is effective when approved rather than when received.

I am the

☐ applicant.

☒ attorney or agent of record. Registration number 76188.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Avi Avraham Jencmen/

Signature

2022-08-09

Date

Avi Avraham Jencmen

Typed or printed name

+1-571-2506566

Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Juristic entities must be represented by a patent practitioner (see 37 CFR 1.31, which is applicable to any paper filed on or after September 16, 2012, that is presented on behalf of a juristic entity, regardless of application filing date). Submit multiple forms if more than one signature is required, see below*.

☐ * Total of _____ forms are submitted.

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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
17/505,866

RECEIPT DATE / TIME
08/09/2022 03:06:32 AM ET

ATTORNEY DOCKET #
SHJ943-US

Title of Invention

SELECTOR MACHINE

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # -

CONFIRMATION # 7769

FILED BY Avi Jenclmen

PATENT CENTER # 60854354

FILING DATE 10/20/2021

CUSTOMER # 150161

FIRST NAMED INVENTOR
Andrea UZZO

CORRESPONDENCE ADDRESS -

AUTHORIZED BY -

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
SHJ943-US_Internet_auth.pdf	2	Internet Communications Authorization	190 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
SHJ943-US_Internet_auth.pdf	B1D31E961984EADF007B2F6E584930DB7DDB24918AFE6F511 E57EB9C877AB397246F14BA67AA7CF9226E0688F88C9DECBF A2719246B7FA4B0E2C27B9B866CA7F

by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
17/505,866	10/20/2021	Andrea UZZO	SHJ943-US

CONFIRMATION NO. 7769

PUBLICATION NOTICE



OC000000133318506

150161
Avi Avraham Jencmen
17 Yizhak Rabin St
Modiin, 7174906
ISRAEL

Title:SELECTOR MACHINE

Publication No.US-2022-0118484-A1

Publication Date:04/21/2022

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

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Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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Application number: 202020000005884

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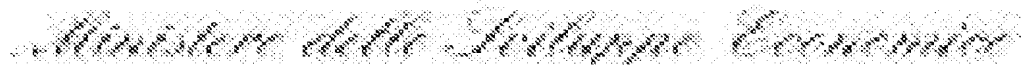
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Cristina Papadia della Divisione V

Cristina Papadia



Data di presentazione: 21/10/2020

DATI IDENTIFICATIVI DEL DEPOSITO

Ruolo	Mandatario
Depositante	Luca Gallo
Data di compilazione	21/10/2020
Riferimento depositante	BI 8137
Titolo	MACCHINA SELEZIONATRICE
Carattere domanda	Ordinaria
Esenzione	NO
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NOTE

MACCHINA SELEZIONATRICE

Riassunto

- Macchina selezionatrice (1) comprendente mezzi di convogliamento (2), predisposti per far avanzare un prodotto sfuso; un sistema di rilevamento ottico (3), il quale è provvisto di un
- 5 dispositivo emettitore (4) per emettere radiazioni elettromagnetiche (40) verso il prodotto, di un sensore ottico (5) predisposto per captare radiazioni riflesse (RF) provenienti dal prodotto irradiato, e di una unità elettronica di controllo (6) atta a ricevere segnali di misura dal sensore ottico (5); e mezzi di espulsione (7) azionabili dall'unità elettronica di controllo (6) per rimuovere determinati elementi solidi dal prodotto.
- 10 In dettaglio, il dispositivo emettitore (4) comprende tre sorgenti IR (8), ciascuna delle quali è predisposta per emettere radiazioni elettromagnetiche (40) in una corrispondente distinta banda spettrale (80) nello spettro infrarosso. Inoltre, l'unità elettronica di controllo (6) è predisposta per accendere in alternanza una dopo l'altra le sorgenti IR (8) in corrispondenti distinti intervalli di tempo (T_{ON}) ed il sensore ottico (5) è predisposto per rilevare, in ciascun
- 15 intervallo di tempo (T_{ON}), corrispondenti radiazioni riflesse (RF) provenienti dal prodotto irraggiato dalla rispettiva sorgente IR (8). Inoltre, l'unità elettronica di controllo (6) comprende un modulo di elaborazione (9), il quale è dotato di tre canali cromatici (10) di uno spazio di colore RGB ed è predisposta per associare i segnali di misura corrispondenti a ciascuna sorgente IR (8) ad un corrispondente canale cromatico (10) per comporre
- 20 un'immagine di sintesi a falsi colori del prodotto, ed è atta a generare i segnali di comando in funzione dell'immagine di sintesi.

MACCHINA SELEZIONATRICE

DESCRIZIONE

Campo di applicazione

Il presente trovato concerne una macchina selezionatrice, secondo il preambolo della
5 rivendicazione indipendente n. 1.

La macchina selezionatrice di cui trattasi si inserisce nel settore della produzione di macchine per lo smistamento di prodotti, le quali sono vantaggiosamente impiegate per individuare all'interno di un prodotto sfuso determinati elementi solidi da separare.

La macchina selezionatrice in oggetto è, in particolare, destinata ad essere impiegata
10 nell'industria agroalimentare, ad esempio per separare frutta secca dai corrispondenti gusci prima del confezionamento, nell'industria del recupero e riciclaggio dei rifiuti, ad esempio per separare rifiuti realizzati con materiali plastici differenti tra loro, od in qualunque altro settore in cui sia necessario separare tra loro elementi solidi in un prodotto sfuso sulla base in particolare del loro aspetto esterno e/o delle loro proprietà chimico-fisiche.

Stato della tecnica

Sono note sul mercato macchine selezionatrici, di tipo automatizzato, le quali sono impiegate per separare, all'interno di un prodotto costituito da più oggetti, determinati oggetti da selezionare o da scartare.

Come è noto, le macchine selezionatrici sono generalmente provviste di mezzi di
20 convogliamento su cui viene fatto avanzare un flusso di un prodotto sfuso, comprendente al suo interno più elementi solidi che devono essere distinti e separati tra loro. Tale prodotto sfuso può, ad esempio, comprendere frutta secca (come noccioline, mandorle, noci, le quali devono essere separate dai loro gusci prima di essere confezionate), oppure può comprendere rifiuti realizzati in diverso materiale (ad esempio plastico), i quali devono essere separati tra
25 loro per permetterne un corretto smaltimento o riciclaggio.

Ad esempio, i mezzi di convogliamento comprendono una o più tramogge attraverso le quali il prodotto viene fatto scorrere all'interno della macchina medesima attraverso un sistema di scivoli, fino a dei cassettei di raccolta.

Le macchine selezionatrici comprendono inoltre un sistema di rilevamento ottico predisposto per acquisire ed analizzare immagini del flusso di prodotto sfuso, al fine di distinguere nel prodotto sfuso gli elementi solidi da separare o scartare.

Tale sistema di rilevamento è atto ad inviare segnali di comando, sulla base delle informazioni ricavate dalle immagini acquisite, a mezzi di espulsione (quali elettrovalvole) azionabili per rimuovere dal prodotto sfuso gli elementi solidi selezionati, ad esempio attraverso l'emissione di getti di aria compressa.

Più in dettaglio, il sistema di rilevamento ottico comprende degli emettitori ottici (costituiti ad esempio da LED) atti ad emettere radiazioni elettromagnetiche verso il prodotto sfuso, ed uno o più sensori ottici predisposti per captare le radiazioni riflesse dal prodotto sfuso per ricavare delle immagini del prodotto sulla base delle quali, mediante opportuni algoritmi di sogliatura, una unità elettronica di controllo determina quali sono gli elementi da rimuovere.

Al fine di poter distinguere nel prodotto sfuso elementi solidi aventi sostanzialmente lo stesso colore nello spettro della luce visibile, è noto impiegare emettitori e sensori ottici che operano anche nello spettro del vicino infrarosso. Infatti, elementi aventi lo stesso colore nello spettro del visibile hanno generalmente caratteristiche chimico-fisiche che determinano un differente spettro di assorbimento alle lunghezze d'onda dell'infrarosso.

In particolare, sono diffuse nel mercato macchine selezionatrici in cui gli emettitori ottici generano radiazioni ad ampio spettro (con lunghezze d'onda sia nel visibile che al di fuori di esso) ed il sensore ottico è costituito da una telecamera iperspettrale. Quest'ultima è in grado di acquisire contemporaneamente una pluralità di immagini, ad esempio trecento immagini, ciascuna contenente informazioni corrispondenti ad una particolare banda spettrale molto

ristretta. Le ristrette bande spettrali in corrispondenza delle quali sono acquisite le immagini coprono gran parte dello spettro della radiazione elettromagnetica, dall'ultravioletto all'infrarosso, e si estendono per una ampiezza non superiore ai 5 o 10 nm.

Pertanto, tali telecamere iperspettrali consentono di rilevare con un alto grado di precisione
5 caratteristiche chimico-fisiche degli elementi da separare non solo mediante il rilevamento di radiazione elettromagnetica nello spettro del vicino infrarosso, ma contemporaneamente nello spettro ultravioletto, del visibile e dell'infrarosso con lunghezza d'onda maggiore.

La macchina selezionatrice provvista di telecamera iperspettrale fin qui brevemente descritta si è rilevata nella pratica non scevra di inconvenienti.

- 10 Il principale inconveniente risiede nell'elevato costo della telecamera iperspettrale medesima, che rende estremamente costoso il sistema di rilevamento ottico e, di conseguenza, la macchina selezionatrice.

Un ulteriore inconveniente della macchina selezionatrice fin qui brevemente descritta risiede nella bassa frequenza di acquisizione immagini della telecamera iperspettrale, la quale
15 frequenza di acquisizione è generalmente compresa tra i 200 ed i 300 Hz.

Un ulteriore inconveniente della macchina selezionatrice fin qui brevemente descritta è dovuta alla quantità molto elevata di dati prodotta dalla telecamera iperspettrale, i quali dati devono essere elaborati dall'unità elettronica di controllo che, conseguentemente, deve possedere elevate prestazioni computazionali, con conseguente aumento dei costi di
20 realizzazione della macchina.

Inoltre, l'elevata quantità di dati da elaborare può determinare un tempo di reazione relativamente lungo da parte dell'unità elettronica di controllo per comandare i mezzi di espulsione, con il rischio di non intercettare il flusso di prodotto nella posizione desiderata a causa dell'elevata velocità di avanzamento di quest'ultimo (anche di 4 m/s).

- 25 Un ulteriore inconveniente della macchina selezionatrice fin qui brevemente descritta risiede

nel fatto che non è in grado di acquisire immagini con elevata risoluzione, poiché la matrice di pixel della telecamera è separata in più settori, ciascuno dei quali ha associato il corrispondente filtro ottico, con la conseguenza che l'immagine a ciascuna banda spettrale è definita da un ridotto numero di pixel della telecamera medesima.

5 Presentazione dell'invenzione

In questa situazione, il problema alla base del presente trovato è pertanto quello di eliminare i problemi della tecnica nota sopracitata, mettendo a disposizione una macchina selezionatrice, la quale presenti un'elevata affidabilità e precisione operativa e, al contempo, risulti economica da realizzare.

10 Un ulteriore scopo del presente trovato è quello di mettere a disposizione una macchina selezionatrice, la quale operi in maniera efficiente, in particolare senza la necessità di eseguire pesanti elaborazioni computazionali da parte dell'unità elettronica di controllo.

Un ulteriore scopo del presente trovato è quello di mettere a disposizione una macchina selezionatrice, in grado di acquisire immagini con elevato grado di risoluzione.

15 Breve descrizione dei disegni

Le caratteristiche tecniche del presente trovato, secondo i suddetti scopi, sono chiaramente riscontrabili dal contenuto delle rivendicazioni sotto riportate ed i vantaggi dello stesso risulteranno maggiormente evidenti nella descrizione dettagliata che segue, fatta con riferimento ai disegni allegati, che ne rappresentano una forma di realizzazione puramente

20 esemplificativa e non limitativa, in cui:

- la figura 1 mostra una vista prospettica di una macchina selezionatrice secondo il presente trovato;
 - le figure 2, 3 e 4 mostrano una vista schematica in sezione laterale della macchina selezionatrice di figura 1, con raffigurata l'attivazione di differenti sorgenti IR del sistema
- 25 di rilevamento ottico della macchina selezionatrice medesima;

- la figura 5 mostra un esempio di andamento temporale di segnali di trigger generati dall'unità elettronica di controllo della macchina selezionatrice per controllare in maniera sincronizzata l'emissione e l'acquisizione delle radiazioni elettromagnetiche;
- le figure 6, 7 e 8 mostrano rispettivi grafici, che illustrano l'azione di filtraggio di un filtro passabanda della macchina selezionatrice, il quale è provvisto di tre bande passanti ristrette, sulle radiazioni elettromagnetiche determinate dalle sorgenti IR del sistema di rilevamento ottico.

Descrizione dettagliata di un esempio di realizzazione preferita

Con riferimento alle allegate figure è stato indicato con 1 una macchina selezionatrice secondo il presente trovato.

Vantaggiosamente, la macchina selezionatrice 1 di cui trattasi è destinata ad essere impiegata, in differenti ambiti di applicazione, per selezionare determinati elementi in un prodotto costituito da un insieme di elementi solidi, in particolare di forma e/o colore molto simili.

Più in dettaglio, la macchina selezionatrice 1 di cui trattasi è destinata ad essere impiegata nell'industria alimentare, al fine in particolare di individuare in un prodotto sfuso (in particolare granulare), quale ad esempio frutta secca (noccioline, noci, mandorle), sementi, grano o simili, degli elementi che devono essere scartati prima del confezionamento del prodotto, i quali possono ad esempio essere i gusci della frutta secca, scarti della lavorazione del prodotto alimentare o altri corpi estranei non commestibili.

Inoltre, la macchina selezionatrice 1 in oggetto può essere impiegata nell'industria del recupero dei rifiuti, al fine in particolare di individuare elementi di determinati materiali (ad esempio differenti tipi di plastica) per essere correttamente smaltiti o riciclati.

La macchina selezionatrice 1 comprende mezzi di convogliamento 2, i quali sono predisposti per far avanzare, lungo un percorso di avanzamento A, almeno un prodotto sfuso comprendente più elementi solidi da selezionare.

Preferibilmente, la macchina selezionatrice 2 comprende un telaio di supporto 12, il quale porta montati i mezzi di convogliamento 2 e definisce internamente un volume operativo 13 almeno parzialmente attraversato dal percorso di avanzamento A.

In accordo con la forma realizzativa preferenziale illustrata nelle allegate figure, i mezzi di convogliamento 2 comprendono una tramoggia 14, attraverso la quale il prodotto viene fornito alla macchina selezionatrice 1 e, più in particolare, inserito nel volume operativo 13 del telaio di supporto 12, ed un alimentatore vibrante (non illustrato) predisposto per far avanzare il prodotto sfuso dalla tramoggia 14 ad uno scivolo 15, lungo il quale il prodotto sfuso scende per gravità per distribuirsi ed avanzare lungo il percorso di avanzamento A.

10 Vantaggiosamente, la macchina selezionatrice 1 comprende almeno un primo vano di raccolta 20 per ricevere il prodotto proveniente dal percorso di avanzamento A, ed almeno un secondo vano di raccolta 21 per ricevere gli elementi solidi selezionati dal suddetto flusso di prodotto, come schematizzato nelle figure 2, 3 e 4.

Opportunamente, la macchina selezionatrice 1 può comprendere più percorsi di avanzamento 15 A (definiti ad esempio da corrispondenti tramogge 14, alimentatori vibranti e scivoli 15) con corrispondenti primi e secondi vani di raccolta 20, 21, al fine di selezionare più prodotti, anche contemporaneamente.

La macchina selezionatrice 1 di cui trattasi comprende un sistema di rilevamento ottico 3 atto ad individuare nel prodotto gli elementi da selezionare.

20 Più in dettaglio, il sistema di rilevamento ottico 3 è provvisto di un dispositivo emettitore 4, il quale è predisposto per emettere verso il percorso di avanzamento A radiazioni elettromagnetiche 40 atte a colpire il prodotto, e di un sensore ottico 5, il quale è rivolto verso il percorso di avanzamento A ed è predisposto per captare radiazioni riflesse RF provenienti dal prodotto irradiato dalle radiazioni elettromagnetiche 40 e per trasdurre le radiazioni 25 riflesse RF in corrispondenti segnali di misura.

Inoltre, il sistema di rilevamento ottico 3 è provvisto di una unità elettronica di controllo 6 operativamente collegata al sensore ottico 5 per ricevere i segnali di misura e predisposta per emettere segnali di comando, i quali sono inviati a mezzi di espulsione 7 per togliere gli elementi selezionati dal prodotto, come trattato nel seguito.

- 5 Vantaggiosamente, il sistema di rilevamento ottico 3 è disposto lungo il percorso di avanzamento A, in particolare inferiormente allo scivolo 15 dei mezzi di convogliamento 2, al fine di rilevare il prodotto sfuso in caduta libera dallo scivolo 15 stesso con gli elementi solidi da selezionare tra loro distanziati.

- 10 Il sistema di rilevamento ottico 3 è preferibilmente disposto nel volume operativo 13 definito internamente al telaio di supporto 12, in modo che il telaio di supporto 12 stesso schermi il sistema di rilevamento ottico 3 dalla luce proveniente dall'ambiente esterno ed impedisca ad essa di interferire con le radiazioni elettromagnetiche 40 emesse dal dispositivo emettitore 4 o con le radiazioni riflesse RF provenienti dal prodotto irradiato e captate dal sensore ottico 5.

- 15 La macchina selezionatrice 1 in oggetto comprende (come sopra anticipato) mezzi di espulsione 7 collegati al sistema di rilevamento ottico 3 per ricevere i segnali di comando dall'unità elettronica di controllo 6. Tali segnali di comando sono atti a comandare ai mezzi di espulsione 7 di eliminare dal percorso di avanzamento A determinati elementi solidi del prodotto selezionati sulla base delle informazioni acquisite dal sistema di rilevamento ottico 3.

- 20 Preferibilmente, i mezzi di espulsione 7 comprendono più ugelli 16 disposti affiancati l'uno all'altro lungo una direzione longitudinale Z sostanzialmente trasversale al percorso di avanzamento (ad esempio orizzontale) e in particolare parallela al piano di giacitura dello scivolo 15.

- 25 Vantaggiosamente, gli ugelli 16 sono disposti al di sotto del sistema di rilevamento ottico 3, sono rivolti verso il percorso di avanzamento A e sono azionabili, sulla base dei segnali di

comando inviati dall'unità elettronica di controllo 6, ciascuno mediante una corrispondente elettrovalvola, ad emettere un getto di aria compressa verso il flusso del prodotto sfuso.

In particolare, ciascuna ugello 16 è operativamente associato ad un determinato punto del percorso di avanzamento A (secondo ad esempio una determinata griglia di posizione), in modo tale che l'azionamento di ciascun ugello 16 generi un flusso d'aria che colpisca gli elementi che passano in tale determinato punto del percorso di avanzamento A.

In questo modo, gli elementi solidi che devono essere separati dal resto del prodotto sfuso, vengono colpiti dal getto di aria compressa emesso da uno degli ugelli 16 dei mezzi di espulsione 7 e vengono efficacemente deviati dal percorso di avanzamento A mentre si trovano nella situazione di caduta libera dallo scivolo 15 dei mezzi di convogliamento 2, venendo preferibilmente convogliate verso il secondo vano di raccolta 21.

Secondo l'idea alla base del presente trovato, il dispositivo emettitore 4 comprende almeno tre sorgenti IR 8, ciascuna delle quali è predisposta per emettere radiazioni elettromagnetiche 40 in una corrispondente distinta banda spettrale 80 nello spettro infrarosso.

In accordo con la forma realizzativa illustrata nelle figure 2-4, il dispositivo emettitore 4 comprende tre sorgenti IR 8. Opportunamente, il dispositivo emettitore 4 potrà comprendere anche più di tre sorgenti IR 8, di tre delle quali sarà abilitato il funzionamento.

Con il termine "banda spettrale" si dovrà intendere nel seguito un intervallo di lunghezze d'onda selezionate delle radiazioni elettromagnetiche 40.

Inoltre, l'unità elettronica di controllo 6 è operativamente collegata al dispositivo emettitore 4 ed è predisposta per accendere in alternanza una dopo l'altra le sorgenti IR 8 in corrispondenti e distinti intervalli di tempo T_{ON} ed il sensore ottico 5 è predisposto per rilevare, in ciascun intervallo di tempo T_{ON} , corrispondenti radiazioni riflesse RF provenienti dal prodotto irraggiato dalla corrispondente sorgente IR 8, e per generare corrispondenti segnali di misura.

L'unità elettronica di controllo 6 comprende, inoltre, un modulo di elaborazione 9, il quale è

dotato di tre canali cromatici 10 di uno spazio di colore RGB, cioè, in particolare, un canale del rosso R, un canale del verde V ed un canale del blu B. Il modulo di elaborazione 9 è predisposto per associare i segnali di misura corrispondenti a ciascuna sorgente IR 8 ad un corrispondente canale cromatico 10 per comporre un'immagine di sintesi a falsi colori del prodotto.

L'unità elettronica di controllo 6 è atta a generare i segnali di comando, e quindi ad individuare gli elementi da selezionare, in funzione della suddetta immagine di sintesi.

In uso, l'unità elettronica di controllo 6 accende in un primo intervallo di tempo T_{ON} una prima delle sorgenti IR 8 con le altre sorgenti IR 8 inattive, in modo che il prodotto sfuso sia

10 irradiato solamente con radiazioni elettromagnetiche 40 alla banda spettrale 80 della suddetta sorgente IR 8. Il prodotto irradiato assorbe alcune delle radiazioni elettromagnetiche 40 e riflette le radiazioni riflesse RF aventi lunghezze d'onda comunque comprese nella corrispondente banda spettrale 80, le quali vengono captate dal sensore ottico 5 per generare un segnale di misura, preferibilmente in forma di immagine in scala di grigi. Tale immagine

15 in scala di grigi, preferibilmente, non è destinata ad essere mostrata, ad esempio attraverso un monitor della macchina selezionatrice 1, ad un utente, bensì è destinata ad essere elaborata come dati informatici dal software dell'unità elettronica di controllo 6. Il suddetto segnale di misura, o più in particolare l'informazione contenuta in ciascun pixel dell'immagine in scala di grigi, dipenderà solamente dall'intensità della radiazione riflessa RF a lunghezze d'onda

20 comprese nella banda spettrale 80 della corrispondente sorgente IR 8. Inoltre, tale segnale di misura viene mappato su un primo dei canali cromatici 10 del modulo di elaborazione 9, come rappresentato in figura 2, ad esempio il canale del rosso R nello spazio di colore RGB in cui vengono elaborate le immagini di sintesi. In un secondo intervallo di tempo T_{ON} successivo, viene inattivata dall'unità elettronica di controllo 6 la prima delle sorgenti IR 8 e

25 viene accesa una seconda delle suddette sorgenti IR 8 per irradiare il prodotto sfuso con

radiazioni elettromagnetiche 40 ad una banda spettrale 80 differente. Il sensore ottico 5 genera pertanto un secondo segnale di misura che viene associato dal modulo di elaborazione 9, come rappresentato in figura 3, ad un secondo dei canali cromatici 10, ad esempio il canale del verde G nello spazio di colore RGB. Il medesimo processo viene ripetuto con una terza
5 delle sorgenti IR 8, in modo che il sensore ottico 5 generi un segnale di misura che viene mappato dal modulo di elaborazione 9, come rappresentato in figura 3, ad un terzo dei canali cromatici 10, ad esempio il canale del blu B nello spazio di colore RGB. Tale attivazione sequenziale delle sorgenti IR viene ripetuta ciclicamente.

Vantaggiosamente, l'unità elettronica di controllo 6 è provvista di almeno un software di
10 sogliatura, di per sé di tipo noto (e quindi non trattato nel seguito), il quale definisce i criteri con cui l'unità elettronica di controllo 6 determina, sulla base delle immagini di sintesi, gli elementi da selezionare e, conseguentemente, i segnali di comando da inviare ai mezzi di espulsione 7.

In particolare, l'impiego di sorgenti IR 8 permette di distinguere tra loro elementi solidi del
15 prodotto sfuso aventi sostanzialmente lo stesso colore nello spettro del visibile ma caratteristiche chimico-fisiche che risultano diverse se irradiate con radiazioni elettromagnetiche appartenenti allo spettro dell'infrarosso.

Ad esempio, le noccioline ed i corrispondenti gusci hanno sostanzialmente lo stesso colore nello spettro del visibile ma sono dotati di una diversa quantità di umidità e grassi che fa
20 assorbire alle noccioline ed ai gusci medesimi, se irradiati con radiazioni elettromagnetiche nello spettro infrarosso, differenti lunghezze d'onda della medesima radiazione elettromagnetica.

Analogamente, materiali plastici aventi lo stesso colore nello spettro del visibile possono essere dotati di catene polimeriche differenti nella loro composizione chimica, le quali
25 determinano un diverso assorbimento delle radiazioni elettromagnetiche nello spettro

dell'infrarosso.

Inoltre, la predisposizione rivendicata di più sorgenti IR 8 azionabili ad emettere in sequenza le radiazioni elettromagnetiche 40 a distinte bande spettrali 80 rende la macchina selezionatrice 1 in oggetto particolarmente economica da realizzare. Infatti, può essere
5 impiegato come sensore ottico 5 un sensore ad ampio spettro, il quale è in grado solamente di acquisire segnali di misura che dipendono dalla media dell'intensità di tutte le radiazioni riflesse RF incidenti su di esso, indipendentemente dalla loro lunghezza d'onda. Non è, infatti, necessario che il sensore ottico 5 sia provvisto di telecamera iperspettrale, prismi, reticoli, specchi dicroici o altri elementi ottici in grado di separare le radiazioni riflesse RF dal
10 prodotto sfuso sulla base delle loro lunghezze d'onda per generare contemporaneamente segnali di misura che dipendono singolarmente dall'intensità a selezionate bande spettrali, in quanto l'azionamento sequenziale delle sorgenti IR 8 in intervalli di tempo T_{ON} non sovrapposti fra loro fa già sì che i segnali di misura acquisiti dipendano ciascuno solamente dalla intensità delle radiazioni riflesse RF in corrispondenza della rispettiva banda spettrale 80
15 selezionata. Di conseguenza, la selezione o separazione delle lunghezze d'onda a cui viene acquisito ciascun segnale di misura non è eseguita in corrispondenza del sensore ottico 5, bensì a monte di esso, in corrispondenza del dispositivo emettitore 4, le cui sorgenti IR 8 sono azionate in sequenza.

Al fine di generare efficacemente l'immagine di sintesi a falsi colori mediante tre segnali di
20 misura acquisiti in intervalli di tempo T_{ON} in sequenza, il sensore ottico 5 ha una frequenza di acquisizione compresa sostanzialmente tra 15 e 25 kHz, preferibilmente uguale alla frequenza di accensione sequenziale delle sorgenti IR 8.

Infatti, la frequenza di acquisizione è così elevata che, ad ogni acquisizione, lo spostamento
25 eseguito dagli elementi solidi del prodotto sfuso (i quali viaggiano lungo il percorso di avanzamento A con una velocità generalmente pari a circa 4 m/s) è talmente piccolo da poter

considerare tre acquisizioni successive (corrispondenti all'attivazione in sequenza delle tre sorgenti IR) relative ad una stessa posizione lungo il percorso di avanzamento A.

In particolare, la macchina selezionatrice 1 in oggetto è in grado di acquisire i segnali di misura ed elaborare le immagini di sintesi con una frequenza così elevata rispetto alle
5 macchine di visione di tipo noto sopra trattate in quanto il sensore ottico 5 acquisisce solamente tre segnali di misura per ciascuna immagine di sintesi, i quali segnali di misura permettono di distinguere con sufficiente precisione gli elementi solidi del prodotto sfuso senza sovraccaricare il modulo di elaborazione 9, ed il modulo di elaborazione 9 genera l'immagine di sintesi a partire dalla quantità di dati ridotta contenuta nei soli tre segnali di
10 misura mappati nei canali cromatici 10 impiegando algoritmi tipici dello spazio di colore RGB, i quali sono di più semplice implementazione rispetto a quelli tipici dell'elaborazione immagini nell'infrarosso.

La banda spettrale 80 delle radiazioni elettromagnetiche 40 emesse da ciascuna sorgente IR 8 è vantaggiosamente contenuta all'interno dello spettro infrarosso ad onda corta, il quale è noto
15 nel gergo tecnico del settore con la sigla "SWIR" (Short Wave Infrared). Le lunghezze d'onda nello SWIR si sono dimostrate particolarmente efficienti per distinguere i diversi elementi solidi del prodotto sfuso sulla base di caratteristiche chimico-fisiche, aumentando pertanto l'affidabilità e l'efficienza operativa della macchina selezionatrice 1.

Vantaggiosamente, le lunghezze d'onda della banda spettrale 80 sono comprese
20 sostanzialmente tra 900 nm e 2200 nm.

Il sensore ottico 5 comprende, vantaggiosamente, almeno una fila di trasduttori ottici sviluppantesi lungo una direzione di estensione X sostanzialmente trasversale al percorso di avanzamento A, preferibilmente sostanzialmente parallela all'estensione in larghezza dello scivolo 15 e, in particolare orizzontale.

25 Vantaggiosamente, i trasduttori ottici del sensore ottico 5 sono trasduttori allo stato solido a

InGaAs, i quali sono particolarmente adatti a rilevare le radiazioni riflesse RF nelle bande spettrali 80 dello spettro infrarosso ad onda corta.

Preferibilmente, il sensore ottico 5 comprende una telecamera lineare (provvista della suddetta fila di trasduttori ottici), eventualmente anche in bianco e nero.

- 5 Preferibilmente, i segnali di misura generati dal sensore ottico 5 contengono informazioni che rappresentano immagini in scala di grigi in forma di vettore lineare di pixel, in cui ciascun pixel corrisponde ad uno dei trasduttori allo stato solido a InGaAs della suddetta fila di trasduttori ottici.

- 10 Pertanto, l'immagine di sintesi a falsi colori elaborata dal modulo di elaborazione 9 ogni tre intervalli di tempo T_{ON} successivi è, preferibilmente, a sua volta, in forma di vettore lineare di pixel.

- Inoltre, il modulo di elaborazione 9 è preferibilmente predisposto per comporre una immagine complessiva in forma di matrice di pixel bidimensionale a partire da più immagini di sintesi a falsi colori in forma di vettore lineare di pixel elaborate in sequenza e per ampliare ogni tre
15 intervalli di tempo T_{ON} la suddetta immagine complessiva aggiungendo la corrispondente immagine di sintesi, in modo tale che siano facilmente individuabili gli elementi solidi del prodotto sfuso da parte dell'unità elettronica di controllo 6.

- Come sopra riportato, il sensore ottico 5 comprende vantaggiosamente una telecamera lineare in bianco e nero, la quale genera, come segnali di misura, delle immagini in scala di grigio in
20 forma di vettore lineare di pixel.

- Tale configurazione del sensore ottico 5 (in particolare come telecamera in bianco e nero) le consente di generare segnali di misura non particolarmente pesanti (contenendo in particolare informazioni relative ad immagini in bianco e nero), permettendo in questo modo al modulo di elaborazione 9 di comporre l'immagine di sintesi attraverso l'elaborazione di una quantità
25 relativamente ridotta di dati (in confronto in particolare a telecamere a colori) e quindi in

tempi particolarmente rapidi. Inoltre, l'acquisizione, istante per istante, di segnali di misura relative ad immagini in forma di vettore lineare di pixel, comporta che, ad ogni acquisizione, sia necessario trasmettere, mediante il BUS di comunicazione, un ridotto quantitativo di dati (rispetto ad una telecamera iperspettrale) dal sensore ottico 5 all'unità elettronica di controllo 6, rendendo pertanto tale trasmissione particolarmente rapida.

In questo modo, in particolare, i rapidi tempi di elaborazione e trasmissione dei dati permettono di posizionare gli ugelli 16 dei mezzi di espulsione 7 appena al di sotto del sistema di rilevamento ottico 3 e, pertanto, ravvicinati allo scivolo 15 dei mezzi di convogliamento 2, in quanto l'unità elettronica di controllo 6 è in grado di mandare i segnali di comando ai mezzi di espulsione 7 medesimi in intervalli di tempo estremamente ridotti. Inoltre, la precisione nella rimozione dal percorso di avanzamento A degli elementi solidi è in questo incrementata, in quanto al diminuire della distanza dei mezzi di espulsione 7 dal sistema di rilevamento ottico 3 e dal bordo inferiore dello scivolo 15, diminuiscono le possibili variazioni della velocità di caduta degli elementi solidi da deviare, riducendo notevolmente il rischio che un getto di aria compressa emesso da uno degli ugelli 16 sia in anticipo od in ritardo rispetto all'elemento solido individuato dall'unità elettronica di controllo 6.

Vantaggiosamente, l'unità elettronica di controllo 6 comprende almeno un processore elettronico implementato opportunamente in una corrispondente scheda elettronica. Opportunamente, il modulo di elaborazione 9 può essere integrato nel suddetto processore elettronico, ad esempio mediante un corrispondente software, oppure ottenuto con un firmware distinto.

Vantaggiosamente, l'unità elettronica di controllo 6 può essere integrata nel sensore ottico 5, in particolare nella telecamera di quest'ultimo (ottenuta ad esempio con una smart camera). Opportunamente, ciascuna sorgente IR 8 comprende vantaggiosamente almeno un LED, al

fine in particolare di mantenere costanti nel tempo le caratteristiche di intensità e lunghezza d'onda delle radiazioni elettromagnetiche 40 emesse dal dispositivo emettitore 4 con facilità.

Vantaggiosamente, ciascuna sorgente IR 8 comprende almeno una fila dei suddetti LED, la quale si sviluppa lungo una direzione di sviluppo Y sostanzialmente trasversale alla direzione di avanzamento A, preferibilmente sostanzialmente parallela all'estensione in larghezza dello scivolo 15 e, in particolare orizzontale.

Le file di LED delle sorgenti IR 8 sono vantaggiosamente disposte con le proprie direzioni di sviluppo Y sostanzialmente parallele alla direzione di estensione X della fila di trasduttori ottici del sensore ottico 8.

10 In questo modo, la radiazione elettromagnetica 40 emessa dalla fila di LED di ciascuna sorgente IR 8 ha un gradiente di intensità e di lunghezza d'onda sostanzialmente nullo lungo tutte le direzioni parallele alla direzione di sviluppo Y e, di conseguenza, alla direzione di estensione X della fila di trasduttori ottici, con conseguente incremento della qualità dei segnali di misura acquisiti.

15 Preferibilmente, ciascuna sorgente IR 8 è provvista di due file di LED, entrambe predisposte per emettere radiazioni elettromagnetiche 40 alla corrispondente banda spettrale 80, le quali sono disposte in maniera sostanzialmente simmetrica rispetto agli assi ottici della fila di trasduttori ottici, in modo da illuminare gli elementi solidi del prodotto sfuso da due differenti direzioni riducendo le ombre su di essi.

20 In accordo con una forma realizzativa non illustrata nelle allegate figure, il sensore ottico 5 comprende due file di trasduttori ottici contrapposte rispetto al percorso di avanzamento A, al fine di acquisire i segnali di misura relativi al prodotto sfuso da due diversi punti di vista, uno frontale ed uno posteriore, e ciascuna sorgente IR 8 del dispositivo emettitore comprende almeno due file di LED, di cui una per ciascuna fila di trasduttori ottici, le quali si estendono
25 lungo direzioni di sviluppo Y parallele tra loro ed alle direzioni di estensione X delle file di

trasduttori ottici e sono predisposte per emettere radiazioni elettromagnetiche 40 da opposte direzioni rispetto al percorso di avanzamento A medesimo.

Vantaggiosamente, l'unità elettronica di controllo 6 è predisposta per inviare alle sorgenti IR 8 segnali di trigger 60, 60' sincronizzati con il modulo di elaborazione 9.

- 5 Più in dettaglio, con riferimento alla figura 5, l'unità elettronica di controllo 6 è provvista di un modulo di comando sincronizzato predisposto per generare i suddetti segnali di trigger 60, 60' a gruppi di tre, di cui il primo segnale di trigger 60' dei segnali di trigger 60, 60' ha estensione temporale maggiore rispetto al secondo e terzo segnale di trigger 60.

- 10 Tale primo segnale di trigger 60' con estensione temporale maggiore consente che le sorgenti IR 8 del dispositivo emettitore 4 vengano risincronizzate con il modulo di elaborazione 9 ogni tre acquisizioni dei segnali di misura da parte del sensore ottico 5, anche nel caso in cui si sia verificata una asincronia tra le sorgenti IR 8, il sensore ottico 5 e l'elaborazione dei segnali di misura sui tre canali cromatici 10 del modulo di elaborazione 9 durante l'acquisizione di tre precedenti segnali di misura. Infatti, ogniquale volta il dispositivo emettitore 4, il sensore ottico 15 5 ed il modulo di elaborazione 9 rilevano un primo segnale di trigger 60' avente estensione temporale maggiore, essi riconoscono che sono già state acquisiti tre segnali di misura alle rispettive bande spettrali 80, indifferentemente dal fatto che l'acquisizione sia stata eseguita correttamente od in maniera asincrona, e che è necessario procedere alla acquisizione di successivi tre segnali di misura.

- 20 La macchina selezionatrice 1 in oggetto comprende, preferibilmente, un filtro passabanda 11 dotato di almeno tre bande spettrali ristrette 110, ciascuna delle quali si estende per un sottoinsieme di lunghezze d'onda della banda spettrale 80 di una corrispondente sorgente IR 8. Più in dettaglio, il filtro passabanda 11 è posizionato in modo tale da intercettare le radiazioni elettromagnetiche 40 emesse dalle sorgenti IR 8 o le radiazioni riflesse RF 25 provenienti dal prodotto.

La predisposizione di un filtro passabanda 11 ad intercettazione delle radiazioni elettromagnetiche 40 o delle radiazioni riflesse RF consente di ottenere un più preciso irraggiamento del prodotto sfuso e, quindi, di rilevare con maggiore precisione le caratteristiche chimico-fisiche degli elementi solidi in esso compresi.

- 5 Infatti, come è noto, i LED delle sorgenti IR 8 possono avere una banda spettrale 80 di emissione più ampia di quella di interesse, ad esempio estendentesi per un intervallo di lunghezze d'onda per circa cento o duecento nanometri, con intensità massima in corrispondenza di una lunghezza d'onda centrale, ad esempio indicata dal costruttore del LED, ed intensità decrescenti tanto più quanto la lunghezza d'onda è lontana da quest'ultima.
- 10 Le bande passanti ristrette 110 del filtro passabanda 11 sono sostanzialmente centrate ciascuna su una corrispondente banda spettrale 80, in modo che attraverso ciascuna banda passante ristretta 110 sia permessa solamente la trasmissione delle radiazioni elettromagnetiche 40 con più alta intensità della banda spettrale 80 e sia impedita la trasmissione delle radiazioni elettromagnetiche 40 con intensità minore.
- 15 Il filtro passabanda 11 può essere, preferibilmente, provvisto di più di tre bande passanti ristrette 110, ad esempio cinque, in modo tale che possa operare con più combinazioni di bande spettrali 80 (cioè predisponendo più combinazioni di sorgenti IR 8) senza la necessità di cambiare tale filtro passabanda 11.

In questo modo, la macchina selezionatrice 1 può essere adattata a smistare, ad esempio, frutta secca installando nel dispositivo emettitore 4 sorgenti IR 8 a tre bande spettrali 80 corrispondenti a tre delle cinque bande passanti ristrette 110 del filtro passabanda 11 sia, ad esempio, a smistare diversi tipi di materiali plastici installando sorgenti IR 8 a tre diverse bande spettrali 80 corrispondenti ad altre tre delle stesse cinque bande passanti ristrette 110 del filtro passabanda 11.

- 25 Vantaggiosamente, ciascuna banda spettrale ristretta 110 del filtro passabanda 11 ha una

ampiezza di banda 111 compresa sostanzialmente tra 15 e 35 nm e, ancor più preferibilmente, compresa sostanzialmente tra 20 e 30 nm.

Inoltre, le bande spettrali ristrette 110 del filtro passabanda 11, vantaggiosamente, non sono sovrapposte le une rispetto alle altre.

- 5 Più in dettaglio, le bande spettrali ristrette 110 sono distanziate tra loro di un intervallo di radiazione elettromagnetica tale che, anche nel caso siano impiegate sorgenti IR 8 con banda spettrale 80 particolarmente ampia, nessuna parte delle radiazioni elettromagnetiche 40 emesse da una delle tre sorgenti IR 8 venga trasmessa attraverso una banda passante ristretta 110 adiacente a quella centrata sulla banda spettrale 80 della corrispondente sorgente IR 8.
- 10 Tuttavia, il corretto funzionamento del sistema di rilevamento ottico 3 è garantito anche nel caso in cui le bande spettrali ristrette 110 siano distanziate tra loro di un intervallo di radiazione elettromagnetica tale da permettere alle sole radiazioni elettromagnetiche 40 a più bassa intensità di ciascuna banda spettrale 80 di essere trasmesse attraverso una banda passante ristretta 110 adiacente a quella centrata sulla banda spettrale 80 della corrispondente
- 15 sorgente IR 8, come illustrato nelle figure 6, 7 e 8, le quali mostrano, in un grafico avente le lunghezze d'onda sull'asse delle ascisse e la percentuale di intensità luminosa che viene trasmessa attraverso il filtro passabanda 11 sull'asse delle ordinate, la porzione di radiazioni elettromagnetiche 40 di ciascuna banda spettrale 80 trasmessa attraverso le bande passanti ristrette 110 con ciascuna sorgente IR 8 azionata singolarmente.
- 20 Vantaggiosamente, il filtro passabanda 11 è posizionato tra il percorso di avanzamento A ed il sensore ottico 5 per intercettare le radiazioni riflesse RF provenienti dal prodotto.
- Ancor più preferibilmente, il filtro passabanda 11 è montato sul sensore ottico 5, in modo tale che tutte le radiazioni riflesse RF incidenti sul sensore ottico 5 siano intercettate dal filtro passabanda 11 medesimo.
- 25 In accordo con una diversa forma realizzativa non illustrata nelle allegate figure, il filtro

passabanda 11 è posizionato tra il percorso di avanzamento A ed il dispositivo emettitore 4 per intercettare le radiazioni elettromagnetiche 40 emesse dalle sorgenti IR 8 del dispositivo emettitore 4. Più in particolare, il suddetto filtro passabanda 11 è montato direttamente sul dispositivo emettitore 4 stesso, in modo che tutte le radiazioni elettromagnetiche 40 siano
5 intercettate dal filtro passabanda 11 medesimo.

Il trovato così concepito raggiunge pertanto gli scopi prefissi.

RIVENDICAZIONI

1. Macchina selezionatrice (1), la quale comprende:

- mezzi di convogliamento (2), i quali sono predisposti per far avanzare, lungo un percorso di avanzamento (A), almeno un prodotto sfuso comprendete più elementi solidi da
5 selezionare;
 - un sistema di rilevamento ottico (3) comprendente:
 - un dispositivo emettitore (4) predisposto per emettere verso detto percorso di avanzamento (A) radiazioni elettromagnetiche (40) atte a colpire detto prodotto;
 - un sensore ottico (5) rivolto verso detto percorso di avanzamento (A) e predisposto per
10 captare radiazioni riflesse (RF) provenienti da detto prodotto irradiato da dette radiazioni elettromagnetiche (40), e per trasdurre dette radiazioni riflesse (RF) in corrispondenti segnali di misura;
 - una unità elettronica di controllo (6) operativamente collegata a detto sensore ottico (5) per ricevere detti segnali di misura, e predisposta per emettere segnali di comando;
 - 15 – mezzi di espulsione (7) collegati a detto sistema di rilevamento ottico (3) per ricevere detti segnali di comando, i quali sono atti a comandare a detti mezzi di espulsione (7) di eliminare da detto percorso di avanzamento (A) determinati elementi solidi di detto prodotto;
- detta macchina selezionatrice (1) essendo **caratterizzata dal fatto che:**
- 20 – detto dispositivo emettitore (4) comprende almeno tre sorgenti IR (8), ciascuna delle quali è predisposta per emettere radiazioni elettromagnetiche (40) in una corrispondente distinta banda spettrale (80) nello spettro infrarosso;
 - detta unità elettronica di controllo (6) è operativamente collegata a detto dispositivo emettitore (4) ed è predisposta per accendere in alternanza una dopo l'altra dette sorgenti
25 IR (8) in corrispondenti e distinti intervalli di tempo (T_{ON});

- detto sensore ottico (5) è predisposto per rilevare, in ciascun detto intervallo di tempo (T_{ON}), corrispondenti dette radiazioni riflesse (RF) provenienti da detto prodotto irraggiato dalla corrispondente detta sorgente IR (8), e a generare corrispondenti detti segnali di misura;
- 5 – detta unità elettronica di controllo (6) comprende un modulo di elaborazione (9), il quale è dotato di almeno tre canali cromatici (10) di uno spazio di colore RGB ed è predisposta per associare i segnali di misura corrispondenti a ciascuna detta sorgente IR (8) ad un corrispondente canale cromatico di detti canali cromatici (10) per comporre un'immagine di sintesi a falsi colori di detto prodotto; detta unità elettronica di controllo (6) essendo atta
10 a generare detti segnali di comando in funzione di detta immagine di sintesi.
- 2. Macchina selezionatrice (1) secondo la rivendicazione 1, caratterizzata dal fatto che la banda spettrale (80) delle radiazioni elettromagnetiche (40) emesse da ciascuna detta sorgente IR (8) è contenuta all'interno dello spettro infrarosso ad onda corta.
- 3. Macchina selezionatrice (1) secondo la rivendicazione 1 o 2, caratterizzata dal fatto che le
15 lunghezze d'onda di detta banda spettrale (80) sono comprese sostanzialmente tra 900 nm e 2200 nm.
- 4. Macchina selezionatrice (1) secondo una qualsiasi delle rivendicazioni precedenti, caratterizzata dal fatto che detto sensore ottico (5) comprende almeno una fila di trasduttori ottici sviluppati lungo una direzione di estensione (X) sostanzialmente trasversale a detto
20 percorso di avanzamento (A).
- 5. Macchina selezionatrice (1) secondo la rivendicazione 4, caratterizzata dal fatto che detti trasduttori ottici sono trasduttori allo stato solido a InGaAs.
- 6. Macchina selezionatrice (1) secondo una qualsiasi delle rivendicazioni precedenti, caratterizzata dal fatto che ciascuna detta sorgente IR (8) comprende almeno un LED.
- 25 7. Macchina selezionatrice (1) secondo la rivendicazione 6, caratterizzata dal fatto che

ciascuna detta sorgente IR (8) comprende almeno una fila di detti LED, la quale si sviluppa lungo una direzione di sviluppo (Y) sostanzialmente trasversale a detta direzione di avanzamento (A).

5 **8.** Macchina selezionatrice (1) secondo le rivendicazioni 4 e 7, caratterizzata dal fatto che dette file di LED sono disposte con dette direzioni di sviluppo (Y) sostanzialmente parallele alla direzione di estensione (X) di detta file di trasduttori ottici.

9. Macchina selezionatrice (1) secondo una qualsiasi delle rivendicazioni precedenti, caratterizzata dal fatto che detto sensore ottico (5) ha una frequenza di acquisizione compresa sostanzialmente tra 15 e 25 kHz.

10 **10** Macchina selezionatrice (1) secondo una qualsiasi delle rivendicazioni precedenti, caratterizzata dal fatto che detta unità elettronica di controllo (6) è predisposta per inviare a dette sorgenti IR (8) segnali di trigger (60, 60') sincronizzati con detto modulo di elaborazione (9).

15 **11.** Macchina selezionatrice (1) secondo una qualsiasi delle rivendicazioni precedenti, caratterizzata di comprendere almeno un filtro passabanda (11) dotato di almeno tre bande spettrali ristrette (110), ciascuna delle quali si estende per un sottoinsieme di lunghezze d'onda della banda spettrale (80) di una corrispondente detta sorgente IR (8); detto filtro passabanda (11) essendo posizionato in modo tale da intercettare dette radiazioni elettromagnetiche (40) emesse da dette sorgenti IR (8) o dette radiazioni riflesse (RF)
20 provenienti da detto prodotto.

12. Macchina selezionatrice (1) secondo la rivendicazione 11, caratterizzata dal fatto che detto filtro passabanda (11) è posizionato tra detto percorso di avanzamento (A) e detto sensore ottico (5) per intercettare le radiazioni riflesse (RF) provenienti da detto prodotto.

25 **13.** Macchina selezionatrice (1) secondo la rivendicazione 11 e 12, caratterizzata dal fatto che detto filtro passabanda (11) è montato su detto sensore ottico (5).

14. Macchina selezionatrice (1) secondo una qualsiasi delle rivendicazioni dalla 11 alla 13, caratterizzata dal fatto che ciascuna detta banda spettrale ristretta (110) di detto filtro passabanda (11) ha una ampiezza di banda (111) compresa sostanzialmente tra 15 e 35 nm.

15. Macchina selezionatrice (1) secondo una qualsiasi delle rivendicazioni dalla 11 alla 14,
5 caratterizzata dal fatto dal fatto che le bande spettrali ristrette (110) di detto filtro passabanda (11) non sono sovrapposte le une rispetto alle altre.

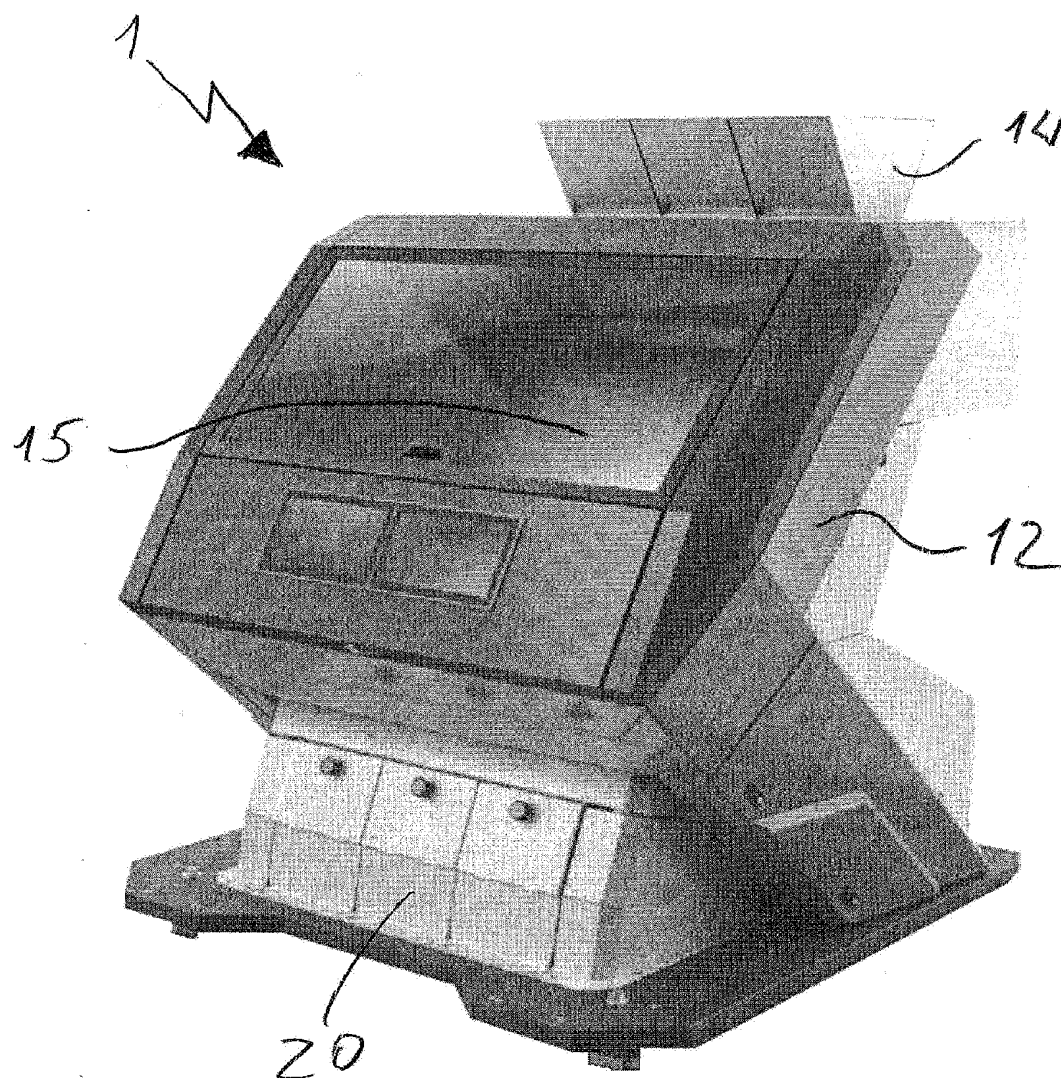
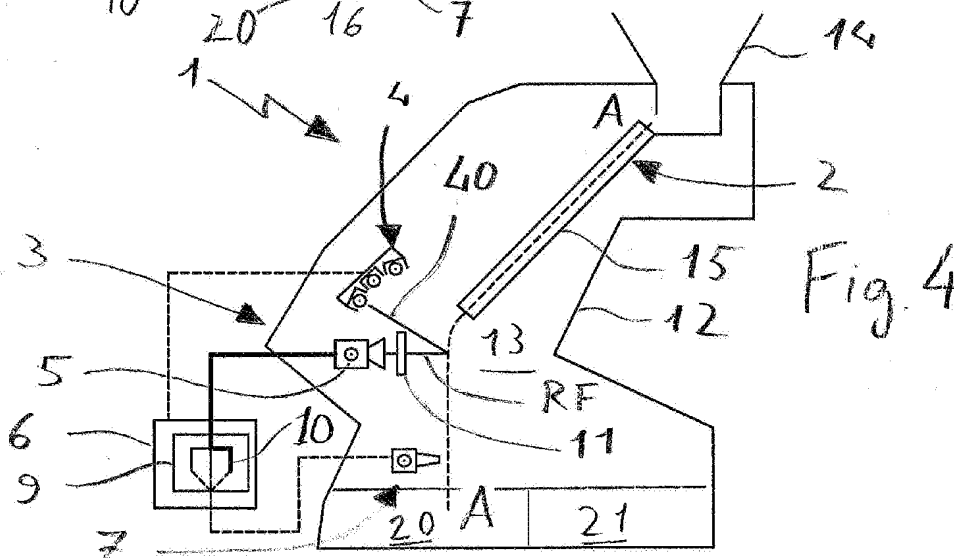
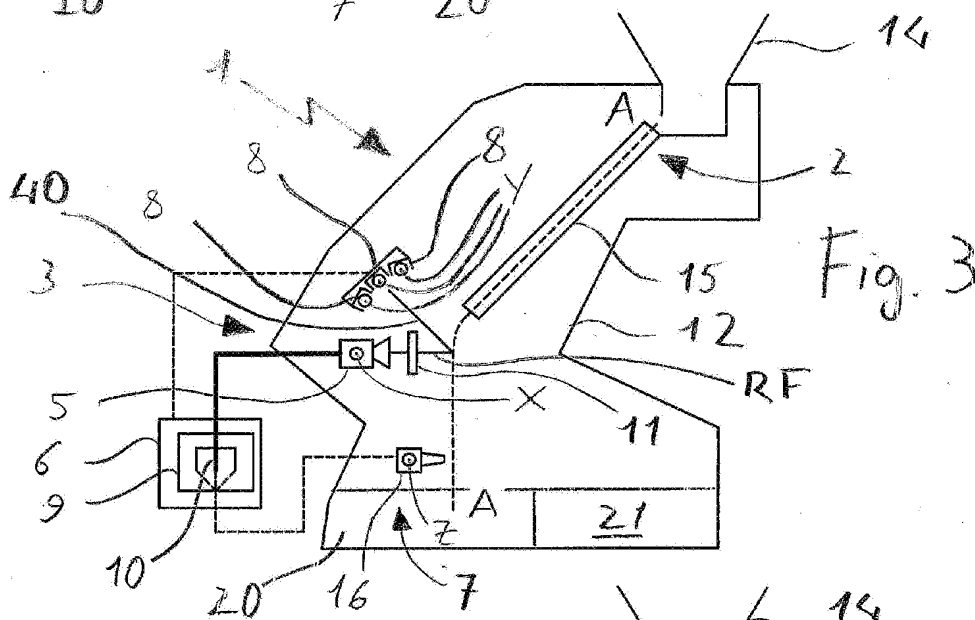
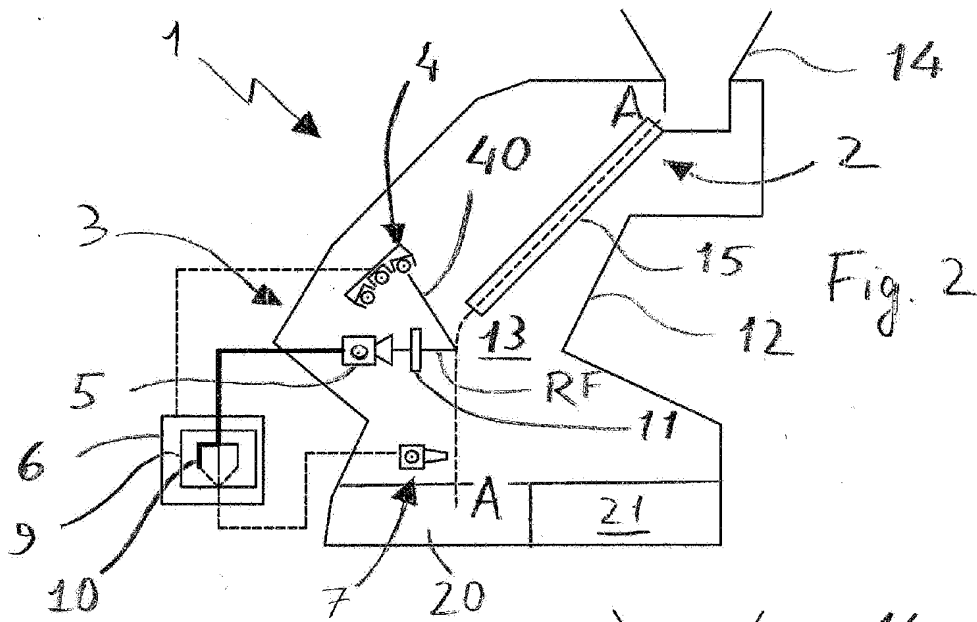
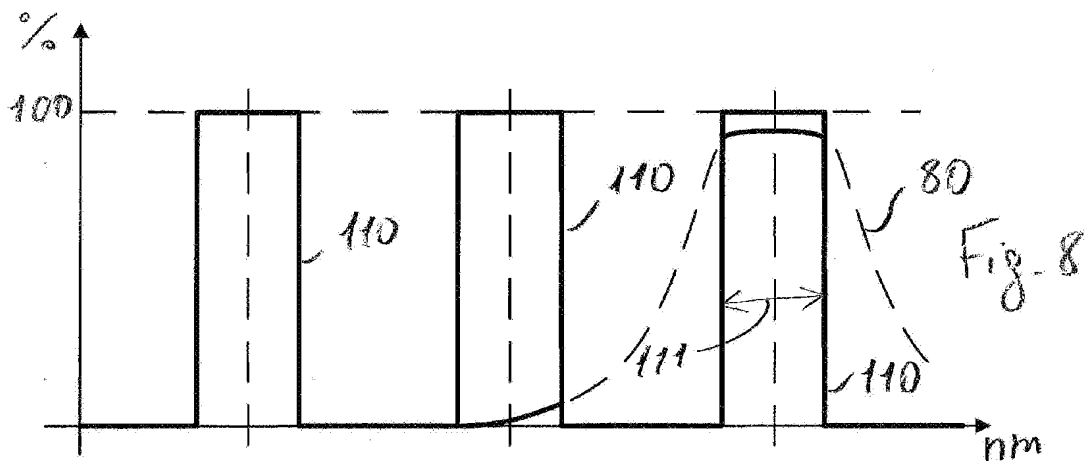
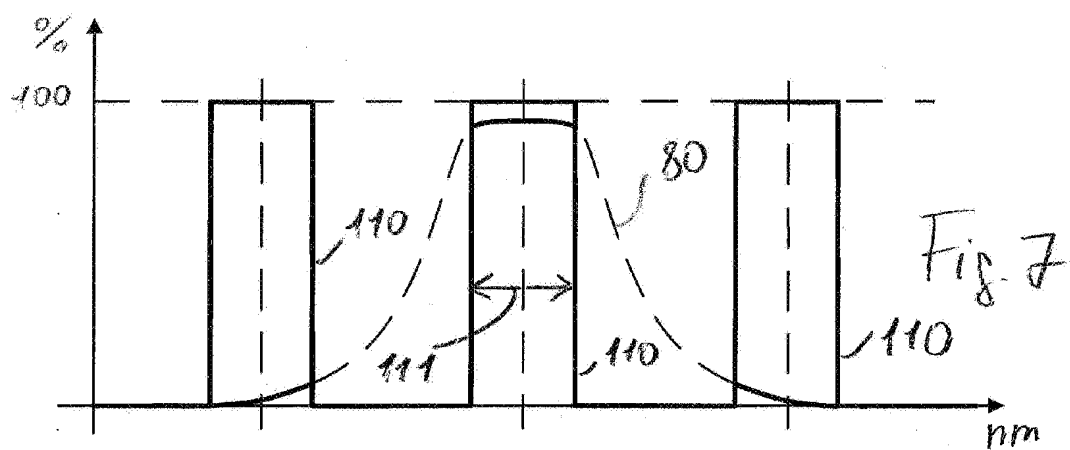
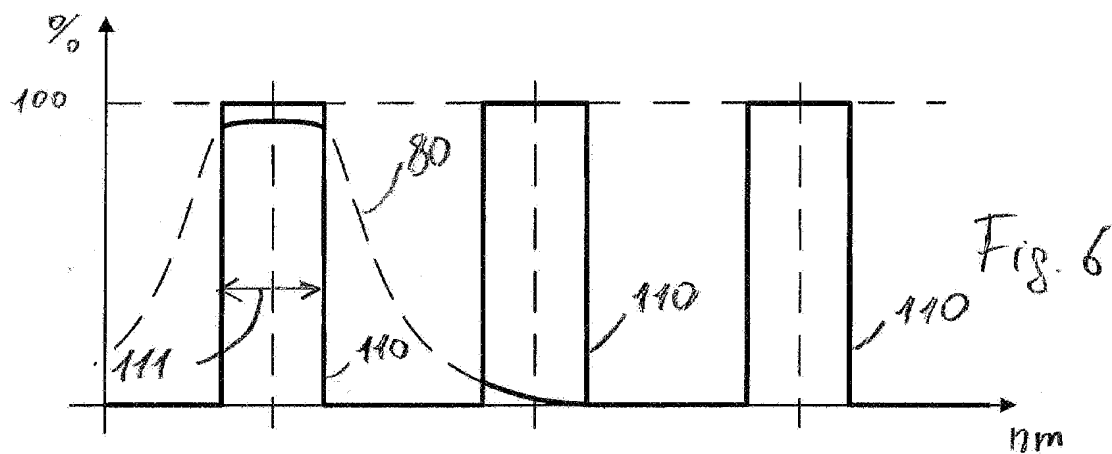
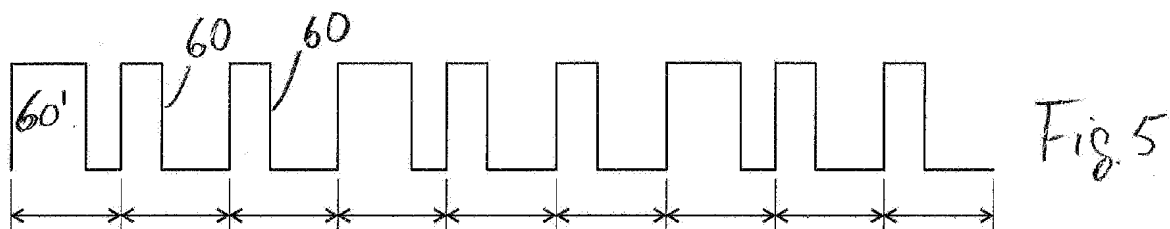


Fig. 1





PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number
17/505,866

APPLICATION AS FILED - PART I

(Column 1)		(Column 2)
FOR	NUMBER FILED	NUMBER EXTRA
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A
TOTAL CLAIMS (37 CFR 1.16(j))	15 minus 20 =	*
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1 minus 3 =	*
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).	
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))		

* If the difference in column 1 is less than zero, enter "0" in column 2.

SMALL ENTITY

RATE(\$)	FEE(\$)
N/A	80
N/A	350
N/A	400
x 50 =	0.00
x 240 =	0.00
	0.00
	0.00
TOTAL	830

OR

OTHER THAN SMALL ENTITY

RATE(\$)	FEE(\$)
N/A	
N/A	
N/A	
TOTAL	

APPLICATION AS AMENDED - PART II

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total (37 CFR 1.16(i))	*	Minus **	=
Independent (37 CFR 1.16(h))	*	Minus ***	=
Application Size Fee (37 CFR 1.16(s))			
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))			

SMALL ENTITY

RATE(\$)	ADDITIONAL FEE(\$)
x =	
x =	
TOTAL ADD'L FEE	

OR

OTHER THAN SMALL ENTITY

RATE(\$)	ADDITIONAL FEE(\$)
x =	
x =	
TOTAL ADD'L FEE	

	(Column 1)	(Column 2)	(Column 3)
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA
Total (37 CFR 1.16(i))	*	Minus **	=
Independent (37 CFR 1.16(h))	*	Minus ***	=
Application Size Fee (37 CFR 1.16(s))			
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))			

RATE(\$)	ADDITIONAL FEE(\$)
x =	
x =	
TOTAL ADD'L FEE	

OR

RATE(\$)	ADDITIONAL FEE(\$)
x =	
x =	
TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO	TOT CLAIMS	IND CLAIMS
17/505,866	10/20/2021	3655	830	SHJ943-US	15	1

CONFIRMATION NO. 7769

FILING RECEIPT

150161
Avi Avraham Jencmen
17 Yizhak Rabin St
Modiin, 7174906
ISRAEL



0000000129442986

Date Mailed: 11/01/2021

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Andrea UZZO, Imola (BO), ITALY;

Applicant(s)

3U VISION SRL, Imola (BO), ITALY;

Power of Attorney: The patent practitioners associated with Customer Number 150161

Domestic Applications for which benefit is claimed - None.

A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)

ITALY 202020000005884 10/21/2020 Access Code Provided

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

Request to Retrieve - This application either claims priority to one or more applications filed in an intellectual property Office that participates in the Priority Document Exchange (PDX) program or contains a proper **Request to Retrieve Electronic Priority Application(s)** (PTO/SB/38 or its equivalent). Consequently, the USPTO will attempt to electronically retrieve these priority documents.

If Required, Foreign Filing License Granted: 10/28/2021

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 17/505,866**

Projected Publication Date: 04/21/2022

Non-Publication Request: No

Early Publication Request: No

**** SMALL ENTITY ****

Title

SELECTOR MACHINE

Preliminary Class

194

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop

technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.

Request to Retrieve Electronic Priority Application(s)

Send completed form to: Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450

COMPLETE IF KNOWN

Application Number	17/505,866
Filing Date	
First Named Inventor	Andrea UZZO
Art Unit	
Examiner Name	
Attorney Docket Number	SHJ943-US

Pursuant to 37 CFR 1.55(i), the undersigned hereby requests that the USPTO retrieve an electronic copy of each of the following foreign applications for which priority has been claimed under 35 U.S.C. 119(a)-(d) from a foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement. This Request must be submitted:

- within the later of sixteen months from the filing date of the prior foreign application or four months from the actual filing date of an application under 35 U.S.C. 111(a),
- within four months from the later of the date of commencement (37 CFR 1.491(a)) or the date of the initial submission under 35 U.S.C. 371 of an application entering the national stage under 35 U.S.C. 371, or
- with a petition under 37 CFR 1.55(e) or (f).

OPTION A

Please retrieve the priority application identified in Column C, a certified copy of which is contained in the EP or JP application identified in Columns A and B:

A	B			C	
Code for Participating Office (EP or JP only)	Application containing the non-participating priority application			Non-participating priority application to be retrieved	
	App. No.	Filing Date	Access Code (for JP only)	Country Code	App. No.
1					

OPTION B

This Request may be used for the infrequent circumstance when a claim for priority to an application filed in a participating foreign intellectual property office was made prior to that foreign intellectual property office becoming a participating foreign intellectual property office.

Please retrieve the priority application identified in Columns A and B:

A	B		
Code for Participating Office (e.g., EP) or WIPO DAS Depositing Office (e.g., AU, BR, CN, DK, EA, EE, ES, FI, GB, IB, IN, JP, KR, MA, NL, NZ, SE)	Application to be retrieved		
	App. No.	Filing Date	Access Code (for WIPO DAS Depositing Office)
1	IT	202020000005884	2020-10-21
2			6DD4

The USPTO will not attempt to retrieve the identified priority application(s) unless an identical claim for foreign priority to the application identified above is made pursuant to 37 CFR 1.55(d) or a petition is granted under 37 CFR 1.55(e) or (f). Applicants are advised to consult Private PAIR (accessed through www.uspto.gov) to assure that the retrieval has been successful. The applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period set forth in 37 CFR 1.55(g)(1).

I hereby declare that I have the authority to grant access to the above-identified foreign application(s).

/Avi Avraham Jencmen/

Signature

Avi Avraham Jencmen

Printed or Typed Name

Title

2021-10-26

Date

+1-571-2506566

Telephone Number

76188

Registration Number, if applicable

This collection of information is required by 37 CFR 1.55(d). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 8 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	44127608
Application Number:	17505866
International Application Number:	
Confirmation Number:	7769
Title of Invention:	SELECTOR MACHINE
First Named Inventor/Applicant Name:	Andrea UZZO
Customer Number:	150161
Filer:	Avi Avraham Jencmen/Devin Katz
Filer Authorized By:	Avi Avraham Jencmen
Attorney Docket Number:	SHJ943-US
Receipt Date:	26-OCT-2021
Filing Date:	
Time Stamp:	16:01:56
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
------------------------	----

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for USPTO to retrieve priority docs	SHJ43-US_PD_Retrieval.pdf	272525	no	2
			f6fdc77bbde9d77268115ca251a777ac7104ea94		

Warnings:

Information:	
Total Files Size (in bytes):	272525
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.	

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(b).

I hereby appoint:



Practitioners associated with the Customer Number:

150161

OR



Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

as attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(b).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(b) to:



The address associated with Customer Number:

150161

OR

☐ Firm or Individual Name			
Address			
City	State	Zip	
Country			
Telephone	Email		

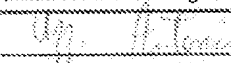
Assignee Name and Address:

3U VISION SRL
Via Ugo La Malfa, 20
40026 Imola (BO); Italy

A copy of this form, together with a statement under 37 CFR 3.73(b) (Form PTO/SB/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(b) may be completed by one of the practitioners appointed in this form if the appointed practitioner is authorized to act on behalf of the assignee, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee

Signature		Date
Name	ANTONIO VERO	Telephone
Title	CEO of 3U VISION SRL	

This collection of information is required by 37 CFR 1.31, 1.32 and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

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The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of
Invention

SELECTOR MACHINE

As the below named inventor, I hereby declare that:

This declaration
is directed to:



The attached application, or



United States application or PCT international application number _____

filed on _____

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor:

UZZO, Andrea

Date (Optional): _____

Signature:



Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:

Filing Date:

Title of Invention:

SELECTOR MACHINE

First Named Inventor/Applicant Name:

Andrea UZZO

Filer:

Avi Avraham Jencmen/Devin Katz

Attorney Docket Number:

SHJ943-US

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY FILING FEE (ELECTRONIC FILING)	4011	1	80	80
UTILITY SEARCH FEE	2111	1	350	350
UTILITY EXAMINATION FEE	2311	1	400	400

Pages:

Claims:

Miscellaneous-Filing:

Petition:

Patent-Appeals-and-Interference:

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				830

Electronic Acknowledgement Receipt

EFS ID:	44075449
Application Number:	17505866
International Application Number:	
Confirmation Number:	7769
Title of Invention:	SELECTOR MACHINE
First Named Inventor/Applicant Name:	Andrea UZZO
Customer Number:	150161
Filer:	Avi Avraham Jencmen/Devin Katz
Filer Authorized By:	Avi Avraham Jencmen
Attorney Docket Number:	SHJ943-US
Receipt Date:	20-OCT-2021
Filing Date:	
Time Stamp:	12:15:44
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$830
RAM confirmation Number	E20210JC16412117
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Application Data Sheet	SHJ943-US_ADS.pdf	1256093	no	8
			37317ce1cccbd7de0ce87fd94e227a65aebb2ee		
Warnings:					
Information:					
2		SHJ943-US_Specification_Claims_Abstract.pdf	116899	yes	22
			a0aaf2df29bebf5c281c4af7424cf1efcc798043		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Specification		1	18	
	Claims		19	21	
	Abstract		22	22	
Warnings:					
Information:					
3	Drawings-only black and white line drawings	SHJ943-US_Drawings.pdf	173834	no	3
			81622ec52f243f55685c004a1e415756dff4e0df		
Warnings:					
Information:					
4	Power of Attorney	SHJ943-US_Signed_POA.pdf	415743	no	2
			da6021cee4bd76d90a80cfbc6329abeece70952a		
Warnings:					
Information:					
5	Oath or Declaration filed	SHJ943-US_Executed_Declaration.pdf	153539	no	2
			e10dd14d72a93b477b0ad3edf62616302dbd90a5		

Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	43858	no	2
			180e4368222ee6d768ffde04393b904210b6a52f		
Warnings:					
Information:					
Total Files Size (in bytes):			2159966		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SHJ943-US
		Application Number	
Title of Invention	SELECTOR MACHINE		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

☐	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Inventor Information:

Inventor	1				Remove
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Andrea		UZZO		
Residence Information (Select One) US Residency • Non US Residency Active US Military Service					
City	Imola (BO)		Country of Residence ⁱ	IT	
Mailing Address of Inventor:					
Address 1		Via Montericco, 11E			
Address 2					
City	Imola (BO)		State/Province		
Postal Code	40026		Country ⁱ	IT	
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.					

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ An Address is being provided for the correspondence Information of this application.			
Customer Number	150161		
Email Address	office@il-ip.com	Add Email	Remove Email

Application Information:

Title of the Invention	SELECTOR MACHINE		
Attorney Docket Number	SHJ943-US	Small Entity Status Claimed	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	3	Suggested Figure for Publication (if any)	

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SHJ943-US
		Application Number	
Title of Invention	SELECTOR MACHINE		

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not be** the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	150161		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status		Remove
Application Number	Continuity Type	Prior Application Number
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.		

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SHJ943-US
		Application Number	
Title of Invention	SELECTOR MACHINE		

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)
202020000005884	IT	2020-10-21	

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SHJ943-US
		Application Number	
Title of Invention	SELECTOR MACHINE		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SHJ943-US
		Application Number	
Title of Invention	SELECTOR MACHINE		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant	1	Remove
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section. Clear		
☒ Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.		Person who shows sufficient proprietary interest
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:		
Name of the Deceased or Legally Incapacitated Inventor:		
If the Applicant is an Organization check here. ☒		
Organization Name	BU VISION SRL	
Mailing Address Information For Applicant:		
Address 1	Via Ugo La Malfa, 20	
Address 2		
City	Imola (BO)	State/Province
Country	IT	Postal Code
Phone Number		Fax Number
Email Address		
Additional Applicant Data may be generated within this form by selecting the Add button. Add		

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SHJ943-US
		Application Number	
Title of Invention	SELECTOR MACHINE		

Assignee	1			
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.				
				Remove
If the Assignee or Non-Applicant Assignee is an Organization check here.				☐
Prefix	Given Name	Middle Name	Family Name	Suffix
Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country ⁱ		Postal Code		
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.				Add

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). However, if this Application Data Sheet is submitted with the **INITIAL** filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Avi Avraham Jencmen/		Date (YYYY-MM-DD)	2021-10-20
First Name	Avi Avraham	Last Name	Jencmen	Registration Number
				76188
Additional Signature may be generated within this form by selecting the Add button.				Add

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	SHJ943-US
		Application Number	
Title of Invention	SELECTOR MACHINE		

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

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The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

SELECTOR MACHINE

DESCRIPTION

Field of application

The present finding regards a selector machine.

- 5 The present selector machine is inserted in the field of production of machines for the sorting of products, which are advantageously employed for identifying, within a bulk product, specific solid elements to be separated.

The present selector machine is, in particular, intended to be employed in the agricultural industry, for example in order to separate dried fruit from the corresponding shells before
10 packaging, in the waste recovery and recycling industry, for example in order to separate waste made with plastic materials that are different from each other, or in any other field in which it is necessary to separate solid elements from each other in a bulk product on the basis in particular of their external appearance and/or of their chemical-physical properties.

State of the art

- 15 Known on the market are selector machines, of automated type, which are employed in order to separate, within a product constituted by multiple objects, specific objects to be selected or to be discarded.

As is known, the selector machines are generally provided with a conveyance system on which a flow of a bulk product is made to advance, at its interior comprising multiple solid
20 elements which must be distinct and separated from each other. Such bulk product can, for example, comprise dried fruit (such as peanuts, almonds, walnuts, which must be separated from their shells before being packaged), or it can comprise waste made of different material (e.g. plastic), which must be separated from each other in order to allow a correct disposal or recycling thereof.

- 25 For example, the conveyance system comprises one or more hoppers through which the

product is made to flow within the machine itself through a system of slides, up to collection drawers.

Selector machines also comprise an optical detection system arranged for acquiring and analyzing images of the flow of bulk product, so as to distinguish, in the bulk product, the
5 solid elements to be separated or discarded.

Such detection system is adapted to send control signals, based on the information obtained from the acquired images, to an expulsion device (such as a solenoid valves) actuatable to remove the selected solid elements from the bulk product, for example through the emission of compressed air jets.

10 More in detail, the optical detection system comprises optical emitters (e.g. constituted by LEDs) adapted to emit electromagnetic radiations towards the bulk product, and one or more optical sensors arranged for receiving the radiations reflected from the bulk product in order to obtain images of the product on the basis of which, by means of suitable thresholding algorithms, an electronic control unit determines which are the elements to be removed.

15 In order to be able to distinguish, in the bulk product, solid elements substantially having the same color in the visible light spectrum, it is known to employ emitters and optical sensors that also operate in the near infrared spectrum. Indeed, elements having the same color in the visible spectrum generally have chemical-physical characteristics that determine a different absorption spectrum at the infrared wavelengths.

20 In particular, widespread on the market are selector machines in which the optical emitters generate wide spectrum radiations (with wavelengths both in the visible range and outside this) and the optical sensor is constituted by a hyperspectral video camera. The latter is capable of simultaneously acquiring a plurality of images, for example three hundred images, each containing information corresponding to a particular very narrow spectral band. The
25 narrow spectral bands at which the images are acquired cover most of the electromagnetic

radiation spectrum, from the ultraviolet to the infrared, and are extended for an amplitude not greater than 5 or 10 nm.

Therefore, such hyperspectral video cameras allow detecting, with a high degree of precision, chemical-physical characteristics of the elements to be separated not only by means of the detection of electromagnetic radiation in the near infrared spectrum, but simultaneously in the ultraviolet spectrum, the visible spectrum and in the infrared with greater wavelength spectrum.

The selector machine provided with hyperspectral video camera described briefly up to now has in practice demonstrated that it does not lack drawbacks.

The main drawback lies in the high cost of the hyperspectral video camera itself, which renders the optical detection system and, consequently, the selector machine extremely costly. A further drawback of the selector machine briefly described up to now lies in the low image acquisition frequency of the hyperspectral video camera, such acquisition frequency generally being comprised between 200 and 300 Hz.

A further drawback of the selector machine briefly described up to now is due to the very high quantity of data produced by the hyperspectral video camera, such data requiring processing by the electronic control unit which, consequently, must possess computation performances, with consequent increase of the machine manufacturing costs.

In addition, the high quantity of data to be processed can determine a relatively long reaction time by the electronic control unit in order to drive the expulsion device, with the risk of not intercepting the flow of product in the desired position due to the high advancement speed of the latter (even 4 m/s).

A further drawback of the selector machine briefly described above lies in the fact that it is unable to acquire images with high resolution, since the pixel matrix of the video camera is separated into multiple sectors, each of which associated with the corresponding optical filter,

with the consequence that the image at each spectral band be defined by a limited number of pixels of the video camera itself.

Presentation of the invention

In this situation, the problem underlying the present finding is therefore that of eliminating the
5 problems of the abovementioned prior art, by providing a selector machine, which has a high reliability and operative precision and, simultaneously, is inexpensive to attain.

A further object of the present finding is to provide a selector machine, which operates in an efficient manner, in particular without having to execute heavy computational processing by the electronic control unit.

10 A further object of the present finding is to provide a selector machine, capable of acquiring images with high degree of resolution.

Brief description of the drawings

The technical characteristics of the present finding, according to the aforesaid objects, and the advantages thereof, will be more evident in the following detailed description, made with
15 reference to the enclosed drawings, which represent a merely exemplifying and non-limiting embodiment of the invention, in which:

- figure 1 shows a perspective view of a selector machine according to the present finding;
- figures 2, 3 and 4 show a schematic view, in lateral section, of the selector machine of figure 1, depicting the activation of different IR sources of the optical detection system of
20 the selector machine itself;
- figure 5 shows an example of time progression of trigger signals generated by the electronic control unit of the selector machine in order to control, in a synchronized manner, the emission and the acquisition of the electromagnetic radiations;
- figures 6, 7 and 8 show respective graphs, which illustrate the filtering action of a bandpass
25 filter of the selector machine, which is provided with three narrow bandwidths, on the

electromagnetic radiations determined by the IR sources of the optical detection system.

Detailed description of a preferred embodiment

With reference to the enclosed figure, reference number 1 indicates a selector machine according to the present finding.

5 Advantageously, the present selector machine 1 is intended to be employed, in different application fields, for selecting specific elements in a product constituted by a set of solid elements, in particular with very similar shape and/or color.

More in detail, the present selector machine 1 is intended to be employed in the food industry, in particular so as to identify in a bulk product (in particular granular), such as for example
10 dried fruit (peanuts, walnuts, almonds), seeds, grain or the like, elements which must be discarded before product packaging, which can for example be the shells of the dried fruit, discards of the working of the food product or other non-edible foreign bodies.

In addition, the present selector machine 1 can be employed in the industry of waste recovery, in particular so as to identify elements of specific materials (e.g. different plastic types) in
15 order to be correctly disposed of or recycled.

The selector machine 1 comprises a conveyance system 2, which is arranged for advancing, along an advancement path A, at least one bulk product comprising multiple solid elements to be selected.

Preferably, the selector machine 1 comprises a support frame 12, which carries mounted
20 thereon the conveyance system 2 and internally defines an operative volume 13 at least partially traversed by the advancement path A.

In accordance with the preferred embodiment illustrated in the enclosed figures, the conveyance system 2 comprises a hopper 14, through which the product is provided to the selector machine 1 and, more particularly, inserted in the operative volume 13 of the support
25 frame 12, and a vibrating feeder (not illustrated) arranged for advancing the bulk product from

the hopper 14 to a slide 15, along which the bulk product descends via gravity in order to be distributed and advance along the advancement path A.

Advantageously, the selector machine 1 comprises at least one first collection space 20 in order to receive the product coming from the advancement path A, and at least one second
5 collection space 21 in order to receive the solid elements selected from the aforesaid product flow, as schematized in figures 2, 3 and 4.

Suitably, the selector machine 1 can comprise multiple advancement paths A (for example defined by corresponding hoppers 14, vibrating feeders and slides 15) with corresponding first and second collection spaces 20, 21, so as to select multiple products, even
10 simultaneously.

The present selector machine 1 comprises an optical detection system 3 adapted to identify, in the product, the elements to be selected.

More in detail, the optical detection system 3 is provided with an emitter device 4, which is arranged for emitting, towards the advancement path A, electromagnetic radiations 40 adapted
15 to hit the product, and with an optical sensor 5, which is directed towards the advancement path A and is arranged for receiving reflected radiations RF coming from the product irradiated by the electromagnetic radiations 40 and for transducing the reflected radiations RF into corresponding measurement signals.

In addition, the optical detection system 3 is provided with an electronic control unit 6
20 operatively connected to the optical sensor 5 in order to receive the measurement signals and arranged for emitting control signals, which are sent to an expulsion device 7 in order to remove the selected elements from the product, as discussed hereinbelow.

Advantageously, the optical detection system 3 is placed along the advancement path A, in particular below the slide 15 of the conveyance system 2, so as to detect the bulk product
25 freely falling from the slide 15 itself with the solid elements to be selected spaced from each

other.

The optical detection system 3 is preferably placed in the operative volume 13 defined inside the support frame 12, in a manner such that the support frame 12 itself screens the optical detection system 3 from light coming from the external environment and prevents it from interfering with the electromagnetic radiations 40 emitted by the emitter device 4 or with the reflected radiations RF coming from the product irradiated and received by the optical sensor 5.

The present selector machine 1 comprises (as anticipated above) an expulsion device 7 connected to the optical detection system 3 in order to receive the control signals from the electronic control unit 6. Such control signals are adapted to drive the expulsion device 7 to eliminate from the advancement path A specific solid elements of the product, which are selected based on the information acquired from the optical detection system 3.

Preferably, the expulsion device 7 comprises multiple nozzles 16 placed side-by-side each other along a longitudinal direction Z substantially transverse to the advancement path (e.g. horizontal) and in particular parallel to the lying plane of the slide 15.

Advantageously, the nozzles 16 are placed below the optical detection system 3, are directed towards the advancement path A and are actuatable, based on the control signals sent by the electronic control unit 6, each by means of a corresponding solenoid valve, to emit a compressed air jet towards the flow of the bulk product.

In particular, each nozzle 16 is operatively associated with a specific point of the advancement path A (for example according to a specific position grid), in a manner such that the actuation of each nozzle 16 generates an air flow that hits the elements that pass into such specific point of the advancement path A.

In this manner, the solid elements that must be separated from the rest of the bulk product are hit by the compressed air jet emitted by one of the nozzles 16 of the expulsion device 7 and

are effectively diverted from the advancement path A while they freely falling from the slide 15 of the conveyance system 2, preferably being conveyed towards the second collection space 21.

According to the idea underlying the present finding, the emitter device 4 comprises at least 5 three IR sources 8, each of which arranged for emitting electromagnetic radiations 40 in a corresponding distinct spectral band 80 in the infrared spectrum.

In accordance with the embodiment illustrated in figures 2-4, the emitter device 4 comprises three IR sources 8. Suitably, the emitter device 4 can also comprise more than three IR sources 8, of which three will be enabled for operation.

10 With the term “spectral band”, it must be intended hereinbelow an interval of selected wavelengths of the electromagnetic radiations 40.

In addition, the electronic control unit 6 is operatively connected to the emitter device 4 and is arranged for alternately turning on the IR sources 8 one after the other in corresponding and separate time intervals T_{ON} and the optical sensor 5 is arranged for detecting, in each time 15 interval T_{ON} , corresponding reflected radiations R_F coming from the product irradiated by the corresponding IR source 8, and for generating corresponding measurement signals.

The electronic control unit 6 comprises, in addition, a processing module 9, which is provided with three chromatic channels 10 of a RGB color space, i.e. in particular a channel of the red R, a channel of the green G and a channel of the blue B. The processing module 9 is arranged 20 for associating the measurement signals corresponding to each IR source 8 with a corresponding chromatic channel 10 in order to compose a false color synthesis image of the product.

The electronic control unit 6 is adapted to generate the control signals, and then identify the elements to be selected, as a function of the aforesaid synthesis image.

25 During use, the electronic control unit 6 turns on in a first time interval T_{ON} a first of the IR

sources 8 with the other IR sources 8 inactive, such that the bulk product is only irradiated with electromagnetic radiations 40 at the spectral band 80 of the aforesaid IR source 8. The irradiated product absorbs several of the electromagnetic radiations 40 and reflects the reflected radiations RF having wavelengths in any case comprised in the corresponding spectral band 80, which are received by the optical sensor 5 in order to generate a measurement signal, preferably in the form of a grayscale image. Such grayscale image, preferably, is not intended to be shown, e.g. through a monitor of the selector machine 1, to a user, but rather to be processed as computer data by the software of the electronic control unit 6. The aforesaid measurement signal, or more particularly the information contained in each pixel of the grayscale image, will only depend on the intensity of the reflected radiation RF at wavelengths comprised in the spectral band 80 of the corresponding IR source 8. In addition, such measurement signal is mapped on a first of the chromatic channels 10 of the processing module 9, as represented in figure 2, for example the channel of the red R in the RGB color space in which the synthesis images are processed. In a successive second time interval T_{ON} , the first of the IR sources 8 is deactivated by the electronic control unit 6 and a second of the aforesaid IR sources 8 is turned on in order to irradiate the bulk product with electromagnetic radiations 40 at a different spectral band 80. The optical sensor 5 therefore generates a second measurement signal which is associated by the processing module 9, as represented in figure 3, with a second of the chromatic channels 10, for example the channel of the green G in the RGB color space. The same process is repeated with a third of the IR sources 8, such that the optical sensor 5 generates a measurement signal that is mapped by the processing module 9, as represented in figure 3, with a third of the chromatic channels 10, e.g. the channel of the blue B in the RGB color space. Such sequential activation of the IR sources is cyclically repeated.

Advantageously, the electronic control unit 6 is provided with at least one thresholding

software, per se of known type (and hence not discussed hereinbelow), which defines the criteria with which the electronic control unit 6 determines, based on the synthesis images, the elements to be selected and, consequently, the control signals to be sent to the expulsion device 7.

- 5 In particular, the use of IR sources 8 allows distinguishing, from each other, solid elements of the bulk product having substantially the same color in the visible spectrum but chemical-physical characteristics which are different if irradiated with electromagnetic radiations belonging to the infrared spectrum.

For example, peanuts and the corresponding shells substantially have the same color in the
10 visible spectrum but are provided with a different moisture and fat quantity, which make the peanuts and the shells themselves absorb - if irradiated with electromagnetic radiations in the infrared spectrum - different wavelengths of the same electromagnetic radiation.

Analogously, plastic materials having the same color in the visible spectrum can be provided with polymer chains that have different chemical composition, which determine a different
15 absorption of the electromagnetic radiations in the infrared spectrum.

In addition, the claimed arrangement of multiple IR sources 8 actuatable to sequentially emit the electromagnetic radiations 40 at distinct spectral bands 80 renders the present selector machine 1 particularly inexpensive to manufacture. Indeed, a sensor with wide spectrum can be employed as optical sensor 5, which is only capable of acquiring measurement signals that
20 depend on the mean of the intensity of all the reflected radiations RF incident thereon, independent on their wavelength. Indeed, it is not necessary that the optical sensor 5 be provided with hyperspectral video camera, prisms, lattices, dichroic mirrors or other optical elements capable of separating the reflected radiations RF from the bulk product based on their wavelengths in order to simultaneously generate measurement signals which separately
25 depend on the intensity at selected spectral bands, since the sequential actuation of the IR

sources 8 in time intervals T_{ON} not overlapped on each other ensures that the acquired measurement signals each depend only on the intensity of the reflected radiations RF at the respective selected spectral band 80. Consequently, the selection or separation of the wavelengths at which each measurement signal is acquired is not executed at the optical
5 sensor 5, but rather upstream thereof, at the emitter device 4, whose IR sources 8 are sequentially actuated.

In order to effectively generate the false color synthesis image by means of three measurement signals acquired in time intervals T_{ON} in sequence, the optical sensor 5 has an acquisition frequency substantially comprised between 15 and 25 kHz, preferably equal to the
10 sequential turning-on frequency of the IR sources 8.

Indeed, the acquisition frequency is so high that, with each acquisition, the movement executed by the solid elements of the bulk product (which travel along the advancement path A with a speed generally equal to about 4 m/s) is so small that three subsequent acquisitions can be considered (corresponding to the sequential activation of the three IR sources) relative
15 to a same position along the advancement path A.

In particular, the present selector machine 1 is capable of acquiring the measurement signals and processing the synthesis images with a frequency that is so high with respect to the vision machines of known type discussed above, since the optical sensor 5 only acquires three measurement signals for each synthesis image, and such measurement signals allow
20 distinguishing, with sufficient precision, the solid elements of the bulk product without overloading the processing module 9, and the processing module 9 generates the synthesis image starting from the reduced quantity of data contained in the only three measurement signals mapped in the chromatic channels 10, employing algorithms that are typical of the RGB color space, which require easier implementation with respect to the typical algorithms
25 of infrared image processing.

The spectral band 80 of the electromagnetic radiations 40 emitted by each IR source 8 is advantageously contained within the short wave infrared spectrum, which is known in the technical jargon of the field with the initials “SWIR” (Short Wave Infrared). The wavelengths in the SWIR have proven particularly efficient for distinguishing the different solid elements
5 of the bulk product based on chemical-physical characteristics, therefore increasing the reliability and operating efficiency of the selector machine 1.

Advantageously, the wavelengths of the spectral band 80 are substantially comprised between 900 nm and 2200 nm.

The optical sensor 5 comprises, advantageously, at least one row of optical transducers 5’
10 extended along an extension direction X substantially transverse to the advancement path A, preferably substantially parallel to the width-wise extension of the slide 15 and, in particular horizontal.

Advantageously, the optical transducers 5’ of the optical sensor 5 are InGaAs solid state transducers, which are particularly adapted to detect the reflected radiations RF in the spectral
15 bands 80 of the short wave infrared spectrum.

Preferably, the optical sensor 5 comprises a linear video camera (provided with the aforesaid row of optical transducers 5’), also possibly in black and white.

Preferably, the measurement signals generated by the optical sensor 5 contain information that represents images in grayscale in a linear vector form of pixels, in which each pixel
20 corresponds to one of the InGaAs solid state transducers of the aforesaid row of optical transducers 5’.

Therefore, the false color synthesis image processed by the processing module 9 every three successive time intervals T_{ON} is in turn preferably in a linear vector form of pixels.

In addition, the processing module 9 is preferably arranged for composing an overall image in
25 the form of a two-dimensional pixel matrix, starting from multiple false color synthesis

images in a linear vector form of pixels which are sequentially processed and for amplifying every three time intervals T_{ON} the aforesaid overall image, by adding the corresponding synthesis image, in a manner such that the solid elements of the bulk product are easily identifiable by the electronic control unit 6.

- 5 As reported above, the optical sensor 5 advantageously comprises a linear video camera in black and white, which generates, as measurement signals, images in grayscale in a linear vector form of pixels.

Such configuration of the optical sensor 5 (in particular like a black and white video camera) allows it to generate measurement signals that are not particularly heavy (in particular
10 allowing information relative to black and white images), in this manner allowing the processing module 9 to compose the synthesis image through the processing of a relatively reduced quantity of data (in particular compared with color video cameras) and in particularly quick time periods. In addition, the acquisition, instant by instant, of measurement signals relative to images in linear vector form of pixels involves that, with each acquisition, it is
15 necessary to transmit, by means of the communication BUS, a reduced quantity of data (with respect to a hyperspectral video camera) from the optical sensor 5 to the electronic control unit 6, hence rendering such transmission particularly quick.

In this manner, in particular, the quick times for processing and transmitting the data allow positioning the nozzles 16 of the expulsion device 7 just below the optical detection system 3
20 and, therefore, close to the slide 15 of the conveyance system 2, since the electronic control unit 6 is capable of sending the control signals to the expulsion device 7 itself in extremely reduced time intervals. In addition, the precision in removing, from the advancement path A, the solid elements is increased since with the decrease of the distance of the expulsion device 7 from the optical detection system 3 and from the lower edge of the slide 15, the possible
25 variations of the drop speed of the solid elements to be diverted are decreased, considerably

reducing the risk that a compressed air jet emitted by one of the jets 16 arrive early or late with respect to the solid element identified by the electronic control unit 6.

Advantageously, the electronic control unit 6 comprises at least one electronic processor suitably implemented in a corresponding circuit board. Suitably, the processing module 9 can
5 be integrated in the aforesaid electronic processor, for example by means of a corresponding software, or obtained with a distinct firmware.

Advantageously, the electronic control unit 6 can be integrated in the optical sensor 5, in particular in the video camera of the latter (obtained for example with a smart camera).

Suitably, each IR source 8 advantageously comprises at least one LED 8', in particular so as
10 to maintain constant over time the characteristics of intensity and wavelength of the electromagnetic radiations 40 emitted by the emitter device 4 with ease.

Advantageously, each IR source 8 comprises at least one row of the aforesaid LED 8', which is extended along an extension direction Y substantially transverse to the advancement direction A, preferably substantially parallel to the width-wise extension of the slide 15 and,
15 in particular horizontal.

The rows of LED 8' of the IR sources 8 are advantageously placed with their extension directions Y substantially parallel to the extension direction X of the row of optical transducers 5' of the optical sensor 5.

In this manner, the electromagnetic radiation 40 emitted by the row of LEDs 8' of each IR
20 source 8 has a substantially zero gradient of intensity and wavelength along all the directions parallel to the extension direction Y and, consequently, to the extension direction X of the row of optical transducers 5', with consequent increase of the quality of the acquired measurement signals.

Preferably, each IR source 8 is provided with two rows of LED 8', both arranged for emitting
25 electromagnetic radiations 40 at the corresponding spectral band 80, which are placed in a

substantially symmetric manner with respect to the optical axes of the row of optical transducers 5', so as to illuminate the solid elements of the bulk product from two different directions, reducing the shadows thereon.

In accordance with an embodiment not illustrated in the enclosed figures, the optical sensor 5
5 comprises two rows of optical transducers 5' which are opposite with respect to the advancement path A, so as to acquire the measurement signals relative to the bulk product from two different viewpoints, a front and a rear, and each IR source 8 of the emitter device comprises at least two rows of LED 8', including one for each row of optical transducers 5', which are extended along extension directions Y parallel to each other and to the extension
10 directions X of the rows of optical transducers 5' and are arranged for emitting electromagnetic radiations 40 from opposite directions with respect to the advancement path A itself.

Advantageously, the electronic control unit 6 is arranged for sending, to the IR sources 8, trigger signals 60, 60' which are synchronized with the processing module 9.

15 More in detail, with reference to figure 5, the electronic control unit 6 is provided with a synchronized control module arranged for generating the aforesaid trigger signals 60, 60' in groups of three, of which the first trigger signal 60' of the trigger signals 60, 60' has greater time extension with respect to the second and third trigger signals 60.

Such first trigger signal 60' with greater time extension allows the IR sources 8 of the emitter
20 device 4 to be resynchronized with the processing module 9 every three acquisitions of the measurement signals by the optical sensor 5, even in the event in which there is an asynchrony between the IR sources 8, the optical sensor 5 and the processing of the measurement signals on the three chromatic channels 10 of the processing module 9 during the acquisition of three preceding measurement signals. Indeed, each time the emitter device
25 4, the optical sensor 5 and the processing module 9 detect a first trigger signal 60' having

greater time extension, these recognize that three measurement signals have already been acquired at the respective spectral bands 80, regardless of whether the acquisition was executed correctly or in an asynchronous manner, and that it is necessary to proceed with the acquisition of subsequent three measurement signals.

5 The present selector machine 1 comprises, preferably, a bandpass filter 11 provided with at least three narrow spectral bands 110, each of which extended for a subset of wavelengths of the spectral band 80 of a corresponding IR source 8. More in detail, the bandpass filter 11 is positioned in a manner such to intercept the electromagnetic radiations 40 emitted by the IR sources 8 or the reflected radiations RF coming from the product.

10 The arrangement of a bandpass filter 11 to intercept the electromagnetic radiations 40 or the reflected radiations RF allows obtaining a more precise irradiation of the bulk product and, thus, detecting with greater precision the chemical-physical characteristics of the solid elements comprised therein.

Indeed, as is known, the LEDs 8' of the IR sources 8 can have a spectral band 80 with
15 emission wider than that of interest, for example extended for an interval of wavelengths for about one hundred or two hundred nanometers, with maximum intensity at a central wavelength, for example indicated by the LED manufacturer, and intensities decreasing the further the wavelength is from such central wavelength.

The narrow bandwidths 110 of the bandpass filter 11 are substantially centered, each on a
20 corresponding spectral band 80, such that through each narrow bandwidth 110 only the transmission of the electromagnetic radiations 40 which has the highest intensity of the spectral band 80 is allowed, and the transmission of the electromagnetic radiations 40 with lower intensity is prevented.

The bandpass filter 11 can be, preferably, provided with more than three narrow bandwidths
25 110, for example five, in a manner such that it can operate with multiple combinations of

spectral bands 80 (i.e. by arranging multiple combinations of IR sources 8) without having to change such bandpass filter 11.

In this manner, the selector machine 1 can be adapted to sort, for example, dried fruit by installing, in the emitter device, 4 IR sources 8 at three spectral bands 80 corresponding to three of the five narrow bandwidths 110 of the bandpass filter 11, and for example to sort different types of plastic materials by installing IR sources 8 at three diverse spectral bands 80 corresponding to other three of the same five narrow bandwidths 110 of the bandpass filter 11.

Advantageously, each narrow spectral band 110 of the bandpass filter 11 has a bandwidth 111 substantially comprised between 15 and 35 nm and, still more preferably, substantially comprised between 20 and 30 nm.

In addition, the narrow spectral bands 110 of the bandpass filter 11, advantageously, are not overlapped on each other.

More in detail, the narrow spectral bands 110 are spaced from each other by an interval of electromagnetic radiation such that, even if IR sources 8 with particularly wide spectral band 80 are employed, none of the electromagnetic radiations 40 emitted by one of the three IR sources 8 is transmitted through a narrow bandwidth 110 adjacent to that centered on the spectral band 80 of the corresponding IR source 8.

Nevertheless, the correct operation of the optical detection system 3 is ensured also in the event in which the narrow spectral bands 110 are spaced from each other by an interval of electromagnetic radiation such to allow only the electromagnetic radiations 40 at lower intensity of each spectral band 80 to be transmitted through a narrow bandwidth 110 adjacent to that centered on the spectral band 80 of the corresponding IR source 8, as illustrated in the figures 6, 7 and 8, which show, in a graph having the wavelengths on the x-axis and the percentage of light intensity that is transmitted through the bandpass filter 11 on the y-axis,

the portion of electromagnetic radiations 40 of each spectral band 80 transmitted through the narrow bandwidths 110 with each IR source 8 separately actuated.

Advantageously, the bandpass filter 11 is positioned between the advancement path A and the optical sensor 5 in order to intercept the reflected radiations RF coming from the product.

- 5 Still more preferably, the bandpass filter 11 is mounted on the optical sensor 5, in a manner such that all the reflected radiations RF incident on the optical sensor 5 are intercepted by the bandpass filter 11 itself.

- In accordance with a different embodiment, not illustrated in the enclosed figures, the bandpass filter 11 is positioned between the advancement path A and the emitter device 4 in
10 order to intercept the electromagnetic radiations 40 emitted by the IR sources 8 of the emitter device 4. More particularly, the aforesaid bandpass filter 11 is mounted directly on the emitter device 4 itself, in a manner such that all the electromagnetic radiations 40 are intercepted by the bandpass filter 11 itself.

The finding thus conceived therefore attains the pre-established aims.

- 15 The contents of the Italian patent application number 202020000005884, from which this application claims priority, are incorporated herein by reference.

CLAIMS

1. A selector machine, comprising:

- a conveyance system (2), which is arranged for advancing, along an advancement path (A), at least one bulk product comprising multiple solid elements to be selected;

5 – an optical detection system (3) comprising:

- an emitter device (4) arranged for emitting, towards said advancement path (A), electromagnetic radiations (40) adapted to hit said at least one product;

10 – an optical sensor (5) directed towards said advancement path (A) and arranged for receiving reflected radiations (RF) coming from said at least one product irradiated by said electromagnetic radiations (40), and for transducing said reflected radiations (RF) into corresponding measurement signals;

- an electronic control unit (6) operatively connected to said optical sensor (5) in order to receive said measurement signals, and arranged for emitting control signals;

15 – an expulsion device (7) connected to said optical detection system (3) in order to receive said control signals, which are adapted to drive said expulsion device (7) to eliminate, from said advancement path (A), specific solid elements of said at least one product;

wherein:

- said emitter device (4) comprises at least three IR sources (8), each of which is arranged for emitting electromagnetic radiations (40) in a corresponding separate spectral band (80)

20 in the infrared spectrum;

- said electronic control unit (6) is operatively connected to said emitter device (4) and is arranged for alternately turning on said IR sources (8) one after the other, in corresponding and separate time intervals (T_{ON});

25 – said optical sensor (5) is arranged for detecting, in each said time interval (T_{ON}), corresponding said reflected radiations (RF) coming from said at least one product

irradiated by the corresponding said IR source (8), and to generate corresponding said measurement signals;

- said electronic control unit (6) comprises a processing module (9), which is provided with at least three chromatic channels (10) of a RGB color space and is arranged for associating the measurement signals corresponding to each said IR source (8) with a corresponding chromatic channel of said chromatic channels (10) in order to compose a false color synthesis image of said at least one product; said electronic control unit (6) being configured to generate said control signals as a function of said synthesis image.

2. The selector machine of claim 1, wherein the spectral band (80) of the electromagnetic radiations (40) emitted by each said IR source (8) is contained within the short wave infrared spectrum.

3. The selector machine of claim 1, wherein the wavelengths of said spectral band (80) are substantially comprised between 900 nm and 2200 nm.

4. The selector machine of claim 1, wherein said optical sensor (5) comprises at least one row of optical transducers (5') extended along an extension direction (X) substantially transverse to said advancement path (A).

5. The selector machine of claim 4, wherein said optical transducers (5') are InGaAs solid state transducers.

6. The selector machine of claim 1, wherein each said IR source (8) comprises at least one LED (8').

7. The selector machine of claim 6, wherein each said IR source (8) comprises at least one row of LEDs (8'); wherein said at least one row of LEDs (8') is extended along an extension direction (Y) substantially transverse to said advancement direction (A).

8. The selector machine of claim 4, wherein each said IR source (8) comprises multiple rows of LED (8');

wherein said rows of LED (8') are placed with said extension directions (Y) substantially parallel to the extension direction (X) of said rows of optical transducers (5').

9. The selector machine of claim 1, wherein said optical sensor (5) has an acquisition frequency substantially comprised between 15 and 25 kHz.

5 **10.** The selector machine of claim 1, wherein said electronic control unit (6) is arranged for sending, to said IR sources (8), trigger signals (60, 60') synchronized with said processing module (9).

11. The selector machine of claim 1, further comprising a bandpass filter (11) provided with at least three narrow spectral bands (110), each of which extended for a subset of wavelengths
10 of the spectral band (80) of a corresponding said IR source (8); said bandpass filter (11) being positioned in a manner such to intercept said electromagnetic radiations (40) emitted by said IR sources (8) or said reflected radiations (RF) coming from said at least one product.

12. The selector machine of claim 11, wherein said bandpass filter (11) is positioned between said advancement path (A) and said optical sensor (5) in order to intercept the reflected
15 radiations (RF) coming from said at least one product.

13. The selector machine of claim 11, wherein said bandpass filter (11) is positioned between said advancement path (A) and said optical sensor (5) in order to intercept the reflected radiations (RF) coming from said at least one product; wherein said bandpass filter (11) is mounted on said optical sensor (5).

20 **14.** The selector machine of claim 11, wherein each said narrow spectral band (110) of said bandpass filter (11) has a bandwidth (111) substantially comprised between 15 and 35 nm.

15. The selector machine of claim 11, wherein the narrow spectral bands (110) of said bandpass filter (11) are not overlapped on each other.

Abstract

Selector machine comprising an optical detection system provided with an emitter device and with an optical sensor adapted to detect a product to be selected. The emitter device comprises three IR sources, each of which emits electromagnetic radiations in a corresponding spectral
5 band in the infrared spectrum. An electronic control unit alternately turns on the IR sources in corresponding separate time intervals, and the optical sensor detects, in each time interval, corresponding reflected radiations coming from the product. In addition, the electronic control unit comprises a processing module, which is provided with three chromatic channels of a RGB color space in order to associate the measurement signals corresponding to each IR
10 source with a corresponding chromatic channel so as to compose a false color synthesis image of the product.

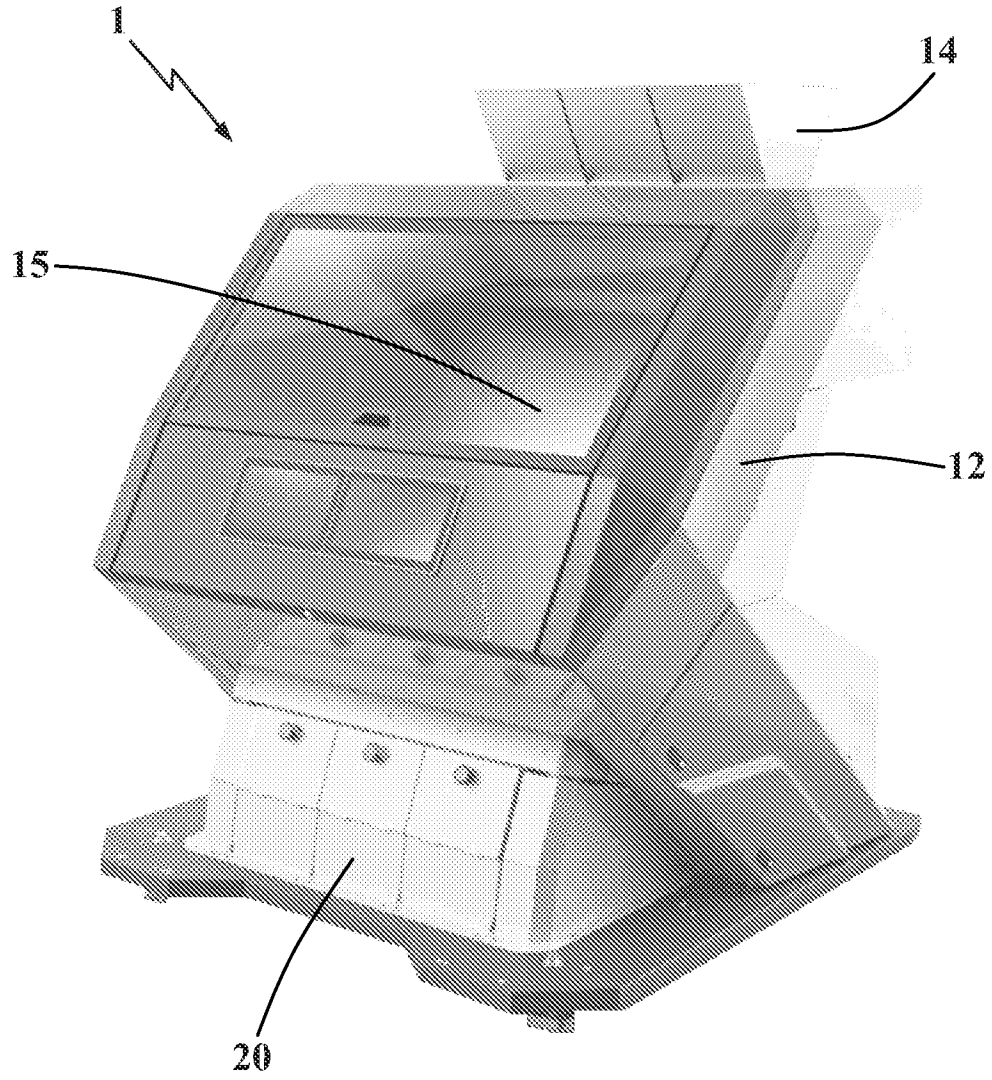
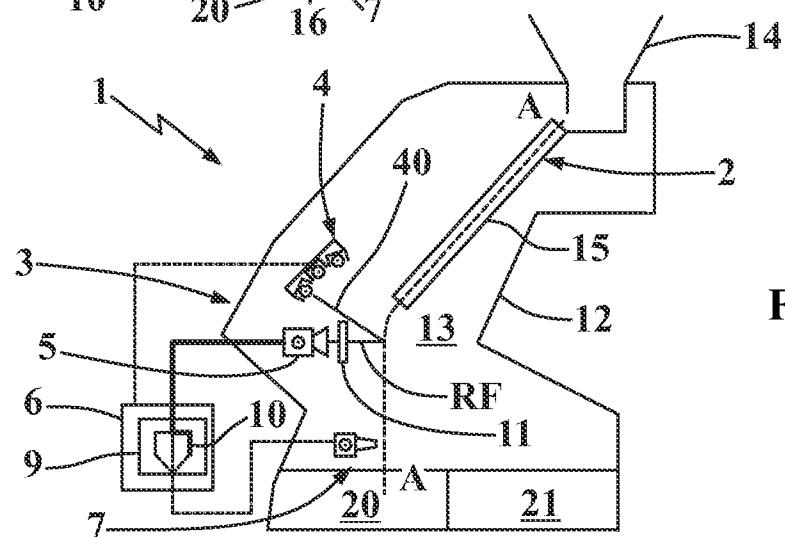
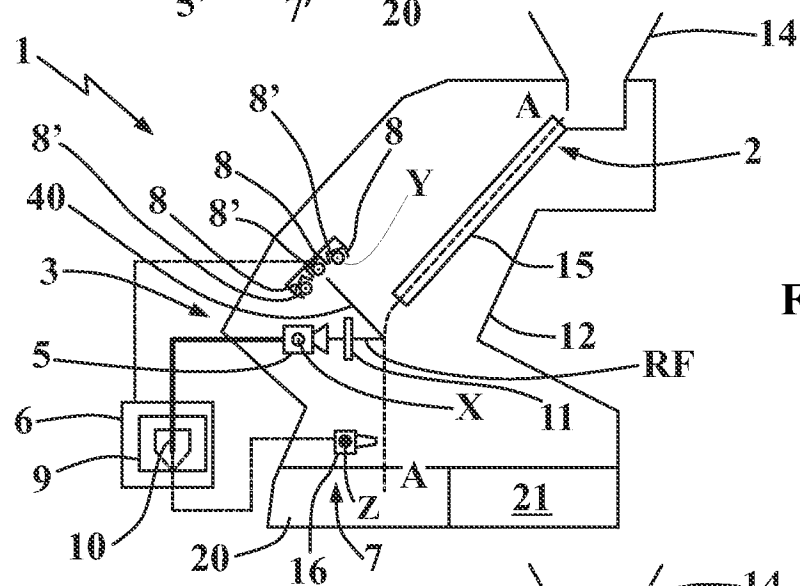


Fig. 1



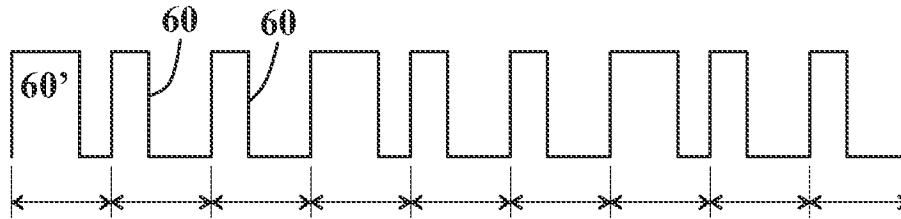


Fig. 5

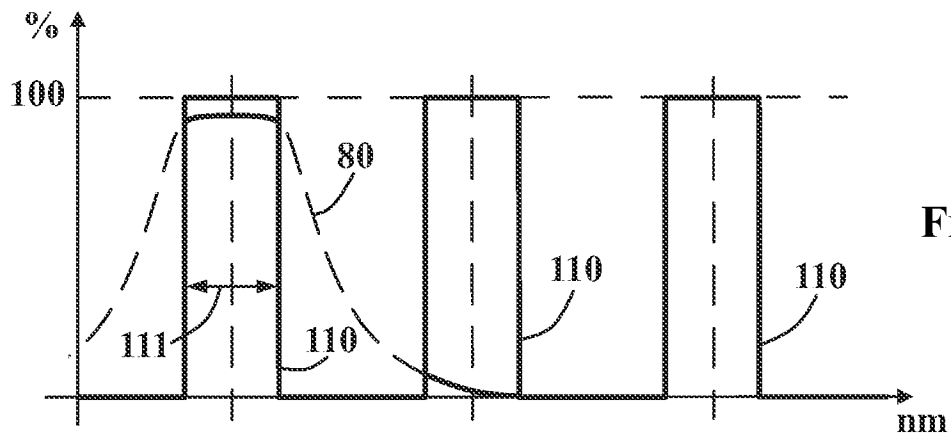


Fig. 6

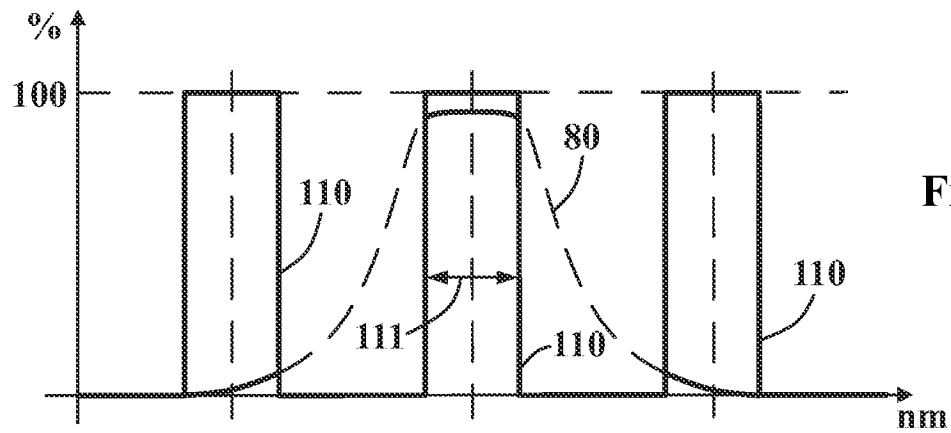


Fig. 7

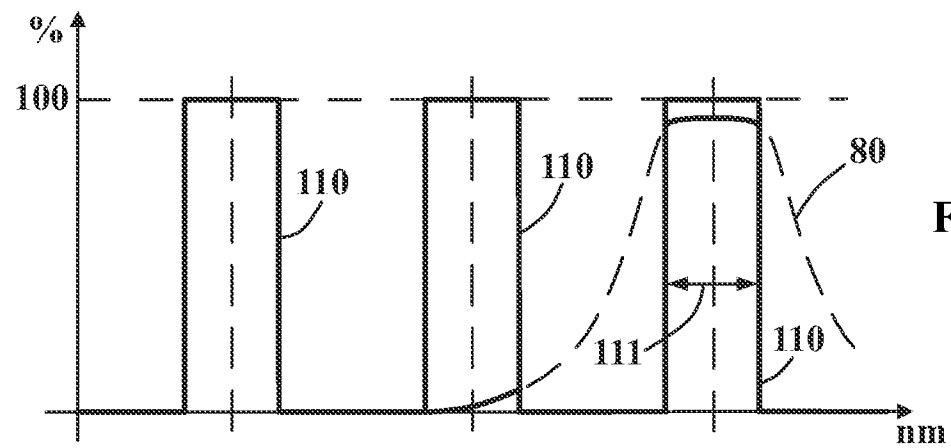


Fig. 8

SCORE Placeholder Sheet for IFW Content

Application Number: 17505866

Document Date: 10/20/2021

The presence of this form in the IFW record indicates that the following document type was received in electronic format on the date identified above. This content is stored in the SCORE database.

Since this was an electronic submission, there is no physical artifact folder, no artifact folder is recorded in PALM, and no paper documents or physical media exist. The TIFF images in the IFW record were created from the original documents that are stored in SCORE.

- Drawing

At the time of document entry (noted above):

- USPTO employees may access SCORE content via DAV or via the SCORE web page.
- External customers may access SCORE content via PAIR using the Supplemental Content tab.